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Effects of Teaching Level, Subject Area, and Degree on Grades 5-12 Educator Learning Modes

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EFFECTS OF TEACHING LEVEL, SUBJECT AREA, AND DEGREE

ON GRADES 5-12 EDUCATOR LEARNING MODES

by

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Therefore encourage one another and build each other up,

just as in fact you are doing. - I Thessalonians 5:11

The process of learning and growing as a person and educator is a continuous journey that never ends. This journey is molded, encouraged, and supported by family, friends, colleagues, and teachers. My personal journey through the dissertation process is no different. Thanks to the support of my parents, Rogers and Missie Jones, and my brother and sister-in-law, Mitchell and Katie Jones, I have had unconditional love and encouragement from the beginning of my educational journey. Both my parents were educators who taught me the value of hard work, dedication, and personal growth. Their example at home and in their careers paved the path for my future.

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While I am not always quick to thank the One who gave me the ability and talent to get to where I am today, I know that God has set me on this path. The last several months, the trail that has been forged for me could only have happened with God's unwavering love and plans. I am reminded of Jeremiah 29:11, *"For I know the plans I have for you," declares the Lord, "plans to prosper you and not to harm you, plans to give you hope and a future."* I pray that I continually remember that God has a plan for me and thank Him for what He has done and who He has placed in my life.

ABSTRACT

by
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December 2017

Title: Effects of Teaching Level, Subject Area, and Degree on Grades 5-12 Educator Learning Modes (Under the direction of Dr. Bruce Bryant)

The purposes of this dissertation were two-fold. First, the purpose of this study was to determine the effects by subject area taught between educators in high schools versus educators in middle schools on the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes measured by Kolb's Learning Style Inventory in one central Arkansas school district. The independent variables for Hypotheses 1-4 were educator teaching level (high school versus middle school) and subject area taught (mathematics/science, literacy/social studies, and other). Second, the purpose of this study was to determine the effects by degree level between educators in high schools versus educators in middle schools on the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes measured by Kolb's Learning Style Inventory in one central Arkansas school district. The independent variables for Hypotheses 5-8 were educator teaching level (high school versus middle school) and degree level (Bachelors, Masters, Masters plus additional hours).

Hypotheses 1-8 were tested using a 2 x 3 factorial between-groups design to analyze the interaction effect and main effects of educator teaching level, subject area taught, and degree level on four separate independent variables that were learning modes. The results of this study were mixed. The interaction between subject area taught and educator teaching level on Concrete Experience learning mode from Hypothesis 3 and the interaction between subject area taught and educator teaching level on Reflective Observation learning mode from Hypothesis 4 were found to be statistically significant. However, neither the interaction effect nor either main effect was found to be statistically significant in Hypothesis 1, Hypothesis 2, Hypothesis 5, Hypothesis 6, Hypothesis 7, or Hypothesis 8. For Hypothesis 3, results indicated high school mathematics/science educators scored significantly higher compared to educators who teach other grades and subjects, and there was a significant difference, in general, in the Concrete Experience learning mode of high school and middle school educators who teach literacy/social studies. For Hypothesis 4, results indicated the high school literacy/social studies educators scored significantly higher compared to educators who teach other grades and subjects, and there is a significant difference, in general, in the Reflective Observation learning mode of high school and middle school educators who teach literacy/social studies.

The review of literature modeled how learning theories have developed and evolved over time to not only include children but adult learners. In the field of education, narrowing the focus to job-embedded professional development through professional learning communities, instructional coaching, and assessment and data disaggregation, administrators, trainers, instructional coaches, and facilitators have multiple researched-based strategies to guide adult learning. Just as each educators' background and experience will be different, those providing professional learning must understand that educator learning styles will be different and adjust professional learning experiences to be purposeful and effective for K-12 educators.

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CHAPTER I

INTRODUCTION

Differentiation is an educational term used in many K-12 classrooms, buildings, and districts to ensure that every student is growing in knowledge and ability. Tomlinson (2014) defined differentiated classrooms as places that allow all students to use their talents and abilities to display their knowledge at different levels, at different rates, and in different ways. Using tests and inventories such as Gardner's (2011) Multiple Intelligences or the Myers-Briggs Type Indicator (Myers & Briggs Foundation, 2016b), educators can assess students to learn more about their individual personalities and learning styles. Although the research on differentiation is limited, Huebner (2010) provided several practices that provide a foundation for differentiation and individual student success. With specific information about students' personalities and learning styles, educators can plan classroom lessons and activities that are individualized and meaningful.

If students need to be provided differentiated lessons, should educators be provided job-embedded differentiated professional learning opportunities such as professional development, webinars, social media outlets, and coaching to continue personal growth? Sweeney's (2011) student-centered coaching focuses on creating goals for students based on the curriculum and working toward ensuring those goals are met. This approach takes the pressure off the teacher; however, Knight's (2007) instructional-coaching model focuses on working with teachers to model and help them implement research-based instructional strategies in the classroom. Although both coaching models help teachers to grow and improve instruction, there are many other strategies and professional development opportunities provided to teachers weekly, monthly, and yearly through professional organizations, webinars, educational cooperatives, and social media outlets. These outlets provide a one-size-fits-all approach to training where educators with various experiences and abilities are all part of the same workshop no matter the content taught, years of experience, degree level of education, gender, learning style or preference.

Although providing differentiated learning for students is beneficial to the educational process, this researcher asked if the same forms of differentiation should be provided to educators. Knight (2011) stated, “When teachers stop learning, so do students” (p. 4). Knowles, Holton, and Swanson (2011) devoted much research to how adults learn, developed the theory of andragogy, and determined adults learn best when learning is adapted to fit the situation. Therefore, professional development and training opportunities that correspond with teachers’ individual personalities and learning styles could encourage and empower them to continue learning. Kolb and Kolb’s (2005) experiential learning theory defined learning as a combination of knowledge and experience. The experiential learning theory is the basis for the Kolb Learning Style Inventory that meets the criteria to determine learning styles of educators (Kolb & Kolb, 2005). Once the learning styles of educators are determined, trainers, administrators, consultants, instructional coaches, and other professional developers can provide quality, engaging, meaningful, and differentiated, job-embedded professional learning opportunities.

Statement of the Problem

The purposes of this study were as follows. First, the purpose of this study was to determine the effects by subject area taught between educators in high schools versus educators in middle schools on the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes measured by Kolb's Learning Style Inventory in one central Arkansas school district. Second, the purpose of this study was to determine the effects by degree level between educators in high schools versus educators in middle schools on the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes measured by Kolb's Learning Style Inventory in one central Arkansas school district.

Background

Research seemed to be rather limited when addressing information on determining the learning styles of adults, and specifically K-12 educators, to differentiate job-embedded professional development learning opportunities. Most of the studies examined in reference to the Kolb Learning Style Inventory addressed the learning styles of students in higher education. However, this researcher attempted to provide the reader with connections to learning styles and adult learners in K-12 education.

Theoretical Framework: Learning Theory

The term learning has many meanings and purposes depending on the one doing the learning and the one doing the teaching. Knowles et al. (2011) defined learning as "the process of gaining knowledge and expertise" (p. 17). Since the creation of schools, the intent was for teachers to impart knowledge to students or children. Piaget (1952) noted that this pedagogical model gave the responsibility of teaching to the adult and the responsibility of learning to the child. For example, the teacher determined the content to be taught, how the information would be presented, when the information would be taught, and if the child had learned the material (Piaget, 1952). Knowles et al. (2011) contended that the student learned if the student followed the teacher's directives while in the classroom; thus, this model did not focus on the child but on the teacher. Research on pedagogy and andragogy have further determined how and why children and adults learn and the differences in how both groups learn.

As researchers and educators evolved and spent time getting to know students, the methods and strategies teachers used to teach changed from being teacher-centered to being student-centered. Teachers gave inventories such as Howard Gardner's (2011) Multiple Intelligences or the Myers-Briggs Type Indicator (Myers & Briggs Foundation, 2016b) to determine students' learning styles and personalities. These inventories and assessments provided the teacher with background knowledge on the student to teach in a way the student could learn. Determining the learning style of a student gave the teacher the ability to differentiate instruction.

Educators should not only impart knowledge to students. Adults teaching students must continually be learning and modeling continuous learning (Knight, 2011). Thus, the term andragogy, "a set of core adult learning principles that apply to all adult learning situations" (Knowles et al., 2011, p. 2) was created to focus on the learning of adults. Knowles et al. (2011) stated, "andragogy works best in practice when it is adapted to fit the uniqueness of the learners and the learning situation" (p. 3). Based on andragogy research, professional learning opportunities need to be differentiated and job-embedded for adult learners, including classroom teachers and all educators.

Professional Development

Research on andragogy has influenced the field of education, K-12 education, higher education, and adult learning centers. Educators learn content, instructional strategies, and classroom management techniques based on the most recent research. Educators continue learning through avenues of professional learning such as job-embedded professional development, training opportunities, workshops, continuing education opportunities, additional college courses, and experience. To model the kind of learning that is “safe, humane, empowering, and guided by a vivid awareness of current reality” (Knight, 2011, p. 3), individuals such as trainers, consultants, administrators, facilitators, instructional coaches, and others providing professional development must use the same techniques and strategies for adult educators as used by educators for students.

State Boards of Education have determined the best way for educators to continue learning and growing is through professional development. In Arkansas, the State Board of Education requires teachers to attend, yearly, a minimum of 36 hours of professional development for licensure renewal (Arkansas Department of Education, 2015a). The standards, adopted by Arkansas through Learning Forward (2001), state that educators must be committed to all students, be involved in professional learning, collaborate, and learn in their own way to be effective with information gained from professional learning. Additionally, addressing educator needs (Castleberry, 2010) and having purpose and structure (Guskey & Yoon, 2009) are other implications for effective professional development for educators. Assessing learning styles is one way to develop professional learning opportunities that engage educators. If educators are to learn in their own way and if professional learning should address individual needs, providing job-embedded professional development based on learning styles becomes the means of meeting both needs.

Learning Styles

In order for professional learning opportunities to be differentiated, presenters, instructional coaches, and facilitators need to understand the learning styles of educators being trained. Several personality and learning style inventories exist including Gardner's (2011) Multiple Intelligences, the Myers-Briggs Type Indicator (The Myers & Briggs Foundation, 2016b), and Kolb's Learning Style Inventory (Kolb & Kolb, 2005); however, the Kolb Learning Style Inventory offers a different perspective as it is based on the experiential learning theory (Kolb & Kolb, 2005). The experiential learning theory defines learning as "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience" (Kolb, 1984, p. 41). Various things including personality type, education, and career and job choice shape learning styles (Kolb, 1984). From Kolb's research on the experiential learning theory, the Learning Style Inventory was created to determine an individuals' learning mode and learning style. Kolb's Learning Style Inventory consists of four learning styles including diverging, assimilating, converging, and accommodating (Hay Group, 2005). These four learning styles were created based on an individual's preference on the cycle of learning which includes Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation as learning modes (Hay Group, 2005). Based on experiential learning, there are two ways to take in experience: Concrete Experience or Abstract Conceptualization. Further, there are two ways to deal with experience: Reflective Observation and Active Experimentation (Hay Group, 2005). The diverging learning style is a combination of Concrete Experience and Reflective Observation; the assimilating learning style is a combination of Reflective Observation and Abstract Conceptualization; the converging learning style is a combination of Abstract Conceptualization and Active Experimentation, and the accommodating learning style is a combination of Active Experimentation and Concrete Experience (Hay Group, 2005). See Figure 1 for a diagram of Kolb's Experiential Learning Theory.

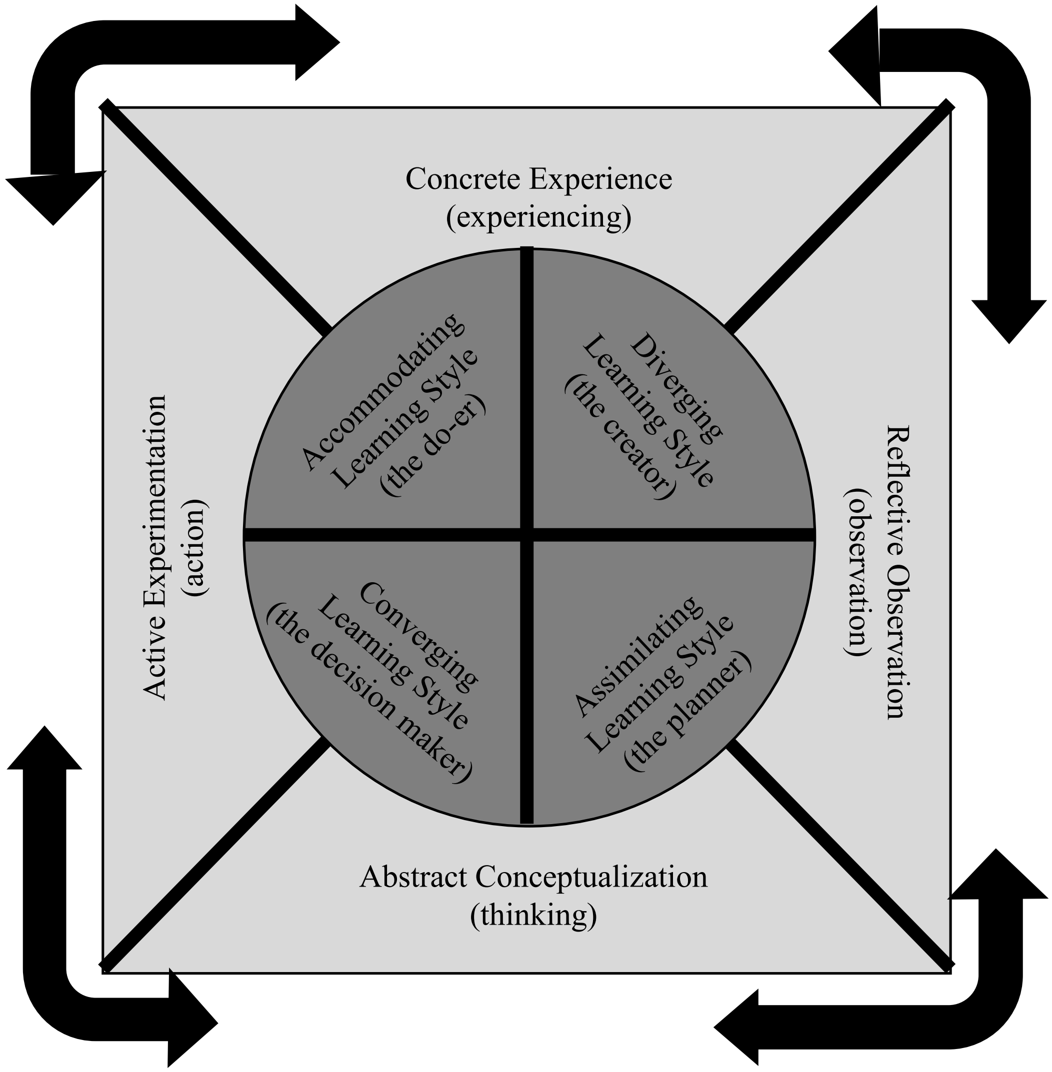

Figure 1. Kolb's Experiential Learning Theory (adapted from Hay Group, 2005).

These four learning modes create a graph in which an individual's personal preference falls. The learning style is determined by looking to see where the individual's preference falls between the learning modes. Both the learning mode and the learning style provide information for the individual being assessed and the individual doing the assessing.

Other inventories look at learning styles in different ways. Gardner's (2011) Multiple Intelligences divides individuals into intelligences including linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, interpersonal, and intrapersonal. These intelligences were meant to show that there are more to "human intellectual competences" (Gardner, 2011, p. 8) than "standardized verbal instruments" (Gardner, 2011, p. xxviii); individuals learn differently and express their knowledge differently. The Myers-Briggs Type Indicator looks not at learning styles but at personality types and how personality affects learning and teaching (The Myers & Briggs Foundation, 2016b). The indicator shows the preference between extraversion and introversion, sensing or intuition, thinking or feeling, and judging or perceiving (The Myers & Briggs Foundation, 2016b). Individuals will fall into one of the 16 personality types, and knowing the differences in the personality types helps not only students to understand themselves better but also the teacher when planning for different students (The Myers & Briggs Foundation, 2016b). The four learning styles and the four learning modes in Kolb's Learning Style Inventory contain characteristics and qualities from specific learning styles and personality traits, combining the two into one (Kolb & Kolb, 2005). Therefore, knowing the Kolb Learning Style of an educator provides more knowledge as to how to differentiate professional learning opportunities.

Variables and Participants

The Kolb Learning Style Inventory has previously been researched and used in various professions. In management education, Boyatzis, Cowen, and Kolb (1995) and Lengnick-Hall and Sanders (1997) matched Kolb's Learning Styles with "learning environments, program design, and experiential learning" (Kolb & Kolb, 2005, p. 18) in business games that were computerized. Boyatzis et al. (1995) and Lengnick-Hall and Sanders (1997) also looked at the relationship of learning styles and management styles. In the field of psychology, the Kolb Learning Style Inventory was used to look at the learning styles of counselors and their clients and the impact of change among those being counseled (Kolb & Kolb, 2005). In the medical fields, the relationships of the physician and patient, as well as the relationships between learning style and specialty areas for physicians and nurses, were studied and found to be useful in training and education (Kolb & Kolb, 2005). As evidenced by these studies, Kolb's Learning Style Inventory has been used with adults in businesses and medical professions.

While the previously mentioned research demonstrated how the Kolb Learning Style Inventory had been used in various fields outside of education, most of the fields including education focused on the learning style of students taking courses and how learning style affected learning in higher education. Specifically, in the field of higher education, Claxton and Murrell (1987) looked at learning style models that included instructional preference, social interaction, information processing, and personality among students in college. The research concluded that faculty members who had information on the learning styles of their students became more aware and careful in addressing differences and planning lessons in the classroom (Claxton & Murrell, 1987). Claxton and Murrell (1987) also indicated that students were more successful when students knew and understood their personal learning styles. Students also wanted to learn strategies to enhance learning in ways that were not their own dominant learning style (Claxton & Murrell, 1987). Not only did research indicate how faculty members and students in higher education could benefit from knowing and understanding learning styles, but Svinicki and Dixon (1987) replicated a study that found students and faculty in higher education wanted courses to have variety and not solely use a lecture model. The Kolb Learning Style Inventory provided professors with a model for selecting activities. Svinicki and Dixon described how different teaching strategies and activities such as lecture, classroom discussion, field experiences, collaboration, and teamwork fit into each of the four learning styles and four learning modes in Kolb's Learning Style Inventory. Understanding different teaching methods and how the methods and activities fit into the experiential learning model provided students with various ways to learn and professors with an increased number of strategies from which to choose based on the content or class situation (Svinicki & Dixon, 1987). Research done using Kolb's Learning Style Inventory indicated that adult students and their teachers benefited from knowing and understanding their learning styles.

The significance of research completed in higher education institutions for students and faculty, alike, on learning styles suggests that there is a need not only in higher education but also in K-12 education for professional developers, administrators, trainers, and instructional coaches to know and understand educator learning styles. Additionally, educators need to know and understand their personal learning styles. Differentiating instruction for students by faculty in higher education and K-12 education is necessary and often required; however, training and job-embedded professional development provided to professors and educators could also be more beneficial and engaging if it were differentiated based on learning style.

Hypotheses

The initial review of the literature suggested that knowing and understanding learning styles of both faculty and students in higher education institutions and in the business world increased knowledge, understanding, and success. Although evidence specifically related to K-12 adult learning education was meager, this researcher asked whether the positive outcome of learning styles in other areas could be generalized to adult educators. Therefore, the researcher generated the following null hypotheses.

1. No significant difference will exist by subject area taught between educators in high schools versus educators in middle schools on Abstract Conceptualization measured by Kolb's Learning Style Inventory in one central Arkansas school district.
2. No significant difference will exist by subject area taught between educators in high schools versus educators in middle schools on Active Experimentation measured by Kolb's Learning Style Inventory in one central Arkansas school district.
3. No significant difference will exist by subject area taught between educators in high schools versus educators in middle schools on Concrete Experience measured by Kolb's Learning Style Inventory in one central Arkansas school district.
4. No significant difference will exist by subject area taught between educators in high schools versus educators in middle schools on Reflective Observation measured by Kolb's Learning Style Inventory in one central Arkansas school district.

5. No significant difference will exist by degree level of education between educators in high schools versus educators in middle schools on Abstract Conceptualization measured by Kolb’s Learning Style Inventory in one central Arkansas school district.
6. No significant difference will exist by degree level of education between educators in high schools versus educators in middle schools on Active Experimentation measured by Kolb’s Learning Style Inventory in one central Arkansas school district.
7. No significant difference will exist by degree level of education between educators in high schools versus educators in middle schools on Concrete Experience measured by Kolb’s Learning Style Inventory in one central Arkansas school district.
8. No significant difference will exist by degree level of education between educators in high schools versus educators in middle schools on Reflective Observation measured by Kolb’s Learning Style Inventory in one central Arkansas school district.

Description of Terms

Abstract conceptualization (AC). One of the modes of the learning cycle from the Kolb Learning Style Inventory version 3.1 that can be described as “learning by thinking” (Hay Group, 2005, p. 2). Characteristics include analyzing, planning, and logic. AC is a combination of the learning styles, converging and assimilating (Hay Group, 2005).

Accommodating. One of the learning styles from the Kolb Learning Style Inventory version 3.1 that can be described as *hands-on* learning (Hay Group, 2005). Characteristics include doing and feeling. The accommodating learning style is a combination of the learning modes, Active Experimentation and Concrete Experience (Hay Group, 2005).

Active experimentation (AE). One of the modes of the learning cycle from the Kolb Learning Style Inventory version 3.1 that can be described as "learning by doing" (Hay Group, 2005, p. 2). Characteristics include accomplishing tasks, modeling, and risk-taking. Active Experimentation is a combination of the learning styles, accommodating and converging (Hay Group, 2005).

Assimilating. One of the learning styles from the Kolb Learning Style Inventory version 3.1 that can be described as focusing on logical ideas and practicality (Hay Group, 2005). Characteristics include watching and thinking. The assimilating learning style is a combination of the learning modes, Reflective Observation and Abstract Conceptualization (Hay Group, 2005).

Concrete experience (CE). One of the modes of the learning cycle from the Kolb Learning Style Inventory version 3.1 that can be described as "learning by experiencing" (Hay Group, 2005, p. 2). Characteristics include feeling and intrapersonal skills. Concrete Experience is a combination of the learning styles, accommodating and diverging (Hay Group, 2005).

Converging. One of the learning styles from the Kolb Learning Style Inventory version 3.1 that can be described as a problem solver (Hay Group, 2005). Characteristics include doing and thinking. The converging learning style is a combination of the learning modes, Abstract Conceptualization and Active Experimentation (Hay Group, 2005).

Degree level. The Carnegie Classification of Institutions of Higher Education (2015) classification system categorizes degree levels into five groups including Doctoral universities, Master's colleges and universities, Baccalaureate colleges, Baccalaureate/Associate's colleges, Associate's colleges, and Special Focus Institutions. The Arkansas Department of Education (2015b) groups salary schedules into Bachelor's degree, Master's degree, and highest degree beyond Master's; therefore, the degree levels referenced in this research were Bachelor's degree, Master's degree, and Master's plus additional hours.

Diverging. One of the learning styles from the Kolb Learning Style Inventory version 3.1 that can be described as learning by observation (Hay Group, 2005). Characteristics include feeling and watching. The diverging learning style is a combination of the learning modes, Concrete Experience, and Reflective Observation (Hay Group, 2005).

Experiential learning cycle. The Experimental learning cycle involves four phases or learning modes including Concrete Experience, Active Experimentation, Abstract Conceptualization, and Reflective Observation. The Kolb Learning Style Inventory version 3.1 assigns participants of the inventory into the phases; however, participants are not likely to land in one phase but are expected to rotate through the phases as they take in or deal with learning experiences (Hay Group, 2005).

High school educators. The United States Department of Education United States Network for Education Information (2008) defines high schools as Grades 9-12. Therefore, high school educators were represented by Grades 9-12.

Learning modes. Kolb and Kolb (2005) define four learning modes that make up the experiential learning cycle including Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation.

Learning styles. The Kolb Learning Style Inventory version 3.1 lists four learning styles including diverging, converging, accommodating, and assimilating that an individual will lean toward based on the individual's experiential learning style (Hay Group, 2005).

Middle school educators. Under the professional licensure description on the Arkansas Department of Education (2016a) Data Center website, middle teacher licensure for English, math, science, and socials studies includes fifth grade through eighth grade; therefore, middle school educators were represented by Grades 6-8.

Reflective observation (RO). One of the modes of the learning cycle from the Kolb Learning Style Inventory version 3.1 that can be described as "learning by reflecting" (Hay Group, 2005, p. 2). Characteristics include reflecting, observing, and considering multiple perspectives. Reflective Observation is a combination of the diverging and assimilating learning styles (Hay Group, 2005).

Years of experience. On the National Center for Education Statistics (2012) website, the most recent schools and staffing survey divided years of teaching experience into four groups including 0-3 years, 4-9 years, 10-14 years, and 15 or more years.

Significance

Research Gaps

The Kolb Learning Style Inventory has been used with sample populations from 10 countries outside of the United States and in many fields including education, management, computer science, psychology, medicine, nursing, accounting, and law; however, the inventory has been used the most in the field of education (Kolb & Kolb, 2005). The largest number of studies have been conducted among individuals in higher education in which the learning styles were compared with the type of instruction being used and curriculum being presented, but researchers also compared the learning styles of undergraduate students, graduate students, and faculty (Kolb & Kolb, 2005). McCarthy's (1996, 1997) work used the Kolb Learning Style Inventory to create her 4MAT design on learning styles to focus on curriculum design in the K-12 education setting. However, this research using the Kolb Learning Style Inventory in K-12 education was minimal in comparison to the previous research studies done using the Kolb Learning Style Inventory. Therefore, there was a gap in research completed in K-12 education (Kolb & Kolb, 2005). This research study provided data to reinforce validity and reliability, and it provided an avenue for educators, consultants, facilitators, and instructional coaches to determine the best methods for providing professional development and trainings to K-12 educators based on educator learning style.

Possible Implications for Practice

Upon completion of this study, educators, consultants, instructional coaches, and facilitators could have a method from which to differentiate and provide engaging professional development and training for K-12 educators. Educators could be provided more diverse professional development and trainings within their districts, educational cooperatives, and online portals that equip them for teaching and learning in the classroom. Additionally, understanding learning styles of adults may positively affect the functionality of professional learning communities. Not only did facilitators and educators want to know about this study, but school districts and state education agencies wanted to see the research to determine the best strategies and methods to use in moving forward with providing continual growth opportunities for educators. School districts and state education agencies wanted to use the research to support the vision and mission, as well as support state professional development legislation affecting educators.

Educators in collaboration with their administrators could have choices when determining the best professional development opportunities to benefit their learning and when participating in professional learning communities. Travel and cost often limited educator choices of differentiated and beneficial training. Results from this research could equip facilitators, instructional coaches, and consultants to differentiate instruction based on learning styles for K-12 educators; therefore, more local opportunities for educators could be provided. Educators could attend professional development based on their learning styles instead of attending a session with all educators.

Process to Accomplish

Design

A quantitative, causal-comparative strategy was used in this study. Hypotheses 1-4 were tested using a 2 x 3 factorial between-groups design. The independent variables for Hypotheses 1-4 were educator teaching level (high school versus middle school) and subject area taught (mathematics/science, literacy/social studies, and other). Hypotheses

5-8 were tested using a 2 x 3 factorial between-groups design. The independent variables for Hypotheses 5-8 were educator teaching level (high school versus middle school) and degree level (Bachelors, Masters, and Masters plus additional hours). The dependent variables for Hypotheses 1-4 and 5-8 were the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes, respectively.

Sample

This study used educators in high schools and educators in middle schools in one central Arkansas school district. The researcher chose the district based on the size of the population. Of the participants, approximately 50.5% were high school educators and 49.5% were middle school educators; 24% taught mathematics/science, 25% taught literacy/social studies, and 51% taught other; 48% held Bachelor's degrees, 34% held Master's degrees, and 18% held Master's degrees plus additional hours; and 13% had 0-3 years of experience, 24% had 4-9 years of experience, 18% had 10-14 years of experience, and 45% had 15 plus years of experience.

One central Arkansas school district was identified to take part in the study including 432 certified educators from three high schools and four middle schools. When completing the survey instrument, educators provided demographic data that was used to stratify the groups. Educators were selected by stratified cluster random sampling to ensure that of the 432 educators in the district, high school and middle school educators were chosen equally. Next, high school and middle school educators were divided into one of three groups based on the subject level taught and one of three groups based on degree level of an educator.

Instrumentation

In the spring of 2017, educators of one district were asked to attend a monthly, building-wide faculty meeting. The required meeting in each building was held on a chosen day either before or after school during the month of February or March by the building administrator. During the required faculty meeting hosted by each building in one district, the Kolb Learning Style Inventory version 3.1 was administered to all educators. The Kolb Learning Style Inventory version 3.1 was used to determine learning style of the educators and consisted of 12 items with four words each that are ranked in order of personal learning style. Educators also completed a demographic questionnaire.

The authors of the inventory noted that their research showed a Cronbach alpha reliability coefficient between .77 and .84 for Concrete Experience, Reflective Observation, Abstract Conceptualization, Active Experimentation, Abstract Conceptualization-Concrete Experience, and Active Experimentation-Reflective Observation on three different studies from an Online Sample, Kayes' study in 2005, and Wierstra and DeJong's study in 2002 (as cited in Kolb & Kolb, 2005). Test-Retest reliability was between .96 and .99 for Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation for an initial sample and a replication sample with data from Veres et al. in 1991 (as cited in Kolb & Kolb, 2005). Based on a sample from multiple studies, these results suggest that the Kolb Learning Style Inventory version 3.1 scales show an internal consistency reliability that is good.

Kolb and Kolb cited internal validity evidence based on six studies that were completed. Scale intercorrelations for the total normative sample were at $p < .001$; ACCE/AERO, $p = -.21$; ACCE/RO, $p = .10$; ACCE/AE, $p = -.26$; AERO/AC, $p = -.14$;

CE/AC, *p* = -.44; RO/AE, *p* = -.43; CE/RO, *p* = -.42; AC/AE, *p* = -.45; CE/AE, *p* = -.03; and AC/RO, *p* = -.20 (Kolb & Kolb, 2005). External validity evidence for the Kolb Learning Style Inventory version 3.1 found that with age, preference for learning by action decreased as age increased and preference for learning by abstraction increased as age increased (Kolb & Kolb, 2005). Males showed preference towards abstraction, and there was no significance between males and females towards action (Kolb & Kolb, 2005). The Kolb Learning Style Inventory version 3.1 demonstrated a linear relationship between the abstractness and the amount of education from elementary school to graduate school (Kolb & Kolb, 2005). Internal and external validity suggests there are significant relationships among the learning preferences.

Data Analysis

To address the first four hypotheses, a 2 x 3 factorial analysis of variance (ANOVA) was conducted using educator teaching level (high school versus middle school) by subject area taught (mathematics/science, literacy/social studies, and other) as the independent variables. The dependent variables for Hypotheses 1-4 were the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes, respectively. In addressing the second four hypotheses, a 2 x 3 factorial ANOVA was conducted using educator teaching level (high school versus middle school) by degree level (Bachelors, Masters, and Masters plus additional hours) as the independent variables. The dependent variables for Hypotheses 5-8 were the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes, respectively. To test the null hypotheses, the researcher used a two-tailed test with a .05 level of significance.

CHAPTER II

REVIEW OF RELATED LITERATURE

Educators, whether in K-12 education, in higher education, or in adult education programs, seek to provide the best learning experience for their students. The drive to further learning in children and adults encourages and motivates educators to find and use the best teaching strategies and resources to engage learners. Researchers such as Piaget and Knowles have led the way in the development of learning theories for children and adults. States have defined standards for professional learning among educators, and further researchers have tied learning theories to the specific standards. Researchers like DuFour, Danielson, Fullan, Stiggins, Bloom, Knight, Sweeney, and Barkley have led the way with ideas to provide job-embedded professional development for educators through professional learning communities, instructional coaching, and the use of assessment and data disaggregation to continually be exposed to and reflect on what is best for each student. Additionally, trainers, consultants, administrators, instructional coaches, and individuals training teachers need to not only know the content being trained but also understand the learning process of the adult learners. The process of focusing on each individual student led to Tomlinson’s (2014) research on differentiation, allowing students to learn on their own level, at their own time, and in their own way. Learning style and personality inventories were introduced as a tool for educators to determine the best way to differentiate for each student. While the focus of differentiation has been on

K-12 students, the need to model the same strategies with adults has been addressed through the experiential learning theory published by Kolb (1984). This theory provides four learning modalities and four learning styles that adults, in and outside of education, fall into in Kolb's Learning Style Inventory. Understanding the learning modalities and learning styles of adult educators allows consultants, trainers, administrators, instructional coaches, and others to provide meaningful, engaging, and job-embedded professional development, trainings, and workshops. Literature on learning theories, professional development, and learning styles was reviewed to determine the need to differentiate K-12 teacher professional learning based on learning styles.

Theoretical Framework: Learning Theory

Learning theory has evolved and continues to evolve to explain how, why, when, and at what rates people learn. These terms, intelligence, knowledge, and learning, are often used interchangeably, but these terms have been defined differently by psychologists and theorists over time. Piaget (1960) defined intelligence as the state where adaptations and interactions between something and its environment collide or meet. Merriam-Webster (n.d.) stated that intelligence is the ability to react to new situations, to learn or understand. Gardner (2011) added that intelligence is the ability not only to solve problems but to create products and add value to cultures. Knowledge is the gaining of information or awareness (Merriam-Webster, n.d.), and learning is "the process of gaining knowledge and expertise" (Knowles et al., 2011, p. 17). Bingham and Conner (2011) say that learning is transformative. Knowles et al. (2011), however, explained that individuals' definitions of words guide how their theories affect learning.

Based upon the various definitions, when learning occurs by an individual, knowledge is gained, and individual intelligence should be shown in action.

The ideas and definitions of learning, knowledge, and intelligence have guided how psychologists, researchers, and theorists have broadened and narrowed the focus of learning theories into areas such as pedagogy and andragogy. The German philosopher, Herbart, saw educational practices as interconnected and as a craft used to achieve a purpose; to him, the purpose of gaining knowledge was to act morally (Kenklies, 2012; Knox, 1975). The ethical sphere held five moral ideas including inner freedom, perfection, goodwill, right or justice, and equity (Knox, 1975). Herbart believed educational theory supported good practices as education supports students (Kenklies, 2012). Further researchers, including Piaget, sought to refine educational and learning theories including pedagogy and constructivism (Harlow, Cummings, & Aberasturi, 2006; Kenklies, 2012). Pedagogy, a term associated with Piaget due to his extensive research on constructivism, refers to how people, especially children, construct knowledge from their involvement, physical or mental, with the environment (Harlow et al., 2006). The constructivist theory adds that being an active participant in learning increases knowledge and understanding (Harlow et al., 2006). Students, as in children, were the initial focus of pedagogical research because babies and children begin to learn and develop intelligence from the moment they are born and begin experiencing life. Piaget's studies of his own children and others' actions and behaviors whether through patterns, senses, or experience from birth to speech guided his formation of the meaning of pedagogy (Piaget, 1952). While Piaget's intent was to focus on learning, not specifically children, he ended up focusing on children; therefore, when other theorists began questioning the learning of adults, the term *andragogy* was coined.

Was the learning of adults different from the learning of children? Kapp, a German educator, was the first to distinguish the two types of learning when he created the term andragogy; however, the term did not begin to be used until Rosenstock-Huessey used the term as he worked to find ways to teach the German people (Chan, 2010; Henschke, 2011). Lindeman furthered the idea of adult learning in America citing it as a key for teaching all adults (Henschke, 2011). The term andragogy has been used since the 1830s, and it continues to develop. However, not until Knowles' research in the 1950s did the theory of adult learning come to fruition, especially in the United States (Chan, 2010; Henschke, 2011). Knowles' theory contains six learning principles for adults including the why, what, and how the learner needs to know; the self-concept of the learner; the past experience of the learner; the learner's readiness to learn; the learner's orientation to learning; and the learner's motivation to learn (Chan, 2010; Knowles et al., 2011). The concept map developed by Knowles et al. (2011) places the principles at the core, surrounded by individual and situation differences whether in the subject matter, the situation, or the individual; the goals and purposes for learning surround the differences (see Figure 2).

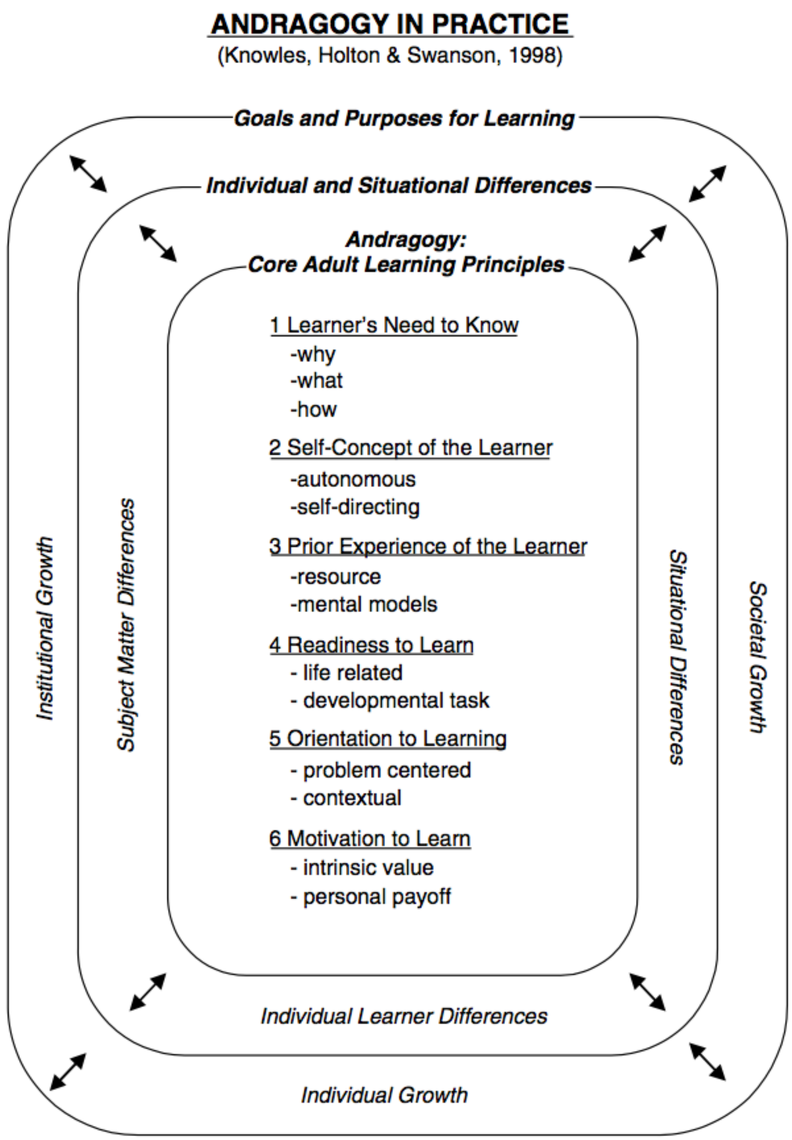

Figure 2. Andragogy in practice (Knowles et al., 2011, used by permission).

Knowles et al. (2011) described andragogy in rings. The first inner ring, core adult learning principles, focuses on the theory of andragogy and specific learning principles of adults; the outer two rings represent how to apply and put andragogy into practice. These core principles were meant to be applied to any situation in which adults learn, but when the principles are differentiated to fit the needs of the learner in the situation, the principles work best (Knowles et al., 2011). Chan (2010) adds that andragogy allows the teacher and student to work together, promoting communication, trust, and partnership, increasing student self-awareness and learning. A partnership approach to learning in andragogy forces the teacher, trainer, or consultant to be a facilitator of learning instead of a presenter of information like in pedagogy (Henschke, 2011). From learning to knowledge to intelligence, adult learning theory involves the learner and meets the needs of adults, where the adults are, and on the adults' time frame, no matter the field of learning.

Professional Development

The theories of pedagogy and andragogy have both played roles in the field of education, whether in K-12 education, higher education, or adult learning centers. Educators have been taught research-based strategies, classroom management techniques, and content knowledge to engage children and adults and to increase their knowledge and understanding. Educators learn techniques and strategies through professional development opportunities, training opportunities, continuing education opportunities, and experience. Knight (2011) suggests, "This kind of learning – learning that is safe, humane, empowering, and guided by a vivid awareness of current reality – should be a driving force for humanizing professional learning in schools" (p. 3). To model this kind of learning for educator use in the classroom, professional developers, trainers, consultants, instructional coaches, and administrators must model the same techniques and strategies for adult educators with whom they are working to increase enthusiasm for the content, engagement by the educator, and a deeper understanding. One way to get to know the audience is to determine learning styles and develop professional learning opportunities tailored to an adult educators' learning style.

In Arkansas, the State Board of Education amended Act 44 of 2015 to require teachers to obtain at least 36 hours of professional development yearly. For licensure renewal, educators must attend professional development that follows the Rules for Governing Professional Development and Standards for Professional Learning (Arkansas Department of Education, 2015b). Learning Forward, a professional learning association, developed the Standards for Professional Learning that Arkansas follows. Learning Forward states four truths about educators that must be believed before an educator can be effective with the information gained from professional learning. The four truths are:

1. Educators' commitment to students, all students, is the foundation of effective professional learning,
2. Each educator involved in professional learning comes to the experience ready to learn,
3. Because there are disparate experience levels and use of practice among educators, professional learning can foster collaborative inquiry and learning that enhances individual and collective performance, and
4. Like all learners, educators learn in different ways and at different rates. (2001, p. 3)

These four statements by Learning Forward are the foundation for professional growth among educators.

While Learning Forward provides the basis for professional learning in Arkansas, additional researchers suggest other professional development needs. Guskey and Yoon

(2009) add that professional development should have a clear purpose and structure to be effective for all participants, and Castleberry (2010) implied professional development must address educator needs. If educators are supposed to develop effective lessons for students to learn, they must attend and participate in effective learning opportunities as well, and effective learning sessions could be developed using, not only content or subject, but educator learning styles. Once these expectations have been established, professional development opportunities should fall into one of the seven standards from Learning Forward (2001) including learning communities, leadership, resources, data, learning designs, implementation, and outcomes. Like the standards and frameworks educators use as a map to teach students, these standards for professional learning are the guide educators use to be more effective in the classroom and for trainers to be more effective when facilitating adult learning.

Learning Communities

Being in a community with others is something people crave. Being on an island, by oneself in life or in education, does not promote growth. People need relationships and often gravitate towards others with similar personalities or learning styles. One way for educators to develop relationships with colleagues who collaborate and work together is through professional learning communities. Learning Forward (2001) suggests, "professional learning that increases educator effectiveness and results for all students occurs within learning communities committed to continuous improvement, collective responsibility, and goal alignment" (p. 2). In recent years, educators claim that any meeting, whether by grade level, department, or committee, is a professional learning community. However, DuFour (2004) argued not all gatherings are professional learning community meetings. Professional learning communities focus on learning and not teaching, collaboration with a collective purpose, and accountability for each member of the team (DuFour, 2004) over a period of time (Fullan, 2014). Stoll, Bolam, McMahon, Wallace, and Thomas (2006) affirmed that professional learning communities provide a model for collaboration among educators in the educational community of their schools. Morrissey (2000) adds that professional learning communities offer a system and structure to create a culture that supports teachers becoming more effective in the classroom. To create more effective teachers, professional learning communities could be created based on educator learning style instead of, or in addition to, grade level or department. Professional learning communities, when implemented with fidelity and established in a positive culture, can benefit both students and teachers.

Not only are professional learning communities good for personal relationships, accountability, and growth, but they are required of educators. Professional learning communities are listed among the standards for professional learning for Arkansas educators (Learning Forward, 2001). Additionally, the 2011 Arkansas General Assembly passed the Teacher Excellence and Support System which uses Charlotte Danielson's *A Framework for Teaching* as the guide and rubric for rating teachers (Arkansas Department of Education, 2016c). The Danielson Group (2011) lists four domains and 22 components of teacher responsibility. Within the domain of professional responsibilities, educators are assigned ratings based on the level at which a teacher pursues and participates in professional development opportunities, welcomes feedback from colleagues, and assumes a leadership role (The Danielson Group, 2011). Teachers earn a rating on a scale of 1 to 4. Therefore, teachers who choose not to participate in a professional learning community receive a rating of a 1 or unsatisfactory, and teachers who participate and even take on leadership responsibilities earn a 4 or distinguished (The Danielson Group, 2011). The Arkansas Teacher Excellence Support System forces educators to participate in a professional learning community, but the educator has a choice to collaborate or not. Even though educators are forced to participate in a professional learning community, educators may be more willing and interested in participating if the professional learning community they are a part of was created based on similar interests and learning styles instead of forced grade levels or departments. When a culture for professional learning communities has been set in the building, student achievement increases and teacher quality increases (DuFour & Mattos, 2013). Learning communities are the first standard listed by Learning Forward and build the foundation for professional growth in the remaining standards. This reinforces the need to have professional learning communities in which educators have common goals, common interests, common personalities, and want to participate.

Leadership

The second standard for professional learning in Arkansas is leadership. Learning Forward (2001) communicated, "Professional learning that increases educator effectiveness and results for all students requires skillful leaders who develop capacity, advocate, and create support systems for professional learning" (p. 2). Fullan (2014) agrees that when leaders give teachers the skills and capacity to learn and lead, teachers become more accountable on their own. Personal accountability breeds leadership qualities, and for teachers to become leaders, they must be given the opportunity to participate in professional development on leadership, as well as be provided the opportunity to lead professional development to develop their personal capacity for leadership. Educators have different backgrounds, personalities, and learning styles. Educators who know themselves and their own learning styles, as well as know how to communicate and work with others with differing styles, will provide more meaningful professional development and increase their aptitude to continue developing leadership traits and more teacher leaders.

Resources

Resources for educators differ depending on the district school mission and vision, administrators, budget, culture, personality, and learning style. Learning Forward (2001) urged, "Professional learning that increases educator effectiveness and results for all students requires prioritizing, monitoring, and coordinating resources for educator learning" (p. 2). Resources for educator learning could be in the form of in or out of district professional development workshops and trainings, collaboration with colleagues, guidance from instructional coaches, books, technology, material resources, and time (Learning Forward, 2015). When professional learning is job-embedded and there is continuous support through resources, teachers are less likely to resist change and more likely to implement their learning (Knight, 2007). One of the components of the Teacher Excellence Support System in Arkansas, as modeled by The Danielson Group's (2011) *Framework for Teaching Evaluation Instrument*, is to demonstrate knowledge of resources within the school, district, and state, and on a broader scope, within the country and the world via the Internet or other resources. The challenge for administrators is to ensure that all resources are provided for educators and that educators see the value of and implement their learning when provided with the professional development, time, and material resources. If resources are provided in a one-size-fits-all mentality to all educators, without buy-in, need, interest, or learning style, educators may walk through the motions and not use the resources effectively. When resources, including professional development, are provided with educator learning style and interest in mind, the educator will make more connections to the resources. Educators must also be a part of a culture that encourages them to look outside of the classroom walls and search for meaningful resources for themselves and for their classrooms.

Data

Data collection can be formal or informal, formative or summative assessment scores, progress monitoring, tallies, checklists, conversations, and student or teacher data. Learning Forward (2001) proposed, "Professional learning that increases educator effectiveness and results for all students uses a variety of sources and types of student, educator, and system data to plan, assess, and evaluate professional learning" (p. 2). Stiggins (2002) warns that assessment should be *of* learning and *for* learning, not solely *of* learning. Educators who look at their individual data as seen in the classroom or as compared to the school, district, or nation can only reflect on their perspective. The first standard for professional learning was learning communities (Learning Forward, 2001). Teachers who become involved in professional learning communities not only reap the benefit of having a safe place to have conversations but also gain an accountability group to have conversations with when looking at data (DuFour, 2004; Stiggins, 2002). Assessments and data collected of learning are typically associated with standardized test scores, but these assessments, given once a year, do not allow for progress monitoring and detecting what is not working (Stiggins, 2002). Guskey (1998) iterated that assessment results and data should help the teacher or professional learning community answer questions such as: Is the strategy or program leading to the intended results; Is it better than what was formerly done; Is it better than other strategies, programs or activities; and Is it worth the cost? These questions, along with specific questions that diagnose student needs throughout the learning process, tell students what is and is not working in their study, or they provide parents with information to support their child's learning focus on using data for learning (Stiggins, 2002). The key to professional development for educators is to use the data to drive professional learning, not use it for condemnation and evaluation.

Learning Designs

When teaching strategies, behavior strategies, models, or programs are first brought up in educational settings, the first question that is asked is if it is a research-based practice. Learning Forward (2001) emphasized, "Professional learning that increases educator effectiveness and results for all students integrates theories, research, and models of human learning to achieve its intended outcomes" (p. 2). Learning designs that are based on research and theory come in many different shapes and forms including discussion, questioning, reflection, demonstrations, modeling, practice, coaching, problem-solving, active participation, active listening, creating, direct instruction, and more. These designs are chosen by educators in the classroom based on the educator's teaching style and preference rather than the style in which students learn or the style which will stretch students the most. The same process can be applied to trainers in workshops – the design of the workshop is often created based on the preference and comfort of the instructor rather than the need, interest, or learning style of the educators participating in the workshop. Implementing research-based resources such as Bloom's Taxonomy, that provide a pyramid of higher order thinking skills ranging from knowledge in Level 1 to comprehension, application, analysis, synthesis, and evaluation in Level 6 (Bloom, 1956) is one way for educators and trainers to create deeper learners and deeper thinkers, but using Bloom's Taxonomy should not be the sole model. Trainers must incorporate and model multiple research-based learning designs to meet the specific needs of each educator, and in turn, meet the specific needs of each student.

Implementation

Learning that occurs from professional development is not meant to be a quick fix or one-time application for the classroom. Learning Forward (2001) contended, "Professional learning that increases educator effectiveness and results for all students applies research on change and sustains support for implementation of professional learning for long-term change" (p. 2). To create long-term change through the implementation of new ideas or strategies, teachers must have continued support from their professional learning communities, their administrators, and other instructional leaders in the district or building (DuFour & Mattos, 2013; Fullan, 2014). Without continued support, teacher buy-in and the excitement to implement new strategies decreases and is often forgotten by educators. Additionally, teacher resistance and fear of the unknown increases, minimizing teacher growth. Knight (2007) argues generating continued job-embedded professional learning reduces teacher resistance to change due to disorganized change initiatives and the feelings of lack of support. Furthermore, when timely and appropriate feedback is given to the teacher by either administrators or instructional leaders and coaches, teachers are more likely to implement professional learning (Knight, 2007; The Danielson Group, 2011). Implementation of professional development can be the most difficult in the learning process because teachers want to have strategies that immediately fix problems and that are easily applied; however, if done with support and feedback and with teacher interest in mind, over time, implementation can help teachers and students.

Outcomes

Reflection upon lessons or observations, of formal and informal data, or professional learning experiences allows educators to closely align personal educational beliefs and outcomes with a building or district. Learning Forward (2001) stated, "Professional learning that increases educator effectiveness and results for all students aligns its outcomes with educator performance and student curriculum standards" (p. 2). Individual educator performance can be assessed through formal and informal observations completed by administrators using the Arkansas Teacher Excellence Support System evaluation process (Arkansas Department of Education, 2016c). One of the components in the evaluation process under Domain D is for educators to reflect upon their lessons (The Danielson Group, 2011). The teacher reflects, and the administrator provides written and verbal feedback, allowing the teacher to determine if the outcomes that are visible are intended or if more learning and clarification is required of the teacher or the students (Arkansas Department of Education, 2016b; The Danielson Group, 2011). Educator performance is not the only piece for teachers to reflect upon. Educators must compare the Arkansas standards for curriculum and student assessment data to determine if student outcomes or misunderstandings are due to curriculum, instruction, or the need for student intervention (Arkansas Department of Education, 2016b). The combination of teacher data, student data, and curriculum provides evidence for reflection and adjustment in the classroom or participation in further professional development. The Arkansas Teacher Excellence Support System evaluation process individualizes reflection and learning for each teacher based on her abilities and needs, and data collected provides administrators with specific information so that individual teachers have buy-in and evidence for further growth and professional learning opportunities tailored to their learning styles and needs for improvement.

Educational Coaching

Educators want feedback about their teaching, but educators often struggle with feedback provided by individuals who have not built a personal relationship with them or who they do not trust. Educational coaching meets both the desire for feedback and a need for a personal connection. Though educational coaching is relatively new, there are various types of coaching including instructional coaching and student-centered coaching and, more specifically, mathematics coaching, literacy coaching, classroom management coaching, cognitive coaching, and leadership coaching (Knight, 2009; Sweeney, 2011). The various types of educational coaching are meant for different purposes, but ultimately, the purpose is to grow adult learners. Professional development provided through job-embedded instructional coaching helps teachers to incorporate research-based strategies directly into their classrooms and teaching (Knight, 2009). Job-embedded professional development provides not only accountability from professional learning communities but also face-to-face support from an instructional coach on a regular basis.

Each form of educational coaching has a different focus and process for coaching. Knight (2007) stated that instructional coaches become partners with teachers implementing seven partnership principles including equality, choice, voice, dialogue, reflection, praxis, and reciprocity. These principles are a roadmap for how instructional coaches should work with teachers (Knight, 2007). While instructional coaching may look different depending on the setting, culture, administration, and coaching model (Knight, 2009; Sweeney, 2011), the principles guide beginning conversations and lead to a focus on what Knight (2007) calls the "Big Four" (p. 139). Knight (2007, 2009, 2011) said that the partnership principles provide a way into classrooms and into conversations with teachers about managing behavior, increasing content knowledge, learning instructional strategies, and using formative assessment data to drive daily decisions. Instructional coaches focus on the "Big Four" (Knight, 2007, p. 139) items when developing partnerships with teachers including:

- Identifying focus areas for coaching with the teachers,
- Explaining how instructional strategies should be used with teachers,
- Modeling teaching practices and instructional strategies for teachers and in teachers' classrooms,
- Observing and collecting specific data in classrooms of teachers,
- Providing feedback of positive things happening in classrooms and areas for growth to teachers, and
- Continuously working to refine the process between the coach and teacher (Knight, 2011).

The partnership principles and the components of coaching provide the road map for instructional coaches to focus on the four areas of behavior, content, instruction, and assessment.

Unlike Knight's approach that focuses more on the instructional coach working with teachers and focusing on what the teacher can do to grow, Sweeney provides a student-centered approach. Sweeney (2011) feels that there is a continuum of student-centeredness with a greater impact on student learning when there is more focus on students in the coaching process and a smaller impact on student learning when the focus of coaching becomes a partnership approach between the coach and teacher. When there is student-centered coaching, there is a four-stage process:

1. Stage 1: Set a goal for students in relationship to the standards,
2. Stage 2: Assess students to determine their performance against the goal,
3. Stage 3: Implement instruction that meets student needs, and
4. Stage 4: Reassess in order to determine if students have reached the goal. (Sweeney, 2011, p. 18)

The process followed in the "student-centered coaching cycle" (Sweeney, 2011, p. 18) takes the focus and pressure off the teacher and places the focus on what is in the best interest of students based on specific data. The coach and teacher look at specific data collected in the classroom along with the standards to be taught and determine what instructional strategies and practices need to be implemented, tweaked, or removed to make the biggest impact for students to reach mastery (Sweeney, 2011). This form of job-embedded professional learning allows teachers to look at point-in-time data and standards while getting constant feedback and help from a coach.

Knight's instructional coaching and Sweeney's student-centered coaching both provide different approaches on growing adult learners and increasing student achievement. Barkley and Bianco (2011) provide a backwards model that combines the focus of students and teachers to create change. Before school-wide change can take place, Barkley (2015) calls for changes in leadership, professional learning communities and coaching, teaching behavior, and student behavior so that student achievement occurs. Through this model, leadership together with instructional coaches look at defining questions from the backwards approach. Specific questions the instructional coach and administrator consider are:

1. What are the changes in student behavior, performance, choices, effort, etc. that you believe are precursors to the improvement in student learning that you seek,
2. What changes must occur in individual staff/teacher practices to generate the changes you seek in students? What changes must occur in parent practices to generate the changes you seek in students,
3. Are there changes that need to occur in the way that staff members work with each other in order for the desired individual staff members' changes to occur,
4. What are the behaviors/practices of school leadership that are necessary to initiate, motivate, and support these changes, and
5. How do you see your role in the changing behaviors of students, teachers, teacher leaders, and administrator? (Barkley, 2015, para. 4)

As Barkley's defining questions are considered, administrators can communicate with teachers and instructional coaches concerning how evaluation, supervision, mentoring, and peer coaching will guide decisions that are made and how the instructional coach will work with teachers (Barkley, 2015). Educational coaching, whether instructional or student-centered, can drive ongoing, timely, job-embedded professional learning among teachers. The culture of the building, leadership, defined roles of the coach, communication to teachers, and individualized plans for teachers define the success.

Teacher Perceptions

Professional development takes on many forms whether through trainings, webinars, self-study, professional learning communities, or coaching. Varying levels of learning, buy-in, and implementation occur depending on the culture of the building, the dynamics of the presentation, accountability, familiarity of the content, and even attitude of the educator. Darling-Hammond and McLaughlin (1995), Guskey (2000), and Knight (2000) found that teachers hold negative beliefs about professional development. Darling-Hammond and McLaughlin (1995) further showed that teachers say they do not have enough time during the day to both attend professional learning sessions and attend to instruction and other requirements of teachers to be effective. Guskey (2000) noted that teachers feel professional development sessions that they attend are ineffective and not relevant to them. Therefore, they do not stay engaged in the session or take information back to their classrooms to implement. After interviewing teachers, Knight (2000) found that when teachers attended conferences, they were not focused due to a conflict of personalities with teachers of different levels, a belief that professional development was not meaningful, a feeling of frustration with decisions made by administrators without teacher buy-in, and an anxiety about a shift in culture and in the school. While there were negative perceptions of attending professional development sessions, Preciado (2015) found that teachers saw the benefit of having instructional coaches who built relationships and provided job-embedded support in the classroom, and Horne (2012) added that teachers were more willing to work with instructional coaches when they were given input into the design of the instructional coaching model. Teachers were intimidated by the title of the instructional coach, fear of being forced to change, and confidence in the instructional coach's ability, but building the relationship with the instructional coaches eased teacher fears (Preciado, 2015). Evans (2010) added that teachers' attitude and perceptions of professional development will affect their behavior in the classroom. For teachers who have not bought into reflecting on their practices and implementing strategies for change or for personal growth, professional development through sessions or working with an instructional coach will continue to be an unwanted time-waster. However, for teachers who are wanting to improve continuously, job-embedded professional development will affect their learning and student success. For professional learning that is individualized through learnings styles, content, or grade levels, growth can be even more powerful.

Differentiation

The term differentiation is a buzzword that is frequently used in education to ensure that all students are being provided the opportunity to learn. Differentiation is not the same as providing a modification or an accommodation as required by an Individualized Education Plan or 504 plan. Tomlinson (2014) defined differentiated classrooms as places that allow all students to use their talents and abilities to display their knowledge at different levels, at different rates, and in different ways. Hall (2002) stated, “To differentiate instruction is to recognize students’ varying background knowledge, readiness, language, preferences in learning, interests, and to react responsively” (p. 2). Although the research on differentiation is limited, especially for adults, Tomlinson (2014) provided several elements of differentiation including focusing on what is essential to student learning. When teachers define the pieces of essential learning from learning standards, all students leave the classroom with a firm understanding of the essential piece instead of having a wide array of disjointed material to remember (Tomlinson, 2014). Tomlinson (2014) also stated the teacher must know the students in the room well enough to know their similarities and differences, their backgrounds, and how they learn – understanding that each student is and will be different, therefore, their learning will be different. The same principle can be applied to adult learners. Whether teachers in professional learning situations, adults in higher education, or adults in adult learning centers, their learning will be different based on their learning styles, personal experiences, past education, and relationships between the presenter and adult learner. See Figure 3 for Tomlinson’s tiered model for differentiation of instruction.

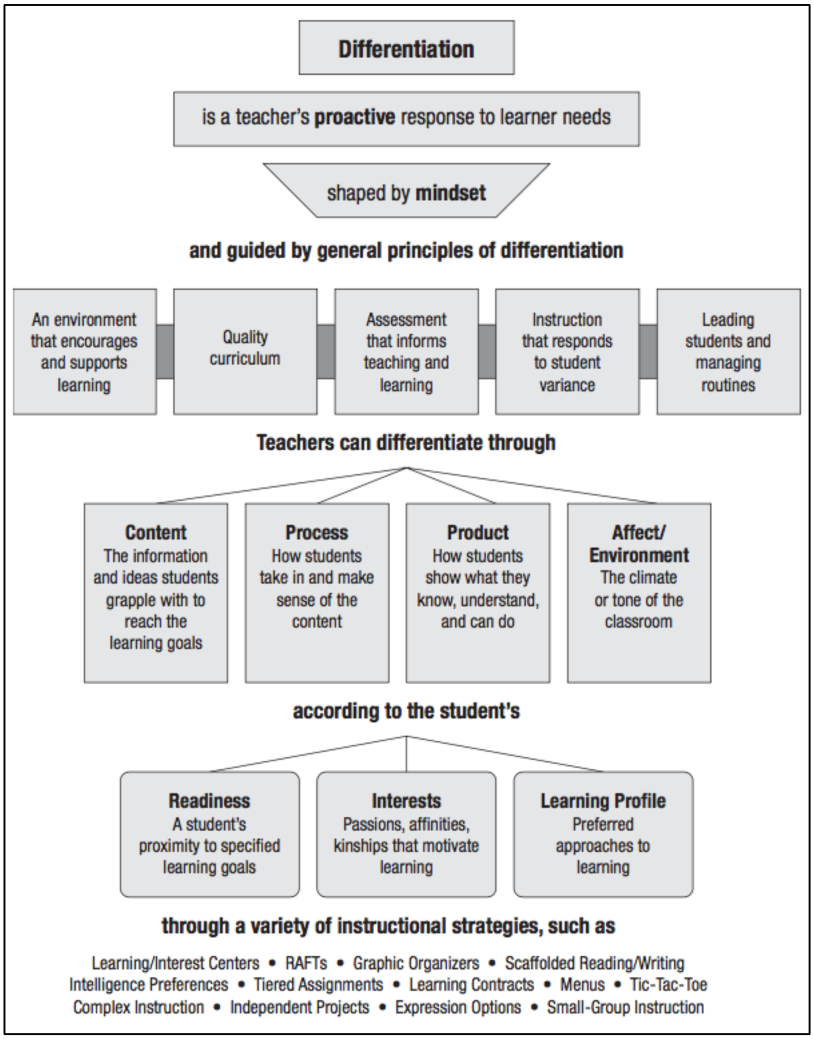

Figure 3. Differentiation of instruction (Tomlinson, 2014, p. 20, used by permission).

Tomlinson's model represents a tiered process educators take using different pathways to further each individual student's needs. The path the teacher will take will not be the same for each student due to the guiding principles, the individual student, and the access to instructional strategies (Tomlinson, 2014). While Tomlinson's model was written for K-12 educators and their students, the same principles could be applied to adult learners and their trainers.

Tomlinson's (1999) differentiation of instruction model provided three ways for teachers to differentiate: content, process, and product. In the updated differentiation of instruction model, Tomlinson (2014) adds affect/environment to how teachers can differentiate. Hall (2002) provides additional guidelines including defining essential understanding, assessing continuously, planning for critical and creative thinking, engaging all learners, and planning for student choice. Both Tomlinson (2014) and Hall (2002) reference teachers looking at individual student learning styles. If teachers should know and use individual student learning styles to plan and guide instruction, then trainers, consultants, professional developers, instructional coaches, and administrators should know the learning styles of their teachers for teachers to reap the benefits of professional learning opportunities. Differentiation allows and forces facilitators of learning to look at the whole individual when planning and providing instruction and assessing for understanding. If there is no differentiation, some learners will thrive, and some learners will be left behind, including classroom teachers.

Learning Styles

The theory of andragogy led to learning for educators through what is known as professional development. Trainers, consultants, instructional coaches, administrators, and peer teachers provide professional learning on site or at a conference through a wide variety of methods such as discussion, questioning, cooperative learning, modeling, lecture, and active participation to other educators. Social media, webinars, and online courses are other modes in which educators can learn. With a wide variety of methods and designs to provide professional learning and for educators to choose from, school leaders need to employ differentiated professional learning so that teachers are engaged and excited about the learning process. One way for those involved in providing professional learning to get to know the teachers they work with is through inventories that determine learning styles or personality styles. The presenter can then provide professional development that is tailored specifically to the audience members and not a one-size-fits-all presentation.

Inventories

The idea of learning styles has developed into a way for people to get to know others around them and, more specifically, for facilitators to get to know how teachers learn. Arce (2006) stated that as adults continue learning in school or professionally, "knowing the best ways of developing curriculum has become crucial to their ultimate success" (p. 89). Individuals have used Gardner's (2011) theory of Multiple Intelligences, the Myers-Briggs Type Indicator (The Myers & Briggs Foundation, 2016b), and the Kolb Learning Style Inventory (Hay Group, 2005) to determine the learning styles of those around them including students, peers, business partners, co-workers, and family members. Each of these indicators provides a different view of individual learning styles and how people take in knowledge, as well as how others can more effectively engage those around them.

One of the most common inventories people will take in regards to learning styles involves Gardner's Multiple Intelligences. Gardner's (2011) Theory of Multiple Intelligences involves eight abilities or behaviors considered to be an intelligence. These routes to learning include musical-rhythmic, visual-spatial, verbal-linguistic, logical-mathematical, bodily-kinesthetic, interpersonal, intrapersonal, and naturalistic (Arce, 2006, Gardner, 2011). Educators often give their students Multiple Intelligence inventories to determine the one modality that best fits the student; however, Gardner's (2011) intent was not to box in students to one modality but to empower them to learn more about their own personal abilities and behaviors. The descriptions of Gardner's (2016) Multiple Intelligences include the following (see Figure 4).

Intelligence	**Intelligence Description**	**Job Example(s)**
Spatial	The ability to conceptualize and manipulate large-scale spatial arrays or more local forms of space.	Airplane Pilot, Sailor, Architect, Chess Player
Bodily Kinesthetic	The ability to use one's whole body, or parts of the body (like the hands or the mouth), to solve problems or create products.	Dancer
Musical	Sensitivity to rhythm, pitch, meter, tone, melody, and timbre. May entail the ability to sing, play musical instruments, and/or compose music.	Musical conductor
Linguistic	Sensitivity to the meaning of words, the order among words, and the sound, rhythms, inflections, and meter of words. (Sometimes called language intelligence.)	Poet
Logical-Mathematical	The capacity to conceptualize the logical relations among actions or symbols.	Mathematicians, Scientists
Interpersonal	The ability to interact effectively with others. Sensitivity to others' moods, feelings, temperaments, and motivations. (Sometimes called social intelligence.)	Negotiator
Intrapersonal	Sensitivity to one's own feelings, goals, and anxieties, and the capacity to plan and act in light of one's own traits. Intrapersonal intelligence is not particular to specific careers; rather, it is a goal for every individual in a complex modern society, where one must make consequential decisions for oneself. (Sometimes called self-intelligence.)	Not specific to a career
Naturalistic	The ability to make consequential distinctions in the world of nature as, for example, between one plant and another, or one cloud formation and another. (Sometimes called nature intelligence.)	Taxonomist

Figure 4. Gardner's Multiple Intelligences (2016).

While the intelligence descriptions may seem inclusive, learners exhibit varying levels of each intelligence, some being more prevalent than others.

Much research was done before Gardner identified the eight intelligences and refined his theory. Gardner (2016) further explained there are two scientific implications and two educational implications to the theory of multiple intelligence. The two scientific implications are that every individual will develop pieces of the intelligences differently because every individual is uniquely made and every individual has a unique genetic makeup (Gardner, 2016). Educationally, teachers should consider that each student has different intelligences; therefore, they should be taught in the way that they learn, and concepts should be taught in multiple ways (Gardner, 2016). Arce (2006) described how Gardner's theory of Multiple Intelligence initially focused on the learning of children; however, the Adult Multiple Intelligence Project began an investigation of the modalities into adult education. Arce (2006) stated as more adults are involved in returning to school or in some form of learning, teachers must understand different ways to explain curriculum, and the Theory of Multiple Intelligences suggests more ways facilitators and trainers can be effective in engaging adult learners. The characteristics of the eight Multiple Intelligences identify and describe how teachers can differentiate instruction based on the modality strengths within each student, child or adult.

A second inventory educators and business people use to learn about those around them is the Myers-Briggs Type Indicator. The Myers and Briggs Foundation (2016b) states that trainers who know and understand the "language of psychological type" (para. 7) of their adult learners can plan their lessons in such a way as to differentiate based on each of the types and appeal to all adult learners including educators. If teachers can differentiate lessons for students in K-12 education based on the Myers-Briggs Type Indicator, facilitators of adult learners should be able to plan for professional learning in a similar way. Isabel Briggs Myer and Katharine Briggs used Jung's theory to identify four dichotomies based on how an individual focuses on the world, how an individual takes in information, and how an individual makes decisions (The Myers & Briggs Foundation, 2016b). Each of the four contrasts is separated into two preferences (The Myers & Briggs Foundation, 2016b). The preferences include extraversion (E) or introversion (I) for focus, sensing (S) or intuition (N) for information, thinking (T) or feeling (F) for decisions, and judging (J) or perceiving (P) for structure (The Myers & Briggs Foundation, 2016b). Once the inventory is complete, an individual is assigned 1 of 16 personalities, made up of different characteristics, which is made up of one preference from each dichotomy (The Myers & Briggs Foundation, 2016b). The characteristics for each personality include the following (see Figure 5).

Personality	Description
ISTJ	Quiet, serious, thorough, dependable, practical, realistic, logical, organized, loyal (The Myers & Briggs Foundation, 2016b).
ISFJ	"Practical and realistic. Concrete and specific. Cooperative and thoughtful. Kind and sensitive" (Myers, 1998, p. 12)
INFJ	"Insightful, creative, and visionary. Conceptual, symbolic, and metaphorical. Idealistic, complex, and deep" (Myers, 1998, p. 14).
INTJ	"Insightful, creative synthesizers. Conceptual, long-range thinkers. Clear and concise. Rational, detached, and objectively critical" (Myers, 1998, p. 16).
ISTP	Tolerant, flexible, observer, problem solver, logical (The Myers & Briggs Foundation, 2016b).
ISFP	Quiet, friendly, sensitive, kind, loyal, dislikes disagreements, likes own space (The Myers & Briggs Foundation, 2016b).
INFP	Idealistic, loyal, curious, adaptable, flexible, listens to others, values are important (The Myers & Briggs Foundation, 2016b).
INTP	Logical, theoretical, abstract, quiet, flexible, problem solver, skeptical, analytical (The Myers & Briggs Foundation, 2016b).
ESTP	Flexible, tolerant, energetic, spontaneous, active (The Myers & Briggs Foundation, 2016b).
ESFP	"Observant. Practical, realistic, and specific. Active, involved in immediate experiences. Generous, optimistic, and persuasive. Warm, sympathetic, and tactful" (Myers, 1998, p. 28)
ENFP	Enthusiastic, imaginative, needs affirmation, spontaneous, flexible, improvises, makes connections (The Myers & Briggs Foundation, 2016b).
ENTP	"Creative, imaginative, and clever. Theoretical, conceptual, and curious. Analytical, logical, rational, and objective. Assertive and questioning" (Myers, 1998, p. 32).
ESTJ	Practical, realistic, matter-of-fact, decisive, organizer, logical, forceful (The Myers & Briggs Foundation, 2016b).
ESFJ	Warmhearted, conscientious, cooperative, determined, loyal, works with others, needs affirmation (The Myers & Briggs Foundation, 2016b).
ENFJ	Warm, empathetic, responsive, responsible, loyal, responds to affirmation, social, helpful (The Myers & Briggs Foundation, 2016b)
ENTJ	Decisive, well-informed, likes learning, forceful, leader, looks for logical and efficient ways to solve problems (The Myers & Briggs Foundation, 2016b).

Figure 5. Myers-Briggs Type Indicator characteristics.

While there are characteristics that are similar among the 16 personality types, there are also differences. The Myers & Briggs Foundation (2016a) confirmed that individuals who take the instrument have results of three to four preferences being the same 75% to 90% of the time when comparing test-retest reliability. Additionally, validity has been confirmed in the categories of “(1) the validity of the four separate preference scales; (2) the validity of the four preference pairs as dichotomies, and (3) the validity of whole types or particular combinations of preferences” (The Myers & Briggs Foundation, 2016a, para. 6). As individuals perceive and react to their reality, over time, their personalities become more concrete and dominate (McCarthy, 1997). McCarthy (1997) believed individuals must not only learn about the patterns within their own personalities, but individuals must also learn about the other personality styles to build knowledge and understand differences. As the facilitator or instructional coach learns about the various personality styles of the educators in trainings and continually differentiates learning sessions, the adults should be adjusting and assimilating the personality styles into their own learning.

A third learning style inventory that has been used by individuals to learn about themselves and others is the Kolb Learning Style Inventory. The Kolb Learning Style Inventory differs from the previous two inventories in that it is based on the experiential learning theory (Kolb & Kolb, 2005). The experiential learning theory “defines learning as the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience” (Kolb, 1984, p. 41). Kolb (1984) showed that learning styles are shaped by personality type, education, and career and job choice. Cultural influences are another influence added by Yamazaki (2005). These things combined form a person's experience. This theory defines two modes of grasping experience, Concrete Experience and Abstract Conceptualization, and two modes of transforming experience, Reflective Observation and Active Experimentation (Kolb & Kolb, 2005). The experiential learning model defines three stages including acquisition from birth to adolescence, specialization from early elementary schooling to beginning work in adulthood, and integration from career to later life (Kolb, 1984). As an individual grows and moves through these stages, there is increasing intricacy, and development of the four modes of experience is based on the individual's learning styles (Kolb & Kolb, 2005). Concrete Experience can be described as "learning by experiencing" (Hay Group, 2005, p. 2) where an individual is "learning from specific experiences, relating to people, and being sensitive to feelings and people" (Hay Group, 2005, p. 2). Active Experimentation is "learning by doing" (Hay Group, 2005, p. 2) where an individual is "showing ability to get things done, taking risks, and influencing people and events through action" (Hay Group, 2005, p. 2). Abstract Conceptualization is "learning by thinking" (Hay Group, 2005, p. 2) where "logically analyzing ideas, planning systematically, and acting on an intellectual understanding of the situation" (Hay Group, 2005, p. 2) are characteristics of the individual. Reflective Observation can be described as "learning by reflecting" (Hay Group, 2005, p. 2) where "carefully observing before making judgments, viewing issues from different perspectives, and looking for the meaning of things" (Hay Group, 2005, p. 2) are characteristics of the individual. These four phases of the cycle intertwine. As an individual expands how they take in an experience and how they deal with an experience, they are more engaged, and the learning process is widened (Hay Group, 2005).

Individuals go through the cycle at different rates and at different times based on their experience.

In addition to the four modes of experience in the experiential learning cycle, there are four learning styles. The four learning styles are associated with four approaches identified as diverging, assimilating, converging, and accommodating (Kolb & Kolb, 2005). Each of the four learning styles has learning abilities from two of the four modes of experience (Hay Group, 2005; Kolb & Kolb, 2005). The diverging style, for example, is in between Concrete Experience and Reflective Observation (Kolb & Kolb, 2005). Individuals with the diverging learning style view "concrete situations from many points of view" (Hay Group, 2005, p. 5; Kolb & Kolb, 2005, p. 5). Diverging learners also stand back and observe, gather information, are imaginative, are emotional, and are interested in people (Hay Group, 2005; Kolb & Kolb, 2005). The assimilating style is in between Reflective Observation and Abstract Conceptualization (Hay Group, 2005; Kolb & Kolb, 2005). This style of learner is "best at understanding a wide range of information and putting it into concise, logical form" (Hay Group, 2005, p. 5; Kolb & Kolb, 2005, p. 5). Assimilating learners are interested in abstract ideas and concepts, look for logic and practicality in theories, and would rather listen to a lecture than focus on people (Hay Group, 2005; Kolb & Kolb, 2005). Converging learners combine Abstract Conceptualization and Active Experimentation (Hay Group, 2005; Kolb & Kolb, 2005). This learning style is best "at finding practical uses for ideas and theories" (Hay Group, 2005, p. 6; Kolb & Kolb, 2005, p. 5). Solving problems, dealing with technicalities, and applying learning in experiments or new situations is part of the converging learning style (Hay Group, 2005; Kolb & Kolb, 2005). The fourth learning style is accommodating, and it combines Active Experimentation and Concrete Experience (Hay Group, 2005; Kolb & Kolb, 2005). Accommodating learners “learn primarily from ‘hands-on’ experience” (Hay Group, 2005, p. 6; Kolb & Kolb, 2005, p. 5). These learners set goals and rely on other people; however, they often react based on their “gut” feeling (Hay Group, 2005; Kolb & Kolb, 2005). As individuals go through various experiences, their learning styles can shift, and the closer the point is to the middle of the grid, the more balanced the learning style is (Hay Group, 2005). See Figure 6 for Kolb’s Experiential Learning Theory diagram.

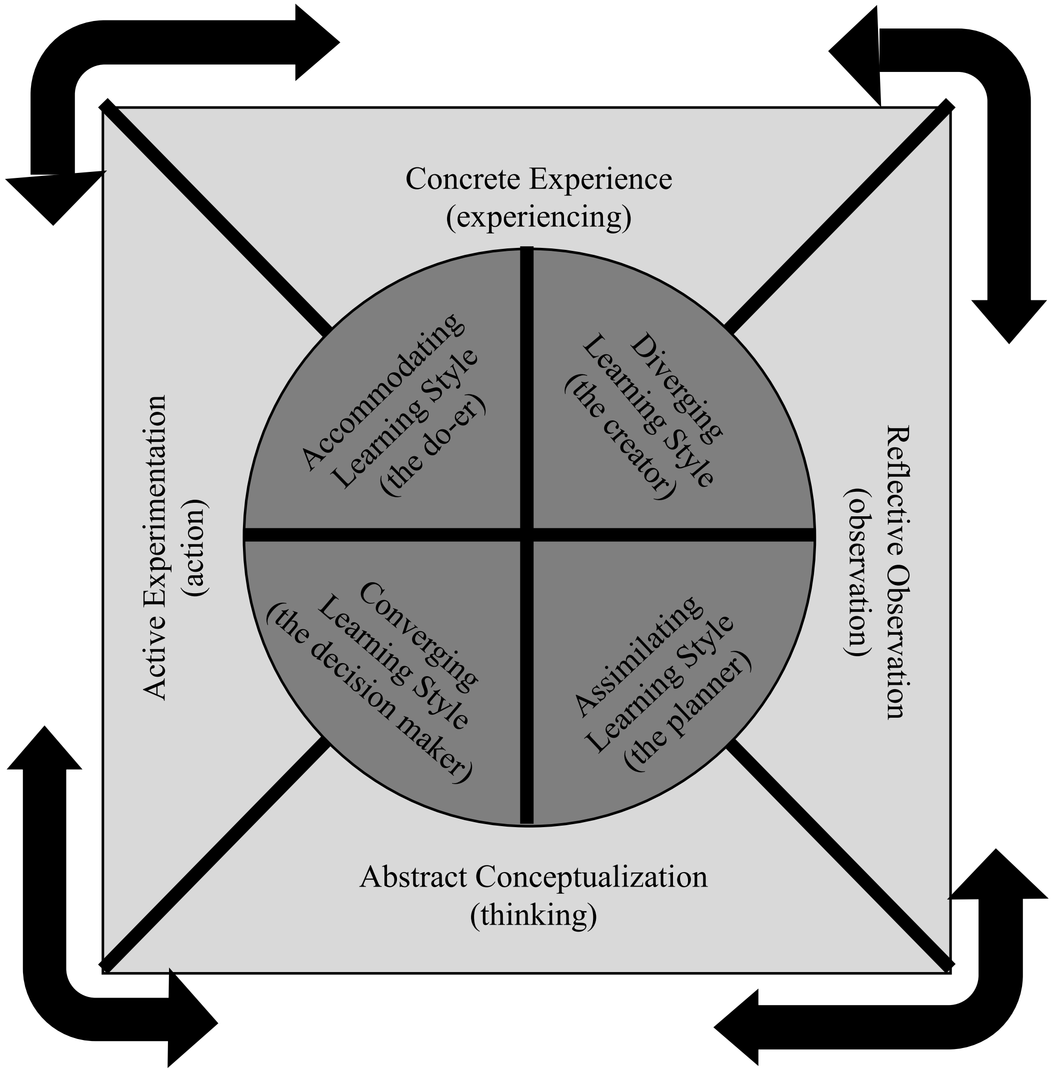

Figure 6. Kolb's Experiential Learning Theory (adapted from Hay Group, 2005).

Kolb's theory is fluid, meaning that individuals can move between the four modes that are represented in the square. Individuals fall into one of four learning styles represented inside the circle, which can also change based on experience (Kolb & Kolb, 2005). The closer one's score is to the center of the circle, the more balanced their learning styles are.

As individuals understand how they relate to experience and their learning style, they learn their own personal strengths and weaknesses. The Learning Style Inventory was created as a tool to further research the experiential learning theory and the learning style characteristics (Kolb & Kolb, 2005). The Learning Style Inventory was also created as a tool to help teachers and learners understand the learning process from the perspective of experience and learning approach (Kolb & Kolb, 2005). Awareness of how someone learns enables the teacher to create an effective and engaging learning environment for every student whether the student is a child or an adult (Kolb & Kolb, 2005). Knowing and understanding the experiential learning theory also educates individuals on how one can and should move from one mode to the next based on experience and learning style.

Variables and Participants

Determining the learning styles of students, whether in K-12 education, higher education, or adult education, has been done by educators to understand students better and to reach all types of learners. The experiential learning theory researched by Kolb continues to be studied using the Learning Style Inventory also created by Kolb and Kolb (2005). While Kolb's inventory has been used mostly in the area of higher education and with adults in careers (Kolb & Kolb, 2005), the variables discussed and recommendations for further study suggested that research in K-12 education, specifically for adult educators, could be valuable. Variables such as field study and content areas, degree level, and gender have previously been used with Kolb's Learning Style Inventory.

Educators who teach different subjects such as mathematics and literacy have often noted that they are different, teach differently, and learn differently than their counterparts. The same assumptions have been made regarding students who like certain subjects or move into specific fields of study over others. In the fields of higher education, several studies have been done using Kolb's Learning Style Inventory to look more closely at the differences and to see if there are preferred learning styles when learning certain subjects. Kolb (1984) predicted that the type of learning environment relates to the learning style. Jones, Reichard, and Mokhtari (2003) found that students learning science were more likely to learn through the modality of Active Experimentation, and when considering learning styles, mathematics, science, and social studies participants were mostly assimilators, and English participants were divergers. Research by Jones et al. (2003) and Seifert (2005) also confirms that students in postsecondary education can adapt to meet the learning task and not depend on the subject-sensitive learning style. For example, nursing students tend to fall under the diverging or accommodating learning style (Laschinger & Boss, 1989). Wyrick (2003) found that engineering students are mostly converging learners. While there is research to back individuals in specific disciplines having some stronger learning styles over individuals in other disciplines, Healey and Jenkins (2000) and Nulty and Trigwell (1996) suggest that the learning styles of students vary depending on the specific specialty areas of a field such as in geography or business. Research indicated teachers and students either have a learning style or adapt their learning style depending on the field of study indicating there seems to be a link between fields or subjects and learning styles.

Kolb's research extends from specialty areas and fields of study to specific differences between undergraduates, graduates, and faculty. In a study of individuals in the field of social work, Kruzich, Friesen, and Soest (1986) concluded that undergraduate students were accommodating learners, graduate students were diverging learners, and faculty members were converging learners. Van Soest and Kruzich (1994) and Raschick, Maypole, and Day (1998) completed a further study that found students in the field of social work preferred the Concrete Experience modality while supervisors preferred the modality of Abstract Conceptualization. There were no significant differences among learning styles between students and teachers in the field of social work education (Van Soest & Kruzich, 1994). In the field of management, Lengnick-Hall and Sanders (1997) researched undergraduate and graduate students taking management courses, and they found students had a mixed variety of learning styles. Even though the learning styles were mixed, students were successful due to multiple learning methods (Lengnick-Hall & Sanders, 1997). The differences in learning modalities and learning styles between undergraduate students, graduate students, and faculty suggest the need to consider multiple teaching methods; however, the differences also suggest that learning styles change as people grow with their learning and experience.

The Learning Style Inventory has been used in areas and specific fields, and additionally, within those areas, gender has been considered. When looking at the learning styles of adults in adult education centers, Seifert (2005) found that males prefer the modality of Active Experimentation. Other researchers also proposed that learning styles are different based on gender (Gallagher, 1998; Philbin, Meier, Huffman, & Boverie, 1995). Philbin et al. (1995) found males prefer the assimilator style while women were distributed between the diverger and converger learning styles. Jones et al. (2003) did not find any significant differences among gender in regards to a preferred learning style. While there is not a specific learning style that is dominant among gender in all studies, there are significant differences in individual studies suggesting the need for more research among genders.

The Kolb Learning Style Inventory has been used in many research studies. To continue the research, these studies suggest recommendations. Seifert (2005) suggests doing a longitudinal study of individuals' learning styles over time. Ashley-Dennison (2010) and Tullos Hutto (2009) suggest sampling a more diverse population from different types of environments. Previous studies showed significant differences in learning styles while others did not show significant differences. Some of these studies suggest an understanding of the learning modalities and learning styles but insist on a need for teachers to move students through the experiential learning cycle to experience different forms of learning. Others maintain that educators must be aware and use learning styles to differentiate for each learner.

Summary

The review of literature modeled how learning theories have developed and evolved over time to include not only children but adult learners. In the field of education, state-determined standards guide the professional development and growth of adult educators. Narrowing the focus to effective job-embedded professional development through professional learning communities, instructional coaching, and assessment and data disaggregation, administrators, trainers, and facilitators have multiple research-based strategies to guide adult learning. Although the review of the literature shows mixed results involving the variables and does not provide data involving the Kolb Learning Style Inventory being given to K-12 educators, there is evidence that knowing and utilizing adult learning styles is important. Previous research indicates the

Kolb Learning Style Inventory has been conducted among students in higher education institutions, faculty, and individuals in the business realm to understand differences in learning modalities and learning styles better. While there is evidence suggesting it is important for learners to go through the experiential learning theory cycle, either during instruction or on their own, instructors, trainers, and consultants still need to know how those they are teaching learn. Based on this literature review, this researcher saw the need to determine K-12 educator learning styles to differentiate job-embedded K-12 educator professional learning experiences better.

CHAPTER III

METHODOLOGY

The review of literature suggested learning theories have evolved to include adults, and in the field of education, states determine the standards that guide professional learning opportunities for educators. Professional learning opportunities often provided are one-size-fits-all for educators, not considering how individuals learn. Creating effective job-embedded professional development through professional learning communities, instructional coaching, and assessment and data disaggregation, administrators, trainers, instructional coaches, and facilitators have multiple research-based strategies to guide adult learning and keep educators engaged. This differentiated learning could meet the needs of educators based on their learning style. The purpose of this study was to determine the effects by subject area taught and degree level between 5-12 educators on learning modes measured by the Kolb Learning Style Inventory.

Although previous research done using the Kolb Learning Style Inventory did not include K-12 education, there is evidence that knowing, understanding, and using adult learning styles is important. There is additional evidence that the learners' learning mode changes as the learners go through the experiential learning theory cycle. Even as the learner's learning mode changes over time, depending on whether the adult is a student or teacher, it is important for the trainer, facilitator, administrator, or instructional coach to understand how those they teach learn. This chapter discusses the research design, the sample used in the study, the instrumentation, the data collection procedures, the analytical methods, and the limitations of the study.

Research Design

A quantitative, causal-comparative design was used in this study. A causal-comparative design was determined to be appropriate because the grouping variables could not be manipulated, and the researcher was attempting to determine the cause for possible differences in the groups (Mills & Gay, 2016). Hypotheses 1-4 were tested using a 2 x 3 factorial between-groups design to analyze the interaction effect and main effects of educator teaching level (high school versus middle school) and subject area taught (mathematics/science, literacy/social studies, and other) on four separate dependent variables that were learning modes (Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation). Hypotheses 5-8 were tested using a 2 x 3 factorial between-groups design to analyze the interaction effect and main effects of educator teaching level (high school versus middle school) and degree level (Bachelors, Masters, and Masters plus additional hours) on four separate dependent variables that were learning modes (Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation). The dependent variables for Hypotheses 1-4 and 5-8 were the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes, respectively. According to Leech, Barrett, and Morgan (2015), a factorial between-groups design was used because each participant is in only one group, there are two or more independent variables, and there is only one dependent variable. Each of the eight hypotheses in this study used a 2 x 3 factorial ANOVA.

Sample

The population of participants in this study included high school level and middle-level certified educators in one central Arkansas school district who were hired prior to the beginning of the study. This public school district consisted of one high school building, one freshman academy, two junior high school buildings, two middle school buildings, two alternative learning environment buildings, and nine elementary school buildings. Only middle and high school certified educators were provided an opportunity to complete the Kolb Learning Style Inventory and demographic questions. The population consisted of 432 certified educators including classroom teachers, administrators, counselors, speech therapists, and coaches. About half of the population were high school educators and half were middle school educators, about half of the educators teach *other* subject, about half hold Bachelors degrees, and about half have 15 plus years of experience. Due to the number of groups and providing every participant in the population an opportunity to take the survey, the data from every participant was used instead of pulling a sample from the population.

Instrumentation

Both instruments used were paper and pencil surveys. The demographic questions were compiled by the researcher, and the Kolb Learning Style Inventory version 3.1 was borrowed from the Hay Group. The demographic portion of the survey consisted of six questions (Appendix B) including gender, grade range taught, subject area taught, highest level of degree earned, total years of completed experience, and traditional or nontraditional licensure. The survey was anonymous; however, participants were given the option to receive the results from the Kolb Learning Style Inventory version 3.1.

Participants wanting to know their learning mode, printed and signed their name at the bottom of the demographic page and gave their school name. Participants who did not want to know the results of the Kolb Learning Style Inventory version 3.1 left the bottom blank.

The Kolb Learning Style Inventory, a self-reported survey administered to participants, was used to provide data for the dependent variables in Hypotheses 1–8. The Kolb Learning Style Inventory version 3.1 created by Kolb (1993) of Experience-Based Learning Systems, Inc. was provided free by permission from a grant from the Hay Group; however, the survey questions cannot be published due to a conditional use agreement signed by the researcher that did not allow for copyright of the inventory. The Kolb Learning Style Inventory consisted of twelve sentences with a choice of four endings. Participants ranked the endings, one through four with one being least like the participant and four being most like the participant, based on how well the participant believed the situation fit them personally and how the participant felt they would learn something new (Kolb, 1993). For each sentence stem, one of each of the four choices matched up with one of the learning modes, Abstract Conceptualization, Active Experimentation, Concrete Experience, or Reflective Observation; however, the participant did not know which sentence ending matched up with the learning mode as the sentence endings were shuffled. The ranks from each question choice were added together based on the provided formula, and a total score was calculated for Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation. Each participant had a score for each learning mode. The learning mode with the highest score was considered the most dominant learning mode for the participant by the researcher. The survey took participants approximately 10 minutes to complete.

Validity and reliability for the Kolb Learning Style Inventory were provided. A Cronbach alpha reliability coefficient on three separate studies, including the online and paper version, was between .77 and .84 for Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation (Kolb & Kolb, 2005). With test-retest data collected from Veres et al. in 1991 (Kolb & Kolb, 2005), test-retest reliability was between .96 and .99 for Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation (Kolb & Kolb, 2005). The Kolb Learning Style Inventory version 3.1 shows an internal consistency reliability alpha that is between .58 and .84 in studies such as Kayes, Wierstra and DeJong, Veres et al., and Ruble and Stout (as cited in Kolb & Kolb, 2005). These alphas suggest the Kolb Learning Style Inventory version 3.1 remains consistent across different studies.

Data Collection Procedures

After approval was obtained from the Institutional Review Board, the researcher contacted building administrators from participating schools about possible times to give the Kolb Learning Style Inventory version 3.1 paper-based version to certified faculty members in March 2017. The researcher knew that all buildings would be holding mandatory testing trainings prior to giving state-wide assessments in Grades 5-9. Other buildings would be holding mandatory one-hour embedded sessions during teachers' planning times to complete required professional development hours for the district for the 2016-2017 school year. The researcher suggested to building administrators that the survey be given as a *bell-ringer* to faculty as they signed in and waited for the testing trainings or embedded sessions to begin. Some participating school administrators gave permission for the school counselor or assistant principal to work with the researcher to get the surveys completed. The contact for each school was provided with detailed instructions by the researcher about the procedures for giving the survey, and surveys were completed in the middle-level buildings at mandatory testing training meetings and in the secondary buildings at mandatory professional development sessions. Some buildings allowed participants to take the survey out of the required meeting and later return it to the counselor or assistant principal later. Upon completion of the survey, the researcher collected the surveys from the contact at each building in April 2017. All demographic data and survey results were entered into an Excel spreadsheet to calculate the scores of each learning mode for each participant. For surveys that were signed, the researcher calculated the learning mode of the educator and provided individual results. Paper copies of the survey were shredded, and educator confidentiality was maintained because names were not recorded.

Analytical Methods

Data from this study were analyzed statistically using the *IBM Statistical Packages for the Social Sciences Version 24* (IBM Corporation, 2016). Each of the eight hypotheses was analyzed with a 2 x 3 factorial ANOVA, and a two-tailed test with a .05 level of significance was used for statistical analysis. Data were examined to verify that the assumptions were met for the test of significance and there were no outliers before running statistical tests (Leech et al., 2015). To test the first four hypotheses, a 2 x 3 ANOVA was conducted using educator teaching level (high school versus middle school) by subject area taught (mathematics/science, literacy/social studies, and other) as the independent variables. The dependent variables for Hypotheses 1-4 were the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes, respectively. To test the second four hypotheses, a 2 x 3 ANOVA was conducted using educator teaching level (high school versus middle school) by degree level (Bachelors, Masters, and Masters plus additional hours) as the independent variables. The dependent variables for Hypotheses 5-8 were the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes, respectively.

The Levene's test of equality of error variances was conducted for each of the eight hypotheses to check for homogeneity of variances. If the interaction was statistically significant ($p > .05$), the researcher considered the simple main effects to determine the differences in the interaction (Leech et al., 2015). If the interaction was not statistically significant ($p < .05$), the researcher considered the main effects individually (Leech et al., 2015). The results of the data analysis and discussion are reported in Chapter IV.

Limitations

Multiple limitations exist in this study. First, because the independent variables could not be manipulated, the researcher had to use a causal-comparative study. This meant the independent variables of educator teaching level, subject area taught, and degree level were pre-existing. Second, there were a limited number of participants in the study. While the study included 432 participants, 229 filled out some portion of the survey, 220 completed the survey entirely, and these participants came from only eight schools in one public school district. This limited number of participants represent a larger population. Third, there were potential demographic question options that were not taken into account and could have affected the results the most. For example, educators could have taught mathematics/science and literacy/social studies at the point of the survey or in the past. Educators could have also taught in middle school and high school at the time of the survey or moved from one building to another in the past. Educators may have had a bachelors degree outside of education meaning that not all of their learning was from the field of education. Educators that have not been consistently teaching the same subject or grade for their entire career have various experiences and opportunities that could have influenced their learning mode. Fourth, the Kolb Learning Style Inventory version 3.1 was self-reported. The researcher cannot guarantee how the mindset or effort of the participants could have affected their responses or that participants took the survey with fidelity. The accuracy of the results was dependent upon the participants' responses.

Fifth, as the researcher was a district administrator, previously worked at several of the schools and was an administrator at one of the schools selected for the study, procedures were put in place to avoid bias. A counselor at the school administered the survey and gave directions to educators. No names or buildings were listed on the survey unless individuals chose to get his or her learning mode results. Finally, based on the exploration of literature, the researcher has a previous bias on what possible results could be; however, the researcher did not share biased opinions of possible results with participants prior to their participation in the study to reduce biased responses. There are limitations in any study; however, this study provides the reader with information to form a perception of the effects of teaching level, subject area, and degree on Grades 5-12 educator learning modes.

CHAPTER IV

RESULTS

The purposes of this quantitative, causal-comparative research study were two-fold. First, the purpose of this study was to determine the effects by subject area taught between educators in high schools versus educators in middle schools on the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes measured by Kolb's Learning Style Inventory in one central Arkansas school district. Hypotheses 1-4 were tested using a 2 x 3 factorial between-groups design. The independent variables for Hypotheses 1-4 were educator teaching level (high school versus middle school) and subject area taught (mathematics/science, literacy/social studies, and other). The dependent variables for Hypotheses 1-4 were the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes, respectively. Second, the purpose of this study was to determine the effects by degree level between educators in high schools versus educators in middle schools on the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes measured by Kolb's Learning Style Inventory in one central Arkansas school district. Hypotheses 5-8 were tested using a 2 x 3 factorial between-groups design. The independent variables for Hypotheses 5-8 were educator teaching level (high school versus middle school) and degree level (Bachelors, Masters, and Masters plus additional hours). The dependent variables for Hypotheses 1-4 and 5-8 were the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes, respectively.

Analytical Methods

The eight hypotheses were analyzed using *IBM Statistical Packages for the Social Sciences Version 24* (IBM Corporation, 2016). Data for the hypotheses were collected and coded for educator teaching level, subject area taught, and degree level. Hypotheses 1-4 and Hypotheses 5-8 were analyzed using two 2 x 3 factorial ANOVAs. Two-tailed tests with a .05 level of significance were used to test the null hypotheses. Prior to running the appropriate statistical analysis for Hypotheses 1-8, the appropriate assumptions of normality, homogeneity of variances, and observations being independent were checked. Data were examined to determine that assumptions were met. Normality was assumed due to a sample size of 220.

Demographics

Certified educator demographics and results from the Kolb Learning Style Inventory version 3.1 survey were obtained from high school level and middle school level certified educators in one central Arkansas school district. All middle and high school certified educators (N = 432) were provided an opportunity to complete the Kolb Learning Style Inventory and demographic questions. The completed number of surveys was 50.9% (N = 220). Table 1 displays demographics for the surveyed population.

Table 1

Demographic Data for Certified Educators taking the Kolb Learning Style Inventory Version 3.1

Variable	High School		Middle School		Total	
	n	%	*n*	%	*n*	%
Educators	91	41.4	129	58.6	220	100.0
Gender						
Female	68	74.7	112	86.8	180	81.8
Male	23	25.3	17	13.2	40	18.2
Total	91	100.0	129	100.0	220	100.0
Subject Area Taught						
Mathematics/Science	28	30.8	46	35.7	74	33.6
Literacy/Social Studies	23	25.3	48	37.2	71	32.3
Other	40	43.9	35	27.1	75	34.1
Total	91	100.0	129	100.0	220	100.0
Degree Level						
Bachelors	37	40.7	66	51.1	103	46.8
Masters	24	26.4	34	26.4	58	26.4
Masters Plus	30	32.9	29	22.5	59	26.8
Total	91	100.0	129	100.0	220	100.0
Years of Experience						
0 – 3 Years	8	8.8	12	9.3	20	9.1
4 – 10 Years	27	29.7	42	32.6	69	31.4
11 or More Years	56	61.5	75	58.1	131	59.5
Total	91	100.0	129	100.0	220	100.0
Licensure						
Traditional	70	76.9	122	94.6	192	87.3
Nontraditional	21	23.1	7	5.4	28	12.7
Total	91	100.0	129	100.0	220	100.0

Due to the number of groups and providing every participant in the population an opportunity to take the survey, the data from every participant were used instead of pulling a sample from the population.

Hypothesis 1

Hypothesis 1 stated that no significant difference will exist by subject area taught between educators in high schools versus educators in middle schools on Abstract Conceptualization measured by Kolb's Learning Style Inventory in one central Arkansas school district. The assumption of independent observations was met, and homogeneity of variances and normal distributions of the dependent variable for each group were checked. The skewness values were within the 1.0 and -1.0 range. Kurtosis values were within the 1.0 and -1.0 range except for literacy/social studies secondary educators (kurtosis = -1.09). The Shapiro-Wilk test was used to test for normality with $p > .05$ for each group, indicating that the data were normally distributed across all groups. Table 2 displays the group means and standard deviations.

Table 2

Means, Standard Deviations, and n *for Abstract Conceptualization by Subject Area Taught and Educator Teaching Level*

Subject Area Taught	Educator Teaching Level	*M*	*SD*	*n*
Mathematics/Science	High School	32.11	5.57	28
	Middle School	31.43	7.33	46
	Total	31.69	6.68	74
Literacy/Social Studies	High School	30.87	7.86	23
	Middle School	30.40	7.97	48
	Total	30.55	7.89	71
Other	High School	29.68	7.11	40
	Middle School	28.11	6.54	35
	Total	28.95	6.85	75

Levene's test of equality of variances was conducted within ANOVA and indicated that homogeneity of variances across groups was not significant, $F(5, 214) = 1.34$, $p > .05$; therefore, the assumption of homogeneity of variance was not violated and met. A 2 x 3 factorial ANOVA was performed to test the interaction between the effects of subject area taught and educator teaching level on Abstract Conceptualization. The results of the ANOVA are displayed in Table 3.

Table 3

Factorial Analysis of Variance for Abstract Conceptualization as a Function of Subject Area Taught and Educator Teaching Level

Variable and source	*df*	*MS*	*F*	*p*	Partial eta^2
Subject Area Taught	2	151.69	2.95	.055	0.030
Educator Teaching Level	1	41.79	0.81	.369	0.004
SubjectAreaTaught*EducatorTeachingLevel	2	5.91	0.12	.892	0.001
Error	214	51.52			

R Squared = .03, Adjusted *R* Squared = .007

Insufficient evidence existed based on the interaction of subject area taught and educator teaching level to reject the null hypothesis, *F*(2, 214) = 0.12, *p* = .892, *ES* = 0.001. Given there was no significant interaction between subject area taught and educator teaching level, the main effect of each variable was examined separately. The main effect for subject area taught, *F*(2, 214) = 2.95, *p* = .055, *ES* = 0.030, and educator teaching level, *F*(1, 214) = 0.81, *p* = .369, *ES* = 0.004, were not significant. The interaction between subject area taught and educator teaching level predicted approximately .7% of variance for Abstract Conceptualization. Therefore, there was not enough evidence to reject the null hypothesis for the main effects.

Hypothesis 2

Hypothesis 2 stated that no significant difference will exist by subject area taught between educators in high schools versus educators in middle schools on Active Experimentation measured by Kolb's Learning Style Inventory in one central Arkansas school district. The assumption of independent observations was met, and homogeneity of variances and normal distributions of the dependent variable for each group were checked. The skewness values were within the 1.0 and -1.0 range. Kurtosis values were within the 1.0 and -1.0 range except for literacy/social studies secondary educators (kurtosis = -1.06). The Shapiro-Wilk test was used to test for normality with $p > .05$ for each group, indicating that the data were normally distributed across all groups. Table 4 displays the group means and standard deviations.

Table 4

Means, Standard Deviations, and n for Active Experimentation by Subject Area Taught and Educator Teaching Level

Subject Area Taught	Educator Teaching Level	*M*	*SD*	*n*
Mathematics/Science	High School	33.93	5.75	28
	Middle School	34.76	6.04	46
	Total	34.45	5.91	74
Literacy/Social Studies	High School	35.22	7.44	23
	Middle School	33.46	7.11	48
	Total	34.03	7.21	71
Other	High School	32.38	7.76	40
	Middle School	35.54	6.49	35
	Total	33.85	7.32	75

Levene's test of equality of variances was conducted within ANOVA and indicated that homogeneity of variances across groups was not significant, $F(5, 214) = 1.88$, $p < .05$; therefore, the assumption of homogeneity of variance was not violated and met. A 2 x 3 factorial ANOVA was performed to test the interaction between the effects of subject area taught and educator teaching level on Active Experimentation. The results of the ANOVA are displayed in Table 5.

Table 5

Factorial Analysis of Variance for Active Experimentation as a Function of Subject Area Taught and Educator Teaching Level

Variable and source	*df*	*S*	*F*	*p*	Partial eta^2
Subject Area Taught	2	3.49	0.08	.927	0.001
Educator Teaching Level	1	28.65	0.62	.432	0.003
SubjectAreaTaught*EducatorTeachingLevel	2	103.01	2.23	.111	0.020
Error	214	46.30			

R Squared = .03, Adjusted *R* Squared = .003

Insufficient evidence existed based on the interaction of subject area taught and educator teaching level to reject the null hypothesis, $F(2, 214) = 2.23$, $p = .111$, $ES = 0.020$. Given there was no significant interaction between subject area taught and educator teaching level, the main effect of each variable was examined separately. The main effect for subject area taught, $F(2, 214) = 0.08$, $p = .927$, $ES = 0.001$, and educator teaching level, $F(1, 214) = 0.62$, $p = .432$, $ES = 0.003$, were not significant. The interaction between subject area taught and educator teaching level predicted approximately .3% of variance for Active Experimentation. Therefore, there was not enough evidence to reject the null hypothesis for the main effects.

Hypothesis 3

Hypothesis 3 stated that no significant difference will exist by subject area taught between educators in high schools versus educators in middle schools on Concrete Experience measured by Kolb's Learning Style Inventory in one central Arkansas school district. The assumption of independent observations was met, and homogeneity of variances and normal distributions of the dependent variable for each group were checked. The skewness values were within the 1.0 and -1.0 range except for mathematics/science secondary educators (skewness = 1.18) and mathematics/science middle school educators (skewness = 1.41). Kurtosis values were within the 1.0 and -1.0 range except for mathematics/science secondary educators (kurtosis = 1.23). The Shapiro-Wilk test was used to test for normality with $p > .05$ for each group, indicating that the data were normally distributed across three groups, literacy/social studies secondary educators, other secondary educators, and other middle school educators. Three groups were not normally distributed with $p < .05$, mathematics/science secondary educators, mathematics/science middle school educators, and literacy/social studies middle school educators. Factorial ANOVA is a robust test against violations of normality; therefore, this test can be effectively used for statistical analysis (Leech et al., 2015). Table 6 displays the group means and standard deviations.

Table 6

Means, Standard Deviations, and n for Concrete Experience by Subject Area Taught and Educator Teaching Level

Subject Area Taught	Educator Teaching Level	*M*	*SD*	*n*
Mathematics/Science	High School	20.79	5.57	28
	Middle School	23.00	7.44	46
	Total	22.16	6.84	74
Literacy/Social Studies	High School	28.35	8.13	23
	Middle School	24.25	7.90	48
	Total	25.58	8.15	71
Other	High School	24.95	6.28	40
	Middle School	25.00	6.16	35
	Total	24.97	6.18	75

Levene's test of equality of variances was conducted within ANOVA and indicated that homogeneity of variances across groups was not significant, $F(5, 214) = 1.59$, $p < .05$; therefore, the assumption of homogeneity of variance was not violated and met. A 2 x 3 factorial ANOVA was performed to test the interaction between the effects of subject area taught and educator teaching level on Concrete Experience. The results of the ANOVA are displayed in Table 7.

Table 7

Factorial Analysis of Variance for Concrete Experience as a Function of Subject Area Taught and Educator Teaching Level

Variable and source	*df*	*MS*	*F*	*p*	Partial eta^2
Subject Area Taught	2	3420.85	6.96	.001	0.061
Educator Teaching Level	1	19.17	0.39	.533	0.002
SubjectAreaTaught*EducatorTeachingLevel	2	167.55	3.40	.035	0.031
Error	214	49.27			

R Squared = .07, Adjusted *R* Squared = .052

Sufficient evidence existed based on the interaction of subject area taught and educator teaching level to reject the null hypothesis. The interaction between subject area taught and educator teaching level on Concrete Experience was significant, $F(2, 214) = 3.40$, $p = .035$, $ES = 0.031$. According to Cohen (1988), this is a small effect size. The main effect for educator teaching level was not significant, $F(1, 214) = 0.39$, $p = .533$, $ES = 0.002$. The main effect for subject area, however, was significant, $F(2, 214) = 6.96$, $p = .001$, $ES = 0.061$. A simple effects analysis was conducted due to the interaction between the level of the variables to compare the effect of one independent variable within one level of a second independent variable. See Figure 7 for means for Concrete Experimentation as a function of subject level by educator teaching level.

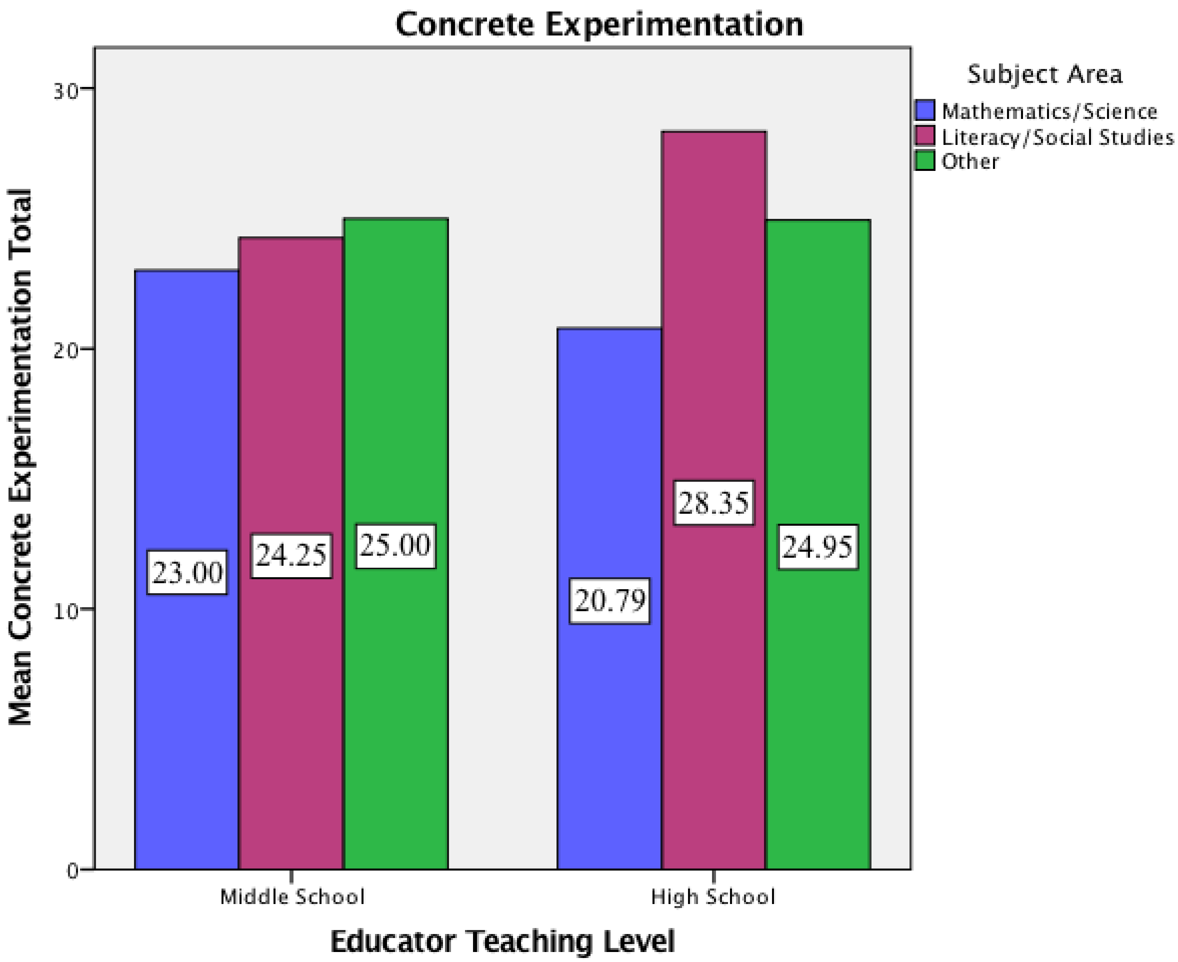

Figure 7. Means for Concrete Experimentation as a function of educator teaching level by subject area.

When comparing the three subject area levels by the high school level only of educator teaching level, two of the three pairings were significant. The pairings included mathematics/science (M = 20.79, SD = 5.57) and literacy/social studies (M = 28.35, SD = 8.13), p = .000; mathematics/science and other (M = 24.95, SD = 6.19), p = .017; and literacy/social studies and other, p = .066. When comparing the three subject area levels by the middle school level only of educator teaching level, no significant pairing was found. The pairings included mathematics/science (M = 23.00, SD = 7.44) and literacy/social studies (M = 24.25, SD = 7.90), p = .389; mathematics/science and other

(M = 25.00, SD = 6.16), p = .205; and literacy/social studies and other, p = .631. Therefore, when looking at the Concrete Experience learning mode of high school educators, there is a significant difference between the learning modes of mathematics/science educators and the learning mode of educators who teach any other subject.

When comparing the two educator teaching levels by the mathematics/science level only of subject area, no significant pairing was found, high school (M = 20.79, SD = 5.57) and middle school (M = 23.00, SD = 7.44), p = .190. When comparing the two educator teaching levels by the literacy/social studies level only, a significant pairing was found, high school (M = 28.35, SD = 8.13) and middle school (M = 24.25, SD = 7.90), p = .022. When comparing the two educator teaching levels by the other level only of subject area, no significant pairing was found, high school (M = 24.95, SD = 6.19) and middle school (M = 25.00, SD = 6.16) and, p = .975. Therefore, when looking at the Concrete Experience learning mode of subject areas, there is a significant difference between the learning modes of high school and middle school educators who teach literacy/social studies.

Hypothesis 4

Hypothesis 4 stated that no significant difference will exist by subject area taught between educators in high schools versus educators in middle schools on Reflective Observation measured by Kolb's Learning Style Inventory in one central Arkansas school district. The assumption of independent observations was met, and homogeneity of variances and normal distributions of the dependent variable for each group were checked. The skewness values were within the 1.0 and -1.0 range. The kurtosis values were within the 1.0 and -1.0 range. The Shapiro-Wilk test was used to test for normality with $p > .05$ for each group, indicating that the data were normally distributed across all groups. Table 8 displays the group means and standard deviations.

Table 8

Means, Standard Deviations, and n for Reflective Observation by Subject Area Taught and Educator Teaching Level

Subject Area Taught	Educator Teaching Level	*M*	*SD*	*n*
Mathematics/Science	High School	33.18	6.84	28
	Middle School	30.80	6.87	46
	Total	31.70	6.91	74
Literacy/Social Studies	High School	25.57	7.91	23
	Middle School	31.90	8.14	48
	Total	29.85	8.55	71
Other	High School	33.03	6.17	40
	Middle School	31.34	7.24	35
	Total	6.70	6.85	75

Levene's test of equality of variances was conducted within ANOVA and indicated that homogeneity of variances across groups was not significant, $F(5, 214) = 1.51$, $p < .05$; therefore, the assumption of homogeneity of variance was not violated and met. A 2 x 3 factorial ANOVA was performed to test the interaction between the effects of subject area taught and educator teaching level on Reflective Observation. The results of the ANOVA are displayed in Table 9.

Table 9

Factorial Analysis of Variance for Reflective Observation as a Function of Subject Area Taught and Educator Teaching Level

Variable and source	*df*	*MS*	*F*	*p*	Partial eta^2
Subject Area Taught	2	246.08	4.72	.010	0.042
Educator Teaching Level	1	29.50	0.57	.453	0.003
SubjectAreaTaught*EducatorTeachingLevel	2	380.65	7.31	.001	0.064
Error	214	52.10			

R Squared = .08, Adjusted *R* Squared = .061

Sufficient evidence existed based on the interaction of subject area taught and educator teaching level to reject the null hypothesis. The interaction between subject area taught and educator teaching level on Reflective Observation was significant, $F(2, 214) = 7.31$, $p = .001$, $ES = 0.064$. According to Cohen (1988), this is a medium effect size. The main effect for educator teaching level was not significant, $F(1, 214) = 0.57$, $p = .453$, $ES = 0.003$. The main effect for subject area, however, was significant, $F(2, 214) = 4.72$, $p = .010$, $ES = 0.042$. A simple effects analysis was conducted due to the interaction between the level of the variables to compare the effect of one independent variable within one level of a second independent variable. See Figure 8 for means for Reflective Observation as a function of subject level by educator teaching level.

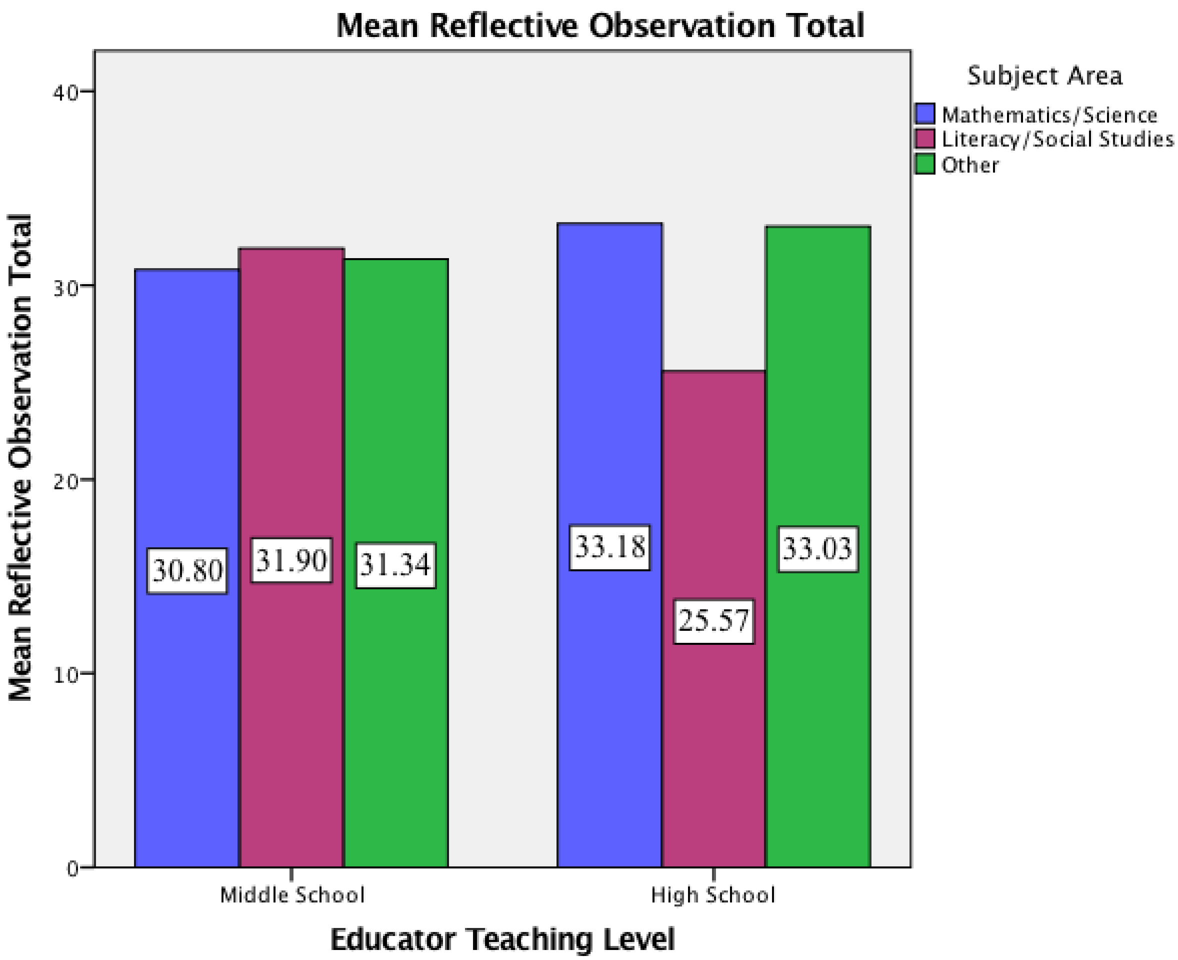

Figure 8. Means for Reflective Observation as a function of educator teaching level by subject area.

When comparing the three subject area levels by the high school level only of educator teaching level, two of the three pairings were significant. The pairings included mathematics/science (M = 33.18, SD = 6.84) and literacy/social studies (M = 25.57, SD = 7.91), p = .000; mathematics/science and other (M = 33.01, SD = 6.17), p = .931; and literacy/social studies and other, p = .000. When comparing the three subject area levels by the middle school level only, no significant pairing was found. The pairings included mathematics/science (M = 30.80, SD = 6.87) and literacy/social studies (M = 31.90, SD =

8.14), *p* = .464; mathematics/science and other (*M* = 31.34, *SD* = 7.24), *p* = .740; and literacy/social studies and other, *p* = .731. Therefore, when looking at the Reflective Observation learning mode of high school educators, there is a significant difference between the learning modes of literacy/social studies educators and the learning mode of educators who teach any other subject.

When comparing the two educator teaching levels by the mathematics/science level only of subject area, no significant pairing was found, high school (*M* = 33.18, *SD* = 6.84) and middle school (*M* = 30.80, *SD* = 6.87), *p* = .171. When comparing the two educator teaching levels by the literacy/social studies level only of subject area, a significant pairing was found, high school (*M* = 25.57, *SD* = 7.91) and middle school (*M* = 31.90, *SD* = 8.14), *p* = .001. When comparing the two educator teaching levels by the other level only of subject area, no significant pairing was found, high school (*M* = 33.02, *SD* = 6.17) and middle school (*M* = 31.34, *SD* = 7.24) and, *p* = .315. Therefore, when looking at the Reflective Observation learning mode of subject areas, there is a significant difference between the learning modes of high school and middle school educators who teach literacy/social studies.

Hypothesis 5

Hypothesis 5 stated that no significant difference will exist by degree level of education between educators in high schools versus educators in middle schools on Abstract Conceptualization measured by Kolb's Learning Style Inventory in one central Arkansas school district. The assumption of independent observations was met, and homogeneity of variances and normal distributions of the dependent variable for each group were checked. The skewness values were within the 1.0 and -1.0 range. The kurtosis values were also within the 1.0 and -1.0. The Shapiro-Wilk test was used to test for normality with $p > .05$ for each group, indicating that the data were normally distributed across all groups. Table 10 displays the group means and standard deviations.

Table 10

Means, Standard Deviations, and n for Abstract Conceptualization by Degree Level and Educator Teaching Level

Degree Level	Educator Teaching Level	*M*	*SD*	*n*
Bachelors	High School	32.05	7.19	37
	Middle School	29.32	7.52	66
	Total	30.30	7.48	103
Masters	High School	29.17	7.20	24
	Middle School	31.59	6.43	34
	Total	30.59	6.80	58
Masters Plus	High School	30.33	6.12	30
	Middle School	30.34	8.30	29
	Total	30.34	7.21	59

Levene's test of equality of variances was conducted within ANOVA and indicated that homogeneity of variances across groups was not significant, $F(5, 214) = .85$, $p > .05$; therefore, the assumption of homogeneity of variance was not violated and met. A 2 x 3 factorial ANOVA was performed to test the interaction between the effects of degree level and educator teaching level on Abstract Conceptualization. The results of the ANOVA are displayed in Table 11.

Table 11

Factorial Analysis of Variance for Abstract Conceptualization as a Function of Degree Level and Educator Teaching Level

Variable and source	*df*	*MS*	*F*	*p*	Partial eta^2
Degree Level	2	2.83	0.05	.947	0.001
Educator Teaching Level	1	0.51	0.01	.921	0.000
DegreeLevel*EducatorTeachingLevel	2	121.05	2.33	.099	0.021
Error	214	51.87			

R Squared = .02, Adjusted *R* Squared = .000

Insufficient evidence existed based on the interaction of degree level and educator teaching level to reject the null hypothesis, $F(2, 214) = 2.33$, $p = .099$, $ES = 0.021$. Given there was no significant interaction between degree level and educator teaching level, the main effect of each variable was examined separately. The main effect for degree level, $F(2, 214) = .05$, $p = .947$, $ES = 0.001$, and educator teaching level, $F(1, 214) = 0.01$, $p = .921$, $ES = 0.000$, were not significant. The interaction between degree level and educator teaching level predicted approximately .00% of variance for Abstract Conceptualization. Therefore, there was not enough evidence to reject the null hypothesis for the main effects.

Hypothesis 6

Hypothesis 6 stated that no significant difference will exist by degree level of education between educators in high schools versus educators in middle schools on Active Experimentation measured by Kolb's Learning Style Inventory in one central Arkansas school district. The assumption of independent observations was met, and homogeneity of variances and normal distributions of the dependent variable for each group were checked. The skewness values were within the 1.0 and -1.0 range. Kurtosis values were within the 1.0 and -1.0 range except for Bachelors middle school educators (kurtosis = -1.28), Masters secondary educators (kurtosis = -1.04), and Masters Plus secondary educators (kurtosis = -1.16). The Shapiro-Wilk test was used to test for normality with $p > .05$ for each group, indicating that the data were normally distributed across five groups, Bachelors secondary educators, Masters middle school educators, Masters secondary educators, Masters Plus middle school educators, and Masters Plus secondary educators. One group, Bachelors middle school educators, was not normally distributed with $p < .05$. Factorial ANOVA is a robust test against violations of normality; therefore, this test can be effectively used for statistical analysis (Leech et al., 2015). Table 12 displays the group means and standard deviations.

Table 12

Means, Standard Deviations, and n for Active Experimentation by Degree Level and Educator Teaching Level

Degree Level	Educator Teaching Level	*M*	*SD*	*n*
Bachelors	High School	33.11	7.04	37
	Middle School	34.59	6.62	66
	Total	34.06	6.78	103
Masters	High School	33.88	7.04	24
	Middle School	34.82	6.41	34
	Total	34.43	6.63	58
Masters Plus	High School	33.90	7.53	30
	Middle School	33.86	6.88	29
	Total	33.88	7.15	59

Levene's test of equality of variances was conducted within ANOVA and indicated that homogeneity of variances across groups was not significant, $F(5, 214) = .47$, $p > .05$; therefore, the assumption of homogeneity of variance was not violated and met. A 2 x 3 factorial ANOVA was performed to test the interaction between the effects of degree level and educator teaching level on Active Experimentation. The results of the ANOVA are displayed in Table 13.

Table 13

Factorial Analysis of Variance for Active Experimentation as a Function of Degree Level and Educator Teaching Level

Variable and source	*df*	*MS*	*F*	*p*	Partial eta^2
Degree Level	2	4.92	0.10	.901	0.001
Educator Teaching Level	1	31.64	0.67	.414	0.003
DegreeLevel*EducatorTeachingLevel	2	10.53	0.22	.800	0.002
Error	214	47.17			

R Squared = .01, Adjusted *R* Squared = -.016

Insufficient evidence existed based on the interaction of degree level and educator teaching level to reject the null hypothesis, $F(2, 214) = 0.22$, $p = .800$, $ES = 0.002$. Given there was no significant interaction between degree level and educator teaching level, the main effect of each variable was examined separately. The main effect for degree level, $F(2, 214) = 0.10$, $p = .901$, $ES = 0.001$, and educator teaching level, $F(1, 214) = 0.67$, $p = .414$, $ES = 0.003$, were not significant. The interaction between degree level and educator teaching level predicted approximately 1.6% of variance for Active Experimentation. Therefore, there was not enough evidence to reject the null hypothesis for the main effects.

Hypothesis 7

Hypothesis 7 stated that no significant difference will exist by degree level of education between educators in high schools versus educators in middle schools on Concrete Experience measured by Kolb's Learning Style Inventory in one central Arkansas school district. The assumption of independent observations was met, and homogeneity of variances and normal distributions of the dependent variable for each group were checked. The skewness values were within the 1.0 and -1.0 range except for Bachelors secondary educators (skewness = 1.19) and Masters middle school educators (skewness = 1.46). Kurtosis values were within the 1.0 and -1.0 range except for Bachelors secondary educators (kurtosis = 1.23) and Masters middle school educators (kurtosis = 1.92). The Shapiro-Wilk test was used to test for normality with $p > .05$ for each group, indicating that the data were normally distributed across one group, Masters secondary educators. Five groups were not normally distributed with $p < .05$, Bachelors secondary educators, Bachelors middle school educators, Masters middle school educators, Masters Plus secondary educators, and Masters Plus middle school educators. Factorial ANOVA is a robust test against violations of normality; therefore, this test can be effectively used for statistical analysis (Leech et al., 2015). Table 14 displays the group means and standard deviations.

Table 14

Means, Standard Deviations, and n for Concrete Experience by Degree Level and Educator Teaching Level

Degree Level	Educator Teaching Level	*M*	*SD*	*n*
Bachelors	High School	23.97	7.47	37
	Middle School	24.32	7.47	66
	Total	24.19	7.44	103
Masters	High School	24.46	7.42	24
	Middle School	22.97	6.83	34
	Total	23.59	7.06	58
Masters Plus	High School	25.27	6.59	30
	Middle School	24.52	7.51	29
	Total	24.90	7.00	59

Levene's test of equality of variances was conducted within ANOVA and indicated that homogeneity of variances across groups was not significant, $F(5, 214) = .49$, $p > .05$; therefore, the assumption of homogeneity of variance was not violated and met. A 2 x 3 factorial ANOVA was performed to test the interaction between the effects of degree level and educator teaching level on Concrete Experience. The results of the ANOVA are displayed in Table 15.

Table 15

Factorial Analysis of Variance for Concrete Experience as a Function of Degree Level and Educator Teaching Level

Variable and source	*df*	*MS*	*F*	*p*	Partial eta^2
Degree Level	2	20.73	0.39	.675	0.004
Educator Teaching Level	1	19.77	0.38	.541	0.002
DegreeLevel*EducatorTeachingLevel	2	15.73	0.30	.742	0.003
Error	214	52.73			

R Squared = .01, Adjusted *R* Squared = -.015

Insufficient evidence existed based on the interaction of degree level and educator teaching level to reject the null hypothesis, $F(2, 214) = 0.30$, $p = .742$, *ES* = 0.003. Given there was no significant interaction between degree level and educator teaching level, the main effect of each variable was examined separately. The main effect for degree level, $F(2, 214) = 0.39$, $p = .675$, *ES* = 0.004, and educator teaching level, $F(1, 214) = 0.38$, $p = .541$, *ES* = 0.002, were not significant. The interaction between degree level and educator teaching level predicted approximately 1.5% of variance for Concrete Experience. Therefore, there was not enough evidence to reject the null hypothesis for the main effects.

Hypothesis 8

Hypothesis 8 stated that no significant difference will exist by degree level of education between educators in high schools versus educators in middle schools on Reflective Observation measured by Kolb's Learning Style Inventory in one central Arkansas school district. The assumption of independent observations was met, and homogeneity of variances and normal distributions of the dependent variable for each group were checked. The skewness values were within the 1.0 and -1.0. The kurtosis values were also within the 1.0 and -1.0 range. The Shapiro-Wilk test was used to test for normality with $p > .05$ for each group, indicating that the data were normally distributed across all groups. Table 16 displays the group means and standard deviations.

Table 16

Means, Standard Deviations, and n for Reflective Observation by Degree Level and Educator Teaching Level

Degree Level	Educator Teaching Level	*M*	*SD*	*n*
Bachelors	High School	30.89	7.92	37
	Middle School	31.77	7.99	66
	Total	31.46	7.94	103
Masters	High School	32.50	7.28	24
	Middle School	30.62	6.76	34
	Total	31.40	6.98	58
Masters Plus	High School	30.50	7.35	30
	Middle School	31.28	6.99	29
	Total	30.88	7.12	59

Levene's test of equality of variances was conducted within ANOVA and indicated that homogeneity of variances across groups was not significant, $F(5, 214) = 0.67$, $p > .05$; therefore, the assumption of homogeneity of variance was not violated and met. A 2 x 3 factorial ANOVA was performed to test the interaction between the effects of degree level and educator teaching level on Reflective Observation. The results of the ANOVA are displayed in Table 17.

Table 17

Factorial Analysis of Variance for Reflective Observation as a Function of Degree Level and Educator Teaching Level

Variable and source	*df*	*MS*	*F*	*p*	Partial eta^2
Degree Level	2	6.84	0.12	.886	0.001
Educator Teaching Level	1	0.28	0.01	.944	0.000
DegreeLevel*EducatorTeachingLevel	2	38.24	0.68	.508	0.006
Error	214	56.36			

R Squared = .01, Adjusted *R* Squared = -.016

Insufficient evidence existed based on the interaction of degree level and educator teaching level to reject the null hypothesis, $F(2, 214) = 0.68$, $p = .508$, $ES = .006$. Given there was no significant interaction degree level and educator teaching level, the main effect of each variable was examined separately. The main effect for degree level, $F(2, 214) = 0.12$, $p = .886$, $ES = 0.00$, and educator teaching level, $F(1, 214) = 0.01$, $p = .944$, $ES = 0.00$, were not significant. The interaction between degree level and educator teaching level predicted approximately 1.6% of variance for Reflective Observation. Therefore, there was not enough evidence to reject the null hypothesis for the main effects.

Summary

This study contained eight hypotheses, all of which were 2 x 3 factorial between-groups designs. The dependent variables for Hypotheses 1-8 were the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes, respectively. The independent variables for Hypotheses 1-4 were educator teaching level (high school versus middle school) and subject area taught (mathematics/science, literacy/social studies, and other). The independent variables for Hypotheses 5-8 were educator teaching level (high school versus middle school) and degree level (Bachelors, Masters, and Masters plus additional hours). The same sample was used in the eight hypotheses. A summary of the first four hypotheses is presented in Table 18.

Table 18

Summary of Statistically Significant Results for Hypotheses 1-8

Hypothesis	Significant Result	*p*	ES
1	None	----	----
2	None	----	----
3	Interaction of Subject Area Taught*EducatorTeachingLevel for Concrete Experience	.035	0.031
	Individual Pairings of Significance		
	High School: Mathematics/Science and Literacy/Social Studies	.000	
	High School: Mathematics/Science and Other	.017	
	Literacy/Social Studies: Middle School and High School	.022	
4	Interaction of Subject Area Taught*EducatorTeachingLevel for Reflective Observation	.001	0.064
	Individual Pairings of Significance		
	High School: and Literacy/Social Studies and Mathematics/Science	.000	
	High School: Literacy/Social Studies and Other	.000	
	Literacy/Social Studies: Middle School and High School	.001	
5	None	----	----
6	None	----	----
7	None	----	----
8	None	----	----

Hypothesis 3 has a significant interaction with a small effect size between subject area taught and educator teaching level on Concrete Experience. Results indicate there is a significant difference between the learning mode of mathematics/science educators and all other educators when looking at the Concrete Experience learning mode of high school educators. There is also a significant difference among high school and middle school educators who teach literacy/social studies. When looking at the average means, these results suggest high school literacy/social studies educators learn more effectively when the Concrete Experience learning mode is applied to the delivery of information and professional learning. Table 19 provides a summary of the significant pairings within Hypothesis 3.

Table 19

Pairings for Hypothesis 3

Hypothesis 3: Concrete Experience			*p*
Middle School	Mathematics/Science	Literacy/Social Studies	.389
	Mathematics/Science	Other	.205
	Literacy/Social Studies	Other	.631
High School	Mathematics/Science	Literacy/Social Studies	.000
	Mathematics/Science	Other	.017
	Literacy/Social Studies	Other	.066
Mathematics/Science	High School	Middle School	.190
Literacy/Social Studies	High School	Middle School	.022
Other	High School	Middle School	.975

Hypothesis 4 had a significant interaction with a medium effect size between subject area taught and educator teaching level on Reflective Observation. Results indicated there is a significant difference between the learning mode of literacy/social studies educators and all other educators when looking at the Reflective Observation learning mode of high school educators. There is also a significant difference among high school and middle school educators who teach literacy/social studies. When looking at the means, these results suggest high school mathematics/science educators, high school other educators, and middle school literacy/social studies educators learn more effectively when the Reflective Observation learning mode is applied to the delivery of information and professional learning. Table 20 provides a summary of the significant pairings within Hypothesis 4.

Table 20

Pairings for Hypothesis 4

Hypothesis 4: Reflective Observation			*p*
Middle School	Mathematics/Science	Literacy/Social Studies	.464
	Mathematics/Science	Other	.740
	Literacy/Social Studies	Other	.731
High School	Literacy/Social Studies	Mathematics/Science	.000
	Literacy/Social Studies	Other	.000
	Mathematics/Science	Other	.931
Mathematics/Science	High School	Middle School	.171
Literacy/Social Studies	High School	Middle School	.001
Other	High School	Middle School	.315

Tables 19 and 20 provide a snapshot of the significant pairings in Hypothesis 3 and Hypothesis 4, respectively. Within the two significant interactions from Hypothesis 3 and Hypothesis 4, there are six significant pairings.

CHAPTER V

DISCUSSION

This research was conducted to determine the effects by subject area taught and degree level between 5-12 grade educators on learning modes measured by the Kolb Learning Style Inventory. This chapter presents a summary of the eight research hypotheses and findings. Additionally, the implications of the relationships between educator teaching level, subject area taught, and degree level are discussed. Finally, recommendations for possible practices in professional development and future research considerations are addressed.

Conclusions

The following statistical analyses were used to address the eight hypotheses. Hypotheses 1 through 4 were tested using a 2 x 3 factorial between-groups design. The independent variables for Hypotheses 1 through 4 were educator teaching level (high school versus middle school) and subject area taught (mathematics/science, literacy/social studies, and other). The dependent variables for Hypotheses 1 through 4 were the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes, respectively. Hypotheses 5 through 8 were tested using a 2 x 3 factorial between-groups design. The independent variables for Hypotheses 5 through 8 were educator teaching level (high school versus middle school) and degree level (Bachelors, Masters, and Masters plus additional hours). The dependent variables for Hypotheses 5 through 8 were the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes, respectively.

Hypothesis 1

Hypothesis 1 stated that no significant difference will exist by subject area taught between educators in high schools versus educators in middle schools on Abstract Conceptualization measured by Kolb's Learning Style Inventory in one central Arkansas school district. There was no significant interaction between the variables of subject area taught and educator teaching level on the Abstract Conceptualization learning mode. Together, subject area taught and educator teaching level did not combine to affect an educator's score of the Abstract Conceptualization learning mode of the Kolb Learning Style Inventory. Based on these results, there was not enough evidence to reject the null hypothesis for the interaction effect. There was no significant difference in either of the main effects of subject area taught or educator teaching level. On average, the mathematics/science groups had higher mean scores compared to the literacy/social studies and other groups, and regardless of subject area taught, high school educators had higher mean scores compared to middle school educators; however, evidence was not sufficient to reject the null hypothesis for either of the two main effects.

Hypothesis 2

Hypothesis 2 stated that no significant difference will exist by subject area taught between educators in high schools versus educators in middle schools on Active Experimentation measured by Kolb's Learning Style Inventory in one central Arkansas school district. There was no significant interaction between the variables of subject area taught and educator teaching level on the Active Experimentation learning mode. Together, subject area taught and educator teaching level did not combine to affect an educator's score of the Active Experimentation learning mode of the Kolb Learning Style Inventory. Based on these results, there was not enough evidence to reject the null hypothesis for the interaction effect. There was no significant difference in either of the main effects of subject area taught or educator teaching level. The mean scores were not consistently higher for any subject area group or for any educator teaching level group, and evidence was not sufficient to reject the null hypothesis for either of the two main effects.

Hypothesis 3

Hypothesis 3 stated that no significant difference will exist by subject area taught between educators in high schools versus educators in middle schools on Concrete Experience measured by Kolb's Learning Style Inventory in one central Arkansas school district. The main effect for educator teaching level was not significant; therefore, the main effect hypothesis for educator teaching level was not rejected. The main effect for subject area taught was significant, and therefore the main effect hypothesis for subject area taught was rejected. The interaction between subject area taught and educator teaching level on Concrete Experience learning mode was significant; therefore, the interaction null hypothesis was rejected. A simple effects analysis was conducted to further examine the significance. Of the nine groups created by the two independent variables in Hypothesis 3 (MS/Math/Sci/Lit/SS, MS/Math/Sci/O, MS/Lit/SS/O, HS/Math/Sci/Lit/SS, HS/Math/Sci/O, HS/Lit/SS/O, Math/Sci/HS/MS, Lit/SS/HS/MS, and O/HS/MS), the results of the simple effects analysis indicated a significant difference between three of the nine group comparisons. The HS/Lit/SS sample mean was significantly higher compared to the HS/Math/Sci and HS/O sample means. In other words, of the six groups, high school literacy/social studies educators scored significantly higher on the Concrete Experience learning mode, in general, than educators who teach any other subject. In addition, the Lit/SS/HS sample mean was significantly higher compared to the Lit/SS/MS sample mean. In other words, of the three groups, there is a significant difference, in general, in the Concrete Experience learning mode of high school and middle school educators who teach literacy/social studies.

Hypothesis 4

Hypothesis 4 stated that no significant difference will exist by subject area taught between educators in high schools versus educators in middle schools on Reflective Observation measured by Kolb's Learning Style Inventory in one central Arkansas school district. The main effect for educator teaching level was not significant; therefore, the main effect hypothesis for educator teaching level was not rejected. The main effect for subject area taught was significant, and therefore, the main effect hypothesis for subject area taught was rejected. The interaction between subject area taught and educator teaching level on Reflective Observation learning mode was significant; therefore, the interaction null hypothesis was rejected. A simple effects analysis was conducted to further examine the significance. Of the nine groups created by the two independent variables in Hypothesis 4 (MS/Math/Sci/Lit/SS, MS/Math/Sci/O, MS/Lit/SS/O, HS/Math/Sci/Lit/SS, HS/Math/Sci/O, HS/Lit/SS/O, Math/Sci/HS/MS, Lit/SS/HS/MS, and O/HS/MS), the results of the simple effects analysis indicated a significant difference between three of the nine group comparisons. The HS/Math/Sci and the HS/O sample means were significantly higher compared to the HS/Lit/SS sample mean. In other words, of the six groups, high school mathematics/science educators and high school other educators scored significantly higher on the Reflective Observation learning mode, in general, than educators who teach high school literacy/social studies. In addition, the Lit/SS/MS sample mean was significantly higher compared to the Lit/SS/HS sample mean. In other words, of the three groups, there is a significant difference, in general, in the Reflective Observation learning mode of high school and middle school educators who teach literacy/social studies.

Hypothesis 5

Hypothesis 5 stated that no significant difference will exist by degree level of education between educators in high schools versus educators in middle schools on Abstract Conceptualization measured by Kolb's Learning Style Inventory in one central Arkansas school district. There was no significant interaction between the variables of degree level and educator teaching level on the Abstract Conceptualization learning mode. Together, degree level and educator teaching level did not combine to affect an educator's score of the Abstract Conceptualization learning mode of the Kolb Learning Style Inventory. Based on these results, there was not enough evidence to reject the null hypothesis for the interaction effect. There was no significant difference in either of the main effects of degree level or educator teaching level. The mean scores were not consistently higher for any degree level group or for any educator teaching level group, and evidence was not sufficient to reject the null hypothesis for either of the two main effects.

Hypothesis 6

Hypothesis 6 stated that no significant difference will exist by degree level of education between educators in high schools versus educators in middle schools on Active Experimentation measured by Kolb's Learning Style Inventory in one central Arkansas school district. There was no significant interaction between the variables of degree level and educator teaching level on the Active Experimentation learning mode. Together, degree level and educator teaching level did not combine to affect an educator's score of the Active Experimentation learning mode of the Kolb Learning Style Inventory. Based on these results, there was not enough evidence to reject the null hypothesis for the interaction effect. There was no significant difference in either of the main effects of degree level or educator teaching level. The mean scores were not consistently higher for any degree level group or for any educator teaching level group, and evidence was not sufficient to reject the null hypothesis for either of the two main effects.

Hypothesis 7

Hypothesis 7 stated that no significant difference will exist by degree level of education between educators in high schools versus educators in middle schools on Concrete Experience measured by Kolb's Learning Style Inventory in one central Arkansas school district. There was no significant interaction between the variables of degree level and educator teaching level on the Concrete Experience learning mode. Together, degree level and educator teaching level did not combine to affect an educator's score of the Concrete Experience learning mode of the Kolb Learning Style Inventory. Based on these results, there was not enough evidence to reject the null hypothesis for the interaction effect. There was no significant difference in either of the main effects of degree level or educator teaching level. The mean scores were not consistently higher for any degree level group or for any educator teaching level group, and evidence was not sufficient to reject the null hypothesis for either of the two main effects.

Hypothesis 8

Hypothesis 8 stated that no significant difference will exist by degree level of education between educators in high schools versus educators in middle schools on Reflective Observation measured by Kolb's Learning Style Inventory in one central Arkansas school district. There was no significant interaction between the variables of degree level and educator teaching level on the Reflective Observation learning mode. Together, degree level and educator teaching level did not combine to affect an educator's score of the Reflective Observation learning mode of the Kolb Learning Style Inventory. Based on these results, there was not enough evidence to reject the null hypothesis for the interaction effect. There was no significant difference in either of the main effects of degree level or educator teaching level. The mean scores were not consistently higher for any degree level group or for any educator teaching level group, and evidence was not sufficient to reject the null hypothesis for either of the two main effects.

Implications

The results of this study were mixed. The interaction between subject area taught and educator teaching level on Concrete Experience learning mode from Hypothesis 3 and the interaction between subject area taught and educator teaching level on Reflective

Observation learning mode from Hypothesis 4 were found to be statistically significant. However, neither the interaction effect nor the main effect was found to be statistically significant in Hypotheses 1, 2, 5, 6, 7, or 8. This study was dependent upon a unique set of variables within a population of 5-12 grade educators in a single school district. An examination of the study results must be placed within the breadth of literature on learning styles and professional learning. The statistical calculations of this study provided insight into the variables of educator teaching level, subject area taught, and degree level that explained the learning modes of Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflect Observation from the Kolb Learning Style Inventory.

In the previous literature review, how the theories of pedagogy and andragogy played roles in the field of education were discussed. Tomlinson (2014) added that students should learn on their own level, at their own time, and in their own way. Knowles et al. (2011) explained that the principles of andragogy work best when the principles are differentiated to fit the needs of the learner in the given situation. The two significant interactions in Hypotheses 3 and 4 provide examples of how differentiating job embedded professional development to a few specific groups could lead to more effective learning by those educators. The interaction between subject area taught and educator teaching level on Concrete Experience was significant from Hypothesis 3. The Concrete Experience learning mode can be described as "learning by experiencing" (Hay Group, 2005, p. 2) and includes characteristics such as feeling and intrapersonal skills. Concrete Experience is a combination of the learning styles, accommodating and diverging, which include characteristics such as hands-on learning and learning by observing (Hay Group, 2005). Among high school educators, literacy/social studies educators score higher on the Concrete Experience learning mode; therefore, in professional learning environments, facilitators should consider involving these educators in new experiences that challenge them to be involved in active learning and determining the why.

The interaction between subject area taught and educator teaching level on Reflective Observation was significant from Hypothesis 4. The Reflective Observation learning mode can be described as "learning by reflecting" (Hay Group, 2005, p. 2) and includes characteristics such as reflecting, observing, and considering multiple perspectives. Reflective Observation is a combination of the diverging and assimilating learning styles (Hay Group, 2005), which include characteristics such as feeling, watching, and thinking. Among high school educators, mathematics/science educators and other educators score higher on the Reflective Observation learning mode; therefore, in professional learning environments, facilitators should focus on lecture with time included for observation and reflection.

In both Hypothesis 3 and Hypothesis 4, there was a difference in the learning mode score for high school literacy/social studies and middle school literacy/social studies educators. This information reinforces that professional developers, facilitators, administrators, and instructional coaches should differentiate job-embedded professional development among all secondary literacy/social studies teachers. There should be a focus on the characteristics of the Concrete Experience learning mode for high school literacy/social studies educators and a focus on the characteristics of the Reflective Observation learning mode for middle school literacy/social studies educators. Knight

(2011) stated, “This kind of learning – learning that is safe, humane, empowering, and guided by a vivid awareness of current reality – should be a driving force for humanizing professional learning in schools” (p. 3). Castleberry (2010) added that professional development must address educators’ needs. Providing professional learning opportunities that are tailored to an educator’s needs could show increased satisfaction by the educator when the presenter reflects on professional development evaluations. Those individuals providing professional learning must use the best strategies to differentiate in order to increase enthusiasm for the content, engagement, and satisfaction by the educator that leads to a deeper understanding by the learner.

Without significant results in the remaining six hypotheses, the results suggest that educators do follow the cycle of learning, not staying within one learning mode. As educators learn and grow, they shift on the cycle from one learning mode to another. Preferences change, and the way educators learn changes. Kolb’s (1984) experiential learning theory “defines learning as the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience” (p. 41). Personality, education, career and job choice, and culture shape an individual’s learning mode (Kolb, 1984; Yamazaki, 2005). However, individuals can move between the four learning modes and between the four learning styles, and when an individual’s mode and style falls more toward the center, the more flexible their style of learning depending on what needs to be learned and how the learning is presented (Kolb & Kolb, 2005; Hay Group, 2005). The current research confirms that an educators’ learning mode shifts, providing evidence that facilitators, instructional coaches, administrators, and trainers should know and understand the modes and be able to adapt. Research from Tomlinson (2011) and Huebner (2010) provided a foundation for differentiation and individual student success. While the focus was on students in schools, educators were encouraged to learn about students' personalities and learning styles to make lessons individualized and meaningful. Knight (2007) and Sweeney (2011) provided coaching models to focus on helping teachers grow. Moreover, Knowles et al.'s (2011) research on the theory of andragogy determined adults learn best when learning is adapted to fit the situation.

Most professional learning outlets are a one-size-fits-all approach to training where educators from various levels and who teach varying subjects are all part of the same workshop. Research from the literature suggested that adult educators should be provided differentiated job-embedded professional learning opportunities; however, results from the current research suggests that there are not significant differences in the way that educators learn due to the movement on the learning cycle in which educators become adaptive in their learning approaches. At some point in an educator's career, Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation are a part of learning.

Recommendations

Potential for Practice/Policy

This study examined the effects by subject area taught and degree level between educators in high schools versus educators in middle schools on the Abstract Conceptualization, Active Experimentation, Concrete Experience, and Reflective Observation learning modes measured by Kolb's Learning Style Inventory. The study was conducted with the population of 5-12 grade educators in one Arkansas school district. The findings of this study could provide conclusions for educators, consultants, administrators, instructional coaches, and facilitators to have an impetus and method from which to differentiate and provide engaging job-embedded professional development and training for K-12 educators. Regardless of the results of the study, individuals providing training to educators must monitor and adjust professional learning so that learning is relevant and meaningful to the educator. Otherwise, the educator may not put into practice what has been taught.

First, trainers, instructional coaches, and administrators should consider involving high school literacy/social studies educators in their own learning. Learning through hands-on experiences and experiences that challenge literacy/social studies educators to be active will keep them engaged. These educators will also thrive when pushed to determine the *why*. Professional learning communities could provide an opportunity to challenge thought processes and explain personal thought or research in small groups. Second, professional developers, facilitators, instructional coaches, and administrators should consider focusing on providing professional learning opportunities in the style of lecture with high school mathematics/science educators, high school other educators, and middle school literacy/social studies educators. These educators need time to observe and reflect on their learning before implementation. Administrators might consider a professional learning format with direct instruction for a short period with time for reflection or observation with time for reflection and discussion.

While the research did not provide significant results indicating differences in learning styles among all educators, there is still a need to differentiate and provide the best strategies and methods to use in moving forward with providing continual growth opportunities for educators. Educators in collaboration with their administrators should have choices when determining the best professional development opportunities to benefit their learning and when participating in professional learning communities. Providing multiple styles of professional learning opportunities gives educators choice in their learning and can increase buy-in and engagement due to choice. Educators may not learn differently based on their learning mode; however, their ability to choose differentiated learning opportunities will make the difference in personal growth.

Future Research Considerations

Some of the findings in this research support the use of learning modes to differentiate professional development for educators; however, some do not. Further investigation into educator learning modes to increase job-embedded professional learning opportunities is needed. To fully comprehend the effects of learning mode on educators, the researcher recommends the following considerations for further study:

1. The creation of professional development models for educators for each of the learning modes as a result of this study;
2. An in-depth explanation of what professional developers, trainers, instructional coaches, administrators, and educators can do with the learning mode once they know it;
3. An extension of this research that includes a qualitative component of educator self-reporting learning mode versus educator self-reported preference for type of professional development sessions;

4. An extension of this research that includes a qualitative component of educator self-reporting learning mode versus actual teaching practice in the classroom;
5. A replication of this study including elementary educators to help determine if there are differences in the learning mode of elementary school versus middle school versus high school educators;
6. A replication of this study including gender;
7. A replication of this study including years of teaching experience; and
8. A replication of this study including traditional versus non-traditional teaching licensure

The review of literature modeled how learning theories have developed and evolved over time to not only include children but also adult learners. In the field of education, state-determined standards guide the professional development and growth of adult educators with a focus on learning communities, leadership, resources, data, learning designs, implementation, and outcomes (Learning Forward, 2001). Narrowing the focus to effective job-embedded professional development through professional learning communities, instructional coaching, and the use of assessment and data disaggregation, administrators, trainers, and facilitators have multiple research-based strategies to guide adult learning. Because instructional coaches, facilitators, and administrators know and understand that each educator will be different, they must understand their learning will be different (Tomlinson, 2014); therefore, there is a place for differentiation among not only students but also adult learners and educators. This research suggests there is evidence that learners do go through the experiential learning theory cycle, either during instruction or on their own; therefore, those individuals providing professional learning opportunities need to know how the educators they are teaching learn. Using the Kolb Learning Style Inventory or another inventory that provides personality and learning style information, facilitators can model the strategies that educators use in their classrooms, as well as create meaningful professional job-embedded learning experiences that are purposeful and effective for K-12 educators.

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APPENDICES

Appendix A

HARDING UNIVERSITY INSTITUTIONAL REVIEW BOARD

Status of Request for Exemption from IRB Review

(For Board Use Only)

Date: 3/15/17

Proposal Number: 2017-016

Title of Project: Effects of Teaching Level, Subject Area, and Degree on Grades 5-12 Educator Learning Modes

Principal Investigator(s) and Co-Investigator(s): Meredith R. Jones mrjones@harding.edu

- [x] Research exempted from IRB review.
- [ ] Research requires IRB review.
- [ ] More information is needed before a determination can be made. (See attachment.)

I have reviewed the proposal referenced above and have rendered the decision noted above. This study has been found to fall under the following exemption(s):

1 ☐ 2 ■ 3 ☐ 4 ☐ 5 ☐ 6 ☐

In the event that, after this exemption is granted, this research proposal is changed, it may require a review by the full IRB. In such case, a ***Request for Amendment to Approved Research*** form must be completed and submitted.

This exemption is granted for one year from the date of this letter. Renewals will need to be reviewed and granted before expiration.

The IRB reserves the right to observe, review and evaluate this study and its procedures during the course of the study.

Rebecca O. Weaver

Chair
Harding University Institutional Review Board

Appendix B

Demographic Questions

Please place a check mark or X for one response to each question below.

1. Your gender is
   a. ______ Female
   b. ______ Male

2. The grade range you teach is
   a. ______ 5th – 6th
   b. ______ 7th – 8th
   c. ______ 9th – 10th
   d. ______ 11th – 12th

3. The subject area you teach is
   a. ______ Mathematics/Science
   b. ______ Literacy/Social Studies
   c. ______ Other

4. The highest level of degree you have earned is
   a. ______ Bachelors
   b. ______ Masters
   c. ______ Masters Plus

5. Your total years of completed experience in education is
   a. ______ 0 – 3 years
   b. ______ 4 – 10 years
   c. ______ 11 or more years

6. Your licensure is
   a. ______ traditional
   b. ______ nontraditional

If you would like a copy of your learning style results, fill out the information below.

____
Printed Name

____
Signature

____
School