CONFIDENCE LEVELS OF TEXAS ENTRY YEAR AGRICULTURAL SCIENCE TEACHERS IN AGRICULTURAL MECHANICS RELATED SKILLS

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by

Robyn Key

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CONFIDENCE LEVELS OF TEXAS ENTRY YEAR AGRICULTURAL SCIENCE

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APPROVED:

Philip R. Saucier, PhD
Thesis Director

Dwayne Pavelock, EdD
Committee Member

Doug R. Ullrich, Jr., EdD
Committee Member

John B. Pascarella, PhD
Dean, College of Science & Engineering Technology

DEDICATION

I dedicate this thesis to my family and friends that have supported and encouraged me throughout this process. I want to send a special thank you to everyone who has continued pushing me to finish graduate school and this thesis.

Mom and Dad, without your unending love and support I would not have been able to complete this goal that I made for myself many years ago. You have always encouraged me to get as much education as I possibly could, and for that, I am extremely grateful. Thank you so much for always being supportive in all of my crazy endeavors. I know for a fact that I would not be where I am today if it wasn't for my wonderful parents.

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ABSTRACT

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The purpose of this study was to examine the confidence levels and level of university preparation of entry year, Texas Agriculture, Food, and Natural Resources (AFNR) teachers regarding the instruction of agricultural mechanics related skills. During the 2018 Vocational Agriculture Teachers Association of Texas (VATAT) first year teacher workshop (n = 143) received a survey instrument titled: The Agricultural Mechanics Skills Assessment. A total of 143 (%) first year teachers during the 2018 – 2019 school year completed this instrument. This instrument consisted of four sections that included: confidence levels to teach agricultural mechanics skills, instruction of skills at the university level and the teaching methods used to teach those skills, professional development format preferences, and demographics information. Additionally, the researcher utilized a simultaneous multiple linear regression to explain if there is a relationship between teachers' confidence levels to teach agricultural mechanics skills and the instructional methods used to teach them those skills. The two skill areas that teachers felt most confident about teaching hand tools skills and employability/career skills, which was only categorized as moderately confident. Whereas, participants had no confidence in teaching pneumatics, hydraulics, modern machinery technology, and multi-cylinder engines. A low percentage of participants indicated that they were taught concrete, fencing, hydraulics, modern machinery technology, and pneumatics. Out of the 13 professional development formats identified by this study, only the multi-day during summer workshop format resulted in more than 50% of respondents preferring that

format. Furthermore, teachers' confidence in 23 of the 24 skill areas could be explained by the application project teaching method.

KEY WORDS: AFNR teacher, Application project teaching method, Professional development format, Agricultural Mechanics, Agriculture safety

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PREFACE

The basis for this research blossomed because of my passion for agriculture education and the learning opportunities that the future generation will have through Agriculture, Food, and Natural resource (AFNR) courses. My thesis advisor asked me what I thought was a major issue or concern in agricultural education. My immediate thought was a concern for the confidence levels of my fellow classmates and myself in teaching agricultural mechanics skills to our future students. I designed my research with the intent to hopefully make a difference in how agricultural mechanics is taught on the university level.

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Introduction

Chapter 1 introduces the history of agriculture education in the United States, as well as in the state of Texas. This chapter gives an overview of agricultural mechanics curriculum and laboratories in the United States and Texas, the agricultural science teacher certification process, and the supply and demand of Agriculture, Food, and Natural Resources (AFNR) teachers. Next, the theoretical framework is outlined in which this study is based upon, the problem that this study addressed, and the research questions that guided this study. Finally, definitions of terms, assumptions, and limitations are addressed.

History and Background

Early Agricultural Education

When the first settlers landed in Massachusetts in 1620, they knew very little about soil and how to grow crops (Moore, 1987). However, these English settlers soon learned from the Native Americans how to grow new crops and to make improvements on the existing ones (Barrick, 1989). Although agriculture was being used and learned through personal experiences, systematic and formal education practices did not occur until later (Barrick, 1989). According to Webster's Third New International Dictionary of the English language, the term *education* is a field of study that concerns itself with the principles and methods of teaching and learning. The term *agriculture* is the science or art of the production of plants and animals used to prepare products for human use. Furthermore, Barrick (1989) also noted that "the community of scholarship between the two is agricultural education: the scientific study of the principles and methods of teaching and learning as they pertain to agriculture" (p. 26).

Morrill Act of 1862

The Morrill Act of 1862, also known as the Land Grant Act, was the federal legislation that began the national land grant school system (Crump & Crunkilton, 1985). "This act established land grant colleges and universities in each state. A total of 30,000 acres of public land was provided to each state for every congressional delegate." (Morris, 2017, p.19). These lands were then sold and the proceeds went to endow and create the land grant colleges (Morris, 2017). The Morrill Act was beneficial to secondary agricultural education; nevertheless, during that time people did not see a need for agriculture instruction in public high schools (Moore, 1987).

Hatch Act of 1887

The Hatch Act of 1887 was the federal legislation that established agriculture experiment stations which allowed the conducting of agricultural research and the distribution of information to the public (Moore, 1988A). These research sites were established at the land grant colleges and other designated lands. The research conducted at these experiment stations were based on current problems experienced by production agriculture (Phipps, Osborne, Dyer, & Ball, 2008). "The Hatch Act of 1887 had close ties to both agricultural education and cooperative extension" (Hillison, 1996, p. 9). Additionally, the Office of the Experiment Stations in the U.S. Department of Agriculture started a campaign to promote agriculture in public schools (Moore, 1987). Experiment stations still hold a major role in creating new products and finding solutions to agricultural related issues (Phipps et al., 2008).

Smith-Hughes Act of 1917

"Passage of the Smith-Hughes Act in 1917 would see a configuration and increase of federal funding for teacher education in agriculture" (Hillison, 1986, p. 16). Furthermore, "the Smith-Hughes Act of 1917 called for implementation of farm practice programs, specified the purposes of agricultural education, and provided federal monies to initiate the program on a nationwide scale." (Camp & Crunkilton, 1985, p. 61). "Passage of the Smith-Hughes Act in 1917 suddenly fostered a great interest in agricultural education. Additionally, states were rapidly signing up for federal money to support agricultural education programs" (Hillison, 1998, p. 2). According to Wirth (1972), federal funds from the Smith-Hughes Act were only given to support the vocational training classes. All of the other general academic courses were to be paid for by other means. After the Smith-Hughes Act of 1917, there was a high demand for agricultural teachers.

Vocational Education Act of 1963

"By the 1960's, vocational education under the Smith-Hughes Act was in need of revision to meet the changing needs of the American economy" (Talbert, Vaughn, Croom, & Lee, 2006, p.80). To help meet this need of change, the Vocational Education Act of 1963 was passed (Talbert et al., 2006). The main purpose of the Vocational Education Act of 1963 was to strengthen the quality of vocational education (Phipps, Osborne, Dyer, Ball, 2008). This act amended the prior legislation that limited funds to only farm related instruction. Therefore, agricultural programs such as horticulture, natural resources, agricultural mechanics and many others were established through the passing of the Vocational Education Act of 1963 (Phipps et al., 2008). This act allowed federal funds to be distributed to the individual states based on the number of students from a certain age group. Additionally, the Vocational Education Act of 1963 changed the supervised agricultural experience to not be restricted to production agriculture (Talbert et al., 2006).

Pioneers of Agricultural Education

The early agricultural teacher educators did not receive formal training or earn prestigious degrees. Instead, these educators had a bachelor of science degree, prior teaching and extensive practical farming experience (Foor & Connors, 2010). According to Foor & Connors (2010), early agricultural teachers taught other science courses as well. During this time period several individuals paved the foundation for agricultural education. These key leaders included: Rufus Stimson, Seaman Knapp, John Dewey, Walter H. French, Kary Davis, and Ashley Storm (Foor & Connor, 2010; Moore, 1988 B). According to Moore (1988 B), Rufus Stimson outlined a plan for teaching agricultural using applied learning from home farms and projects. This *project* concept is still being used today in the agricultural science classrooms (Moore, 1988 B). Furthermore, Stimson believed that the best way for teachers to adopt new practices was to see ideas in practice (Moore, 1988 B). Seaman Knapp encouraged agricultural teachers to teach using practical and applicable instruction (Knobloch, 2003). Knapp believed in the philosophy of learning by doing. Knapp used the principle of learning by doing to solve and investigate agricultural problems (Knobloch, 2003). Another notable scholar was John Dewey who believed that education should be applied to real life experiences (Knobloch, 2003). Dewey argued that the purpose of vocational agriculture is for students to develop transferable life skills from an integrated approach (Roberts & Ball, 2009). Moreover, Dewey's philosophical concept of experiential learning is the foundation that agricultural education programs are built on (Knobloch, 2003). Professor Walter H. French served as the president of Michigan State

Teachers Association and in 1908 he was chosen as the first department head of the Michigan Agricultural College's Department of Agricultural Education. Furthermore, he devoted time into furthering agricultural education in elementary, high school, and adult settings (Foor & Connors, 2010). According to Foor and Connors (2010), Dr. Kary C. Davis was the first student to earn a Ph.D in Agriculture. Davis has been acknowledged nationally and internationally for his methods concerning solutions to problems in agricultural education (Foor & Connors, 2010). Davis encouraged the job analysis method for organizing agricultural content for teachers and published a series of text books dealing with that matter (Chesnutt, 1929). Ashely Storm was formerly a school superintendent and resigned to be one of the first agricultural education teachers. He established and led the Division of Agricultural Education at the University of Minnesota. Furthermore he assisted Davis in writing the textbook "How to Teach Agriculture" (Foor and Connors, 2010).

History of Agricultural Education in Texas

"In Texas, the teaching of agriculture was introduced in 1903 by Mr. B Youngblood, who taught an elementary agriculture course in the public schools of Henderson" (Stockton Dillingham, Cepica, & Eggenberger, 1988, p. 1). Soon after, other elementary education programs developed (Stockton et al.). Shortly after the Smith-Hughes Act of 1917 was passed, Texas approved it on June 15, 1917, and it went into effect 90 days later (Stockton et al., 1988). Due to very strict state guidelines and a small supply of trained teachers, very few vocational agriculture programs were established after the Smith-Hughes Act of 1917 (Stockton et al., 1988). After the Smith-Hughes Act of 1917 passed, many states were attempting to establish teacher education programs, because very few were established prior to 1917.

School-Based Agricultural Education Programs

According to Phipps, Osborne, Dyer, & Ball (2008), "a complete school-based, agricultural education program consists of three essential and interdependent components: classroom and laboratory instruction; Supervised Agricultural Experience (SAE) programs; and membership in the National FFA Organization" (p. 4). The agricultural, Food, and Natural Resources (AFNR) teacher is responsible for teaching classroom instruction, supervising SAE projects, and advising the local FFA organization (Talbert, Vaughn, & Croom, 2006). Classroom and laboratory instruction should include demonstrations, activities, and learning experiences that happen during the allotted class period (Talbert et al., 2006). AFNR teachers must teach curriculum that meets certain standards. It is the teacher's responsibility to use their training to learn the best ways to teach the standards to their students (Talbert et al., 2006). "The National Council for Agricultural Education has developed content standards for each of the eight career pathways in the Agricultural, Food, and Natural Resources career clusters. Additionally, each pathway is designed with a one general broad standard and multiple performance foundations that gives an outline on what content should be taught and then three performance levels to measure knowledge and skills (Talbert et al., 2006). Since 1928, millions of agriculture students have donned the official FFA jacket and championed the FFA Creed (National FFA, n.d. A). Today, there are 7,859 local FFA chapters and over 800,000 students participate in formal agricultural education instructional programs offered in grades seven-adult throughout the 50 states and three U. S. territories (National FFA, n.d., A).

Agricultural Mechanics in School Based Agriculture Education Programs

Part of the agricultural education curriculum is agricultural mechanics. Agricultural mechanics curriculum allows students the opportunity to engage in hands on learning activities that focus on mechanical skills, academic applications, and cognitive learning. (Wells, Perry, Anderson, Shultz, & Paulsen, 2013). In addition, agricultural mechanics is a science based curriculum that provides teachers with the opportunities to integrate concepts of physics, chemistry, and mathematics (Leiby, Robinson, Key, 2013; Miller, 1991). A study conducted by Burris, Robinson, & Terry (2005) identified nine agricultural mechanics content areas taught in secondary programs. 90% of agricultural mechanic teacher respondents indicated that the areas they teach include: metal fabrication, operating hand and power tools, project planning and designing, electricity, and building construction. Additionally 80% of respondents noted that plumbing, concrete, and machinery where included in their states secondary curriculum (Burris et al., 2005). According to Burris, Robinson, & Terry (2005), agricultural mechanics has historically been a cornerstone in secondary agricultural programs and still remains a strong interest for students. Moreover, the agriculture industry has indicated a need for entry-level employees to be skilled in basic mechanic areas (Ramsey & Edwards, 2011; Wells et al., 2013). This need has led to industry support of secondary agricultural mechanics programs (Wells et al., 2013), and is a driving force in the enrollment in these courses (Burris et al., 2005; Hubert & Leising, 2000).

Agricultural Mechanics Curriculum in Texas

The Texas Essential Knowledge and Skills (TEKS) are a state mandated curriculum developed by the Texas State Board of Education for students in kindergarten through 12th grade. According to the Texas Education Agency (TEA) (n.d. D), the State Board of Education (SBOE) has the legislative authority to adopt the TEKS for each subject of the required curriculum. In addition, “TEKS objectives direct the teaching of all curricula in Texas” (Wigenbach, White, Degenhart, Pannkuk, & Kujawski, 2007, p.116). According to Wigenbach, et al., (2007) TEKS objectives provide uniform guidelines for the mastery of knowledge and skills expected in all classes (K-12). The TEKS objectives for the agriculture mechanics related courses are designed to prepare students for careers in agriculture power, structural, and technical systems. In order to be prepared for these types of careers, students must be skilled and knowledgeable in those agriculture systems and industries, develop and understand career opportunities, and industry certifications, and expectations (TEA, n.d. D).

Agricultural Mechanics Laboratories

Laboratories are vital educational tools for agricultural mechanics courses and provide students with the opportunity to develop skills and knowledge pertaining to agriculture mechanics (Phipps, Osborne, Dyer, & Ball, 2008). According to Shinn (1987), the agricultural mechanics laboratory must be a safe and organized environment in order for optimum learning. In order for laboratory instruction to occur in a safe environment, the agricultural mechanics teacher must be knowledgeable and competent in managing the laboratory (Saucier, Terry, & Schumacher, 2009; Saucier, Vincent, & Anderson, 2011). According to Johnson and Fletcher (1990), students enrolled in agricultural mechanics courses are exposed to equipment, supplies, and materials that could potentially be dangerous. Opportunity of injury, or mishaps, are common in agricultural mechanic laboratories, moreover, sometimes these instances are overlooked by the teacher and are not properly addressed (Hubert, Ullrich, Lindner, & Murphy, 2003). “To combat the prospect of student injury in shops or laboratories, a strong safety climate must be instituted in programs” (Hubert et al., 2003, p. 3). The proper personal protective equipment should include leather shoes with steel toes, leather gloves, safety glasses, and face masks. According to Herren (2015), hard hats are needed when working where objects are above head or when flying objects could possibly occur. Additionally, masks that cover the nose and mouth are needed to filter out particles including spray paint and dust (Herren, 2015). Ear plugs are also recommended for hearing protection when working with certain levels of noise (Herren, 2015). It is recognized that safety is not the most interesting topic; however, it is a crucial component of the success of the course (Huebert et al.).

Saucier, McKim, & Tummons (2012), identified a list of 23 essential agricultural mechanics skills that need to be taught in secondary agricultural mechanic programs. These skills vary from very simple skills like using hand and measurement tools to extremely technical skills like Gas Tungsten Arc Welding (GTAW). Other essential agricultural mechanic skills include soldering, surveying, plumbing, concrete, small gas engines, carpentry, Oxygen/ Acetylene Welding (OAW), Oxygen/ Acetylene Cutting (OAC), Plasma Arc Cutting (PAC), carpentry, Gas Metal Arc Welding (GMAW), Shielded Metal Arc Welding (SMAW), and project developing (Saucier et al., 2012). According to Herren (2015), tools and equipment needed in an agricultural mechanics laboratory vary from simple tools like hand tools, to more complex equipment such as several types of welding machines. There are certain hand tools that are necessary in an agricultural mechanics laboratory. These hand tools include grinders, tape measures, levels, squares, various types of saws, hammers, pliers, clamps, wrenches, screw drivers, drills, chipping hammers, and wire brushes. Welding equipment could include Oxygen/ Acetylene equipment, SMAW welding machine and equipment, welding table or booth, GMAW and GTAW welding machine and equipment. Virtual reality welding simulations can also be used in laboratories to train students to obtain basic skills for job in a technical field (Byrd, Anderson, & Stone, 2015). “Training within a virtual reality can prepare a trainee to anticipate and recognize when situations go awry, as well as to test and individual’s decision-making skills under normal and stressful conditions” (Byrd et al., 2015, p. 390). According to Byrd et al. (2015), virtual realities simulators could also be used as a tool for employers to find skilled employees. Allowing students the opportunity to use this type of simulator could give them an advantage when attempting to enter industry jobs (Byrd et al., 2015).

Agricultural Science Teacher Certification

The federal government provides additional federal funding for education; however, each state develops its own requirements for certification of teachers (NAAE, n.d.). In most states teacher candidates are required to pass a knowledge and skills test, complete a teacher preparation program, a bachelor’s degree, and to pass a background check. According to Texas Education Agency (TEA; TEA, n.d. B), applicants must take and pass both the 272 Agricultural Food and Natural Resources and the 160 Pedagogy and professional responsibilities test to be certified to teach agriculture courses in Texas. Additionally the Agricultural, Food, and Natural Resources Grades 6-12 (TAC 233.13) certification does require a college degree; however, does not require wage earning experience, a licensure, or an additional certification (TEA, n.d. B).

The traditional teacher certification process in Texas is typically completed through an agricultural education preparation program. The state of Texas has 11 universities that offer these programs. According to TEA (n.d. E), there are alternative certification programs that allow individuals to teach prior to completing the state requirements. This non- traditional type of certification requires very limited formal training prior to teaching. TEA's website provides a list of approved non- traditional programs and requirements (TEA, n.d. E).

Supply and Demand of Agriculture, Food, and Natural Resources teachers

Research studies have shown that there is a critical shortage of agriculture science teachers at the secondary level. These studies document that there is a strong link between the teacher shortages throughout all facets of education and beginning teacher attrition. Some attrition is inevitable since some teachers leave for personal reasons, a small number are encouraged to leave, and some teachers reach retirement (Shakrani, 2008). According to Shakrani (2008), university teacher preparations programs are producing adequate numbers of teachers to meet the demands; however, too many teachers are leaving the teaching profession for other occupations.

Moreover, a current problem concerning high school AFNR teacher educators and school administrators is teachers leaving the profession prematurely (McIntosh, 2017). In order for the agricultural education profession to prosper, it will need to maintain an adequate supply of qualified teachers (Boone & Boone, 2007). Respondents of the 2015-2016 National Agricultural Education Supply & Demand Study reported that a total of 721 Agriculture, Food, and Natural Resources teacher in the U.S., who taught during the 2015-2016 school year, would not be returning to the teaching profession in 2016- 2017 (Smith, Lawyer, & Foster, 2016). According to NAAE's Agriculture Teacher Supply and Demand Overview (2016), Region II (New Mexico, Colorado, Kansas, Oklahoma, Arkansas, and Louisiana) alone had 40 new positions, 28 new programs, 52 retirements, and 209 individuals leaving the teaching profession, 9 unfilled full-time positions, and 198 of the previous year's 293 agricultural education graduates are currently employed as AFNR teachers. According to Smith, Lawyer, & Foster (2016), the main reasons that the younger teachers are leaving include: seeking employment in industry and agribusiness, graduate school, or teaching another subject.

Theoretical Framework

To guide this study, researchers utilized three theories: Andragogy Theory, Self-Efficacy Theory, and Expertise Theory.

Andragogy Theory

Researcher utilized Knowle's Theory of Andragogy to guide this study (Knowles, Holton III, & Swanson, 2015). Knowles et al. (2015 p.27) defines andragogy is "a set of core adult learning principles that apply to all adult learning situations." The term *adult* has four different definitions. First the biological definition refers to when an individual can reproduce. Additionally, the legal definition is when an individual can legally vote, obtain a driver's license, marry without consent etc. Another definition is defined by the social status of the individual performing an adult role. Lastly is the psychological definition which means when an individual realizes that they are fully responsible for their own lives. The word pedagogy is derived from the Greek work that means *child*. Therefore, "pedagogy literally means the art and science of teaching children" (Knowles et al., 2015, p.85). The Pedagogical teaching model puts full responsibility of determining what is learned, how and when it is learned on the teacher. In contrast, andragogy focuses on adult learners and centered on the fact that most adults learn best when they are involved in the methods, content, timing, and reflection of their own learning. Additionally, adult learners are more motivated to learn if they know why that information or skill is important and useful and how it benefits them. The six principles of andragogy include: the learners need to know why, what, and how, the self-concept of the learner, the learner's previous experiences, eagerness, orientation, and motivation to learn (Knowles et al., 2015).

Self-Efficacy Theory

To further guide this study, researchers also utilized Bandura's theory of self-efficacy. Self- efficacy is defined by Bandura (1986) to be the "beliefs in one's capabilities to organize and execute the course of action required to produce given attainments" (p. 3). Bandura (1997) noted that self- efficacy involves an individual's personal judgements of their own capabilities. Self-efficacy influences an individual's decisions, behaviors, amount of determination, reactions to obstacles and difficulties, as well as the overall level of achievement they accomplish (Bandura, 1986). Additionally, it is essential for people to have firm confidence in their self- efficacy to sustain the effort required to be successful (Bandura, 1997). Pajares (1996) addressed that knowledge and skills are poor predictors of continuous achievements because the belief that an individual holds about their own knowledge and ability influences the end result of how they will behave (Bandura, 1986, & Pajares, 1996).

According to Bandura (1997), self-efficacy is achieved through mastery experiences, physiological and emotional arousal, vicarious experience, and social persuasion. Mastery experiences have the biggest impact of efficacy and occur when an individual succeeds in accomplishing a task (Blackburn & Robinson, 2008). Furthermore, success builds a vigorous belief in ones self-efficacy; however, failure moderates it, especially if self-efficacy is not yet established.

Expertise Theory

An *expert* is described as "one who is very skillful and well-informed in some special field" (Webster's New World Dictionary, 1968, p. 168). Additionally, *expertise* refers to the characteristics, skills, and knowledge that differentiates experts from novices and those with less experiences (Ericsson, 2006). Ericsson's Theory of Expertise focuses on the characteristics of expert performance and mastery knowledge (Ericsson, 2006).

According to Ericsson and Lehmann (1996), expert performance is shown to be arbitrated by the cognitive and perceptual motor skills by domain specific areas. One of the main components of Ericsson's theory is deliberate practice. Therefore, deliberate practice must be full of effort, intense, and involves full concentration (Theiler, 2003). "For elite performers, supervised practice starts at very young ages and is maintained at high daily levels for more than a decade" (Ericsson & Charness, 1994, p. 725). In addition, the experts in most domains reach their highest level of performance after a decade or more of intensive preparation (Ericsson & Lehmann, 1996). In almost every domain, methods of effective training and instruction run parallel with relevant knowledge and techniques (Ericson & Charness). Ericsson & Charness, further noted that most amateurs and employees spend very limited time on deliberate efforts once they meet an acceptable level of success.

Statement of the Problem

A review of literature has determined that there is a critical shortage of AFNR teachers at the secondary level. Approximately 25.5% of teachers are estimated to leave the teaching profession within three years of beginning (Boe, Cook, & Sunderland, 2008). Agricultural science teacher turnover is a problem in Texas as well. Saucier, Roe, & Muller (2015) found that there was 317 agricultural science teacher job openings in Texas for the 2014-2015 academic school year. According to Karen Jones (Personal communication, October 14, 2017) “There was approximately, 1800 AFNR teachers from 2014- 2015.” This data results in a 17.60% turnover rate, attrition, teachers moving school, and retirement in 2014. P. R. Saucier (personal communication, October 17, 2017) noted that “out of all of the Texas agricultural science teacher position openings for the 2014-2015 academic school year, 36% of the schools were seeking teachers to teach agricultural mechanics courses.” According to Bandura (1997), it is essential for people to have firm confidence in their self-efficacy to sustain the effort required to be successful. By understanding the confidence levels of entry level AFNR teachers in Texas, teacher educators, state staff, and public school administrators can do a better job of training new teachers at the collegiate level and providing professional development opportunities for existing teachers. Therefore, this study sought to answer the following general research questions:

1. What are the personal, professional, and programs demographics of entry year, Texas Agriculture, Food, and Natural Resources (AFNR) teachers who instruct agricultural mechanics related Texas Essential Knowledge and Skills?

2. How prepared are entry year, Texas (AFNR) teachers to teach agricultural mechanics related Texas Essential Knowledge and Skills?

Purpose of the Study

The purpose of this study was to examine the confidence levels of entry year, Texas Agriculture, Food, and Natural Resources teachers that attended the VATAT professional development conference new teacher workshop regarding the instruction of agricultural mechanics related Texas Essential Knowledge and Skills (TEKS) and determine their level of university preparation to teach these agricultural mechanics related TEKS.

Research Questions

1. What are the personal, professional, & program demographics of entry year Texas Agriculture, Food, and Natural Resources (AFNR) teachers in regards to agricultural mechanic related Texas Essential Knowledge and Skills (TEKS)?
2. What are the confidence levels of entry year, Texas AFNR teachers regarding the instruction of agricultural mechanics related TEKS?
3. What knowledge and skills did entry year, Texas AFNR teachers learn while a student in their agricultural mechanics university courses?
4. What teaching methods were used to teach entry year, Texas AFNR teachers agricultural mechanics related knowledge and skills in their university agricultural mechanics courses?
5. What professional development format would be the most beneficial in assisting entry year, Texas AFNR teachers regarding the instruction of agricultural mechanics related TEKS?

6. Can teaching methods used at the university level to instruct agricultural mechanics curriculum to entry year, Texas AFNR teachers explain their confidence levels to teach agricultural mechanics related skills?

Definition of Terms

For the purposes of this study, the following terms were defined:

Agricultural education- the agricultural education program is created by the three core components of classroom/ laboratory instruction, supervised agricultural experience programs, and FFA student organization activities and opportunities. Agricultural education prepares students for successful careers and a lifetime of informed choices in the global agriculture, food, fiber and natural resources systems (National FFA Organization, n.d. C).

Agricultural mechanics – the selection, operation, maintenance, servicing, selling, and use of power units, machinery, equipment, structures, and utilities used in agriculture (Herren, 2006).

Alternative teacher certification – a non-traditional route into the teaching profession. This includes all levels of certifications from emergency certification to well-designed programs that address the professional development preparation needs of the growing population of individuals who already have a baccalaureate degree and considerable life experience and who want to become teachers (Feistritzer and Chester, 2000; Ruhland & Bremer, 2002b).

Competency – behavioral characteristics of knowledge, skills, attitudes, and judgment generally required for the successful performance of a task (Lamberth, 1982).

Teacher education competency is a system of teacher education which has as its specific purpose to develop described knowledge, skills, and behaviors that will enable a teacher to meet performance criteria for classroom teaching (Lamberth, 1982).

Expertise- refers to the characteristics, skills, and knowledge that differentiates experts from novices and those with less experiences (Ericsson, 2006).

Expert- one who is very skillful and well- informed in some special field (Webster's New World Dictionary, 1968, p. 168).

Novice agriculture teacher- a teacher of agriculture with less than three years of teaching experience (Whittington, McConnell, & Knoblach, 2006).

Level of self-efficacy – defined as a person's general belief that certain behavior can bring about a desired outcome, and that the individual possesses the necessary skill or ability to bring about a desired outcome (Bandura, 1986).

Professional development education – any structured program designed to improve the knowledge base of employed teachers (Gamon, Miller, & Roe, 1994).

Supervised Agricultural Experience (SAE) - a required component of a total agricultural education program and intended for every student. Through their involvement in the SAE program, students are able to consider multiple careers and occupations, learn expected workplace behavior, develop specific skills within an industry, and are given opportunities to apply academic and occupational skills in the workplace or a simulated workplace environment (National FFA, n.d., B).

The Texas Essential Knowledge and Skills (TEKS)- state required curriculum developed by the Texas State Board of Education for students in kindergarten through 12 grade (Texas Education Agency n.d. D).

Traditional teacher certification- traditional teacher certificates have the greatest requirements for teachers. Teachers typically earn a bachelor's degree in education, and have completed student teaching under the direction of a supervisor and/or master/mentor teacher (Brown, 1987; Cornett, 1984; Laczko-Kerr, 2002; Sandlin, Young & Karge, 1993).

Assumptions

The following assumptions were made in conducting this study:

1. The respondents were honest and truthful with their response and participation;
2. The frame created for this study was representative of all entry year Agriculture, Food, and Natural Resources teachers in Texas that attended the 2018 the VATAT professional development conference new teacher workshop;
3. The researcher adequately controlled for collection errors

Limitations

The following limitations were associated with this study:

1. This study is limited to the population of entry year, Texas Agriculture, Food, and Natural Resources (AFNR) teachers that participate in this study.
2. A frame of entry year, Texas AFNR teachers could not be determined due to area coordinators lacking relevant data about this group of teachers and the Vocational

Agriculture teachers Association of Texas (VATAT) declining to release member information. Therefore, we recognize that this study is not a complete census of all entry year AFNR teachers.

3. The confidence levels of entry year, Texas AFNR teachers are perceptions and not actual values.

CHAPTER II

Review of Literature

Chapter two consists of a review of literature related to a background in agricultural education history, agricultural mechanics curriculum, agricultural science teacher requirements, and supply and demand of agricultural science teachers. This review is structured into nine sections: History of Agricultural Education in the U.S., History of Agricultural Education in Texas, Agricultural Mechanic Curriculum and Laboratories, Agricultural Science Teacher Certification Requirements in the U.S., Agricultural Science Teacher Certification Requirements in Texas, Agricultural Education Teacher Preparation in Texas, Supply and Demand of Agriculture, Food, and Natural Resources teachers, Theoretical Framework, and a Summary.

History of Agriculture Education in the U.S.

When the first settlers landed in Massachusetts in 1620, they knew very little about soil and how to grow crops (Moore, 1987). However, these English settlers soon learned from the Native Americans how to grow new crops and to make improvements on the existing ones (Barrick, 1989). Although agriculture was being used and learned through personal experiences, systematic and formal education practices did not occur until later (Barrick, 1989). According to Webster's Third New International Dictionary of the English language, the term *education* is a field of study that concerns itself with the principles and methods of teaching and learning. The term *agriculture* is the science or art of the production of plants and animals used to prepare products for human use. Furthermore, Barrick (1989) noted that "the community of scholarship between the two is agricultural education: the scientific study of the principles and methods of teaching and learning as they pertain to agriculture" (p. 26).

One of the first examples of agriculture being taught occurred on a 10-acre experimental garden in Savannah, Georgia in 1732. The colony hired three Italians to settle and teach the people about raw silk production (Moore, 1987). As noted by Moore, (1987) the first time agriculture was taught in a school setting was in 1734 at an orphan's school in Georgia. During the early 19th century, agriculture was being taught with more frequency in private schools and through agricultural societies (Moore, 1987). One of the first secondary schools to provide agriculture education was Storrs Agricultural School in Mansfield, CT (Moore, 1987). Boys that attended this school learned about agriculture in the classroom and had hands on experiences at the school farm. The Storrs Agricultural School became Connecticut's land-grant college in 1893 (Moore, 1987).

Years later, the Morrill Act of 1862, also known as the Land Grant Act, was the federal legislation that began the national land grant schools (Crump & Crunkilton, 1985). "This act established land grant colleges and universities in each state... A total of 30,000 acres of public land was provided to each state for every congressional delegate." (Morris, 2017, p.19). These lands were sold and the proceeds went to endow and create the land grant colleges (Morris, 2017). The Morrill Act was beneficial to secondary agriculture education; nevertheless, during that time people did not see a need for agriculture instruction in public high schools (Moore, 1987).

The Hatch Act of 1887 was the federal legislation that established agriculture experiment stations which allowed the conducting of agriculture research and the distribution of information to the public (Moore, 1988A). These research sites were established to at the land grant colleges and other designated lands. The research conducted at these experiment stations were based on current problems experienced by production agriculture (Phipps, Osborne, Dyer, & Ball, 2008). “The Hatch Act of 1887 had close ties to both agricultural education and cooperative extension” (Hillison, 1996, p.9). Additionally, the Office of the Experiment Stations in the U.S. Department of Agriculture started a campaign to promote agriculture in public schools (Moore, 1987). Experiment stations still hold a major role in creating new products and finding solutions to agricultural related issues (Phipps et al., 2008). The main objectives of this act was to teach people useful and practical information related to agriculture, promote scientific investigation, and experiments involving agricultural science. (Hatch Act, 1887).

“During the early years of the 20th century, agricultural education also grew rapidly in popularity at the secondary levels” (Hillison, 1986, p. 8). This growth started in 1906, when individual states began passing laws requiring agriculture to be taught in public high schools (Moore, 1987). In 1907, the Nelson Amendment was approved, which permitted federal funds to land grant colleges to provide preparation courses for agriculture instructors (Hillison, 1986). “This amendment gave another boost and some recognition to the profession of agricultural education teacher education (Hillison, 1998, p. 2). Robinson and Jenks (1913) reported that in the school year 1906-1907, less than a 100 public secondary schools offered instruction in agriculture and for the school year 1908-09 the number had grown to 500. “Two years before the passage of the Smith-Hughes Act, 90,708 students were enrolled in agricultural classes in 4,665 high schools” across the U.S. (Moore, 1988 A, p. 164). With a growing demand for agriculture teachers during this time period, several key items had to be addressed such as: what should the qualifications of an agriculture teacher be? How and what should the teachers be taught? Where should they be prepared?" (Hillison, 1986, p. 8). These were all questions that had to be answered during this time period in educational reform.

In 1911, the Page-Wilson Bill was introduced to financially encourage agriculture instruction (Page-Wilson Bill, 1912). According to Wirth (1980), a great degree of confusion existed over if the Page-Wilson Bill was for the extension or vocational education. This resulted in the Smith-Lever Agricultural Extension Bill being passed first in 1914, as a concession to farm interests in return for a promise from farmers to support vocational education later (Wirth, 1980). "Passage of the Smith- Hughes Act in 1917 would see a configuration and increase of federal funding for teacher education in agriculture" (Hillison, 1986, p. 16).

Furthermore "the Smith-Hughes Act of 1917 called for implementation of farm practice programs, specified the purposes of agricultural education, and provided federal monies to initiate the program on a nationwide scale." (Camp & Crunkilton, 1985, p. 61) "Passage of the Smith-Hughes Act in 1917 suddenly fostered a great interest in agricultural education. Additionally, states were rapidly signing up for federal money to support the agricultural education programs" (Hillison, 1998, p. 2). "The acknowledged leader of the coalition which was formed to lobby for such legislation was Charles A. Prosser, Executive Secretary of the National Society for Promotion of Industrial Education and the effective author of the Smith-Hughes Act" (Wirth, 1972, p. 365). Prosser envisioned a classroom where students could learn job specific special tasks, operations, and information by a skilled and knowledgeable teacher. According to Wirth (1972), federal funds from the Smith-Hughes Act were only given to support the vocational training classes. All of the other general academic courses were to be paid for by other means. In addition, the Vocational Education Act of 1963 announced as its aim was the development of vocational education for all ages, in all communities (Wirth, 1972).

“By the 1960’s, vocational education under the Smith-Hughes Act was in need of revision to meet the changing needs of the American economy” (Talbert, Vaughn, Croom, & Lee, 2006, p.80). To help meet this need of change, the Vocational Education Act of 1963 was passed (Talbert et al., 2006). The main purpose of the Vocational Education Act of 1963 was to strengthen the quality of vocational education (Phipps, Osborne, Dyer, Ball, 2008). This act amended the prior legislation that limited funds to only farm related instruction. Therefore, agricultural programs such as horticulture, natural resources, agricultural mechanics and many others were established through the passing of the Vocational Education Act of 1963 (Phipps et al., 2008). This act allowed federal funds to be to be distributed to the individual states based on the number of students from a certain age group. Additionally, the Vocational Education Act of 1963 changed the supervised agricultural experience to not be restricted to production agriculture (Talbert et al., 2006).

Pioneers of Agricultural Education

The early agricultural science teacher educators did not receive formal training or earn prestigious degrees. Instead, these educators had a bachelor’s of science degree, prior teaching and extensive practical farming experience (Foor & Connors, 2010). According to Foor & Connors (2010), early agricultural teachers taught other science courses as well. During this time period, several individuals paved the foundation for agricultural education. These key leaders included: Rufus Stimson, Seaman Knapp, John Dewey, Walter H. French, Kary Davis, and Ashley Storm (Foor & Connor, 2010; Moore, 1988 B).

After the Smith-Hughes Act passed, many states were attempting to establish teacher education programs because very few were established prior to 1917. However, Rufus W. Stimson had been training teachers and evaluating different methods of instructing those teachers for nearly 10 years (Stimson, 1942). Rufus Stimson studied philosophy at Harvard University and went on to receive the A.B. degree at the Yale Divinity School. From 1897 to 1901 he was a professor of English at the Connecticut Agricultural College. Rufus Stimson became the president of the Connecticut Agricultural College for seven years and then was appointed as a research specialist of Agricultural Education for Massachusetts. “The profession looked to Stimson for leadership in teacher training” (Moore, 1988 B, p. 54). Stimson also developed a plan that stated that students would learn about agriculture in the classroom and then would apply that knowledge through home projects known as the project concept which is still being used in agricultural education classrooms today. (Moore, 1988 B). “The profession looked to Stimson for leadership in teacher training” (Moore, 1988 B, p. 54). Furthermore, Stimson believed that the best way for teachers to adopt new practices was to see ideas in practice (Moore, 1988 B). In addition, Stimson was also the first one to advocate the idea of advisory councils (Moore, 1988 B). Moreover, Stimson was also an advocate for girls in vocational agriculture and FFA. During the 1930’s, Stimson fought to grant FFA membership to girls; however, the delegates of the National FFA convention voted against it. After Stimson retired, this issue did not emerge again until the 1960’s (Moore, 1988 B). “It was not until 1969 that the last technical barrier to girls in the program was removed with the official admission of girls into the FFA” (Camp & Crunkilton, 1985, p. 62).

According to Bailey, (1945) Seaman Knapp was selected to become a special agent to promote agriculture in the south. Knapp understood that for agriculture to prosper as a whole in America, farmers needed to adopt new methods. Knapp believed that the best way to do this was to show the farmers those methods through a demonstration method. Knapp developed a way to get information that was studied and taught at universities and laboratories to farmers that were located far from those locations. This development was called the County Demonstration Agent System. This method integrated rural communities with agricultural colleges and experiment stations that could offer newly researched information (Bailey, 1945). In 1903, on behalf of the U.S. Department of Agriculture established the first demonstration farm on the land of Walter C. Porter near Terrell Texas. Porter agreed to follow the practices the Knapp and the Department of Agriculture suggested. The first planting included approximately 55 acres of various crops. At the end of the crop season, Porter reported that his income was at least $700 more that if he would have grown his crops with his normal practices. Porter continued to use these new cultivation practices and used his land to demonstrate to others how to utilize these methods. “The Porter farm became a “laboratory” for teaching progressive farm techniques and an incubator for the establishment of the agricultural extension service” (Texas A & M Agrilife, n.d.) Because of this Knapp is commonly thought of as the “father” of Agricultural Extension Education (Knobloch, 2003). Additionally, Knapp knew that weevils would impact the south greatly. Therefore he pushed congress to develop a plan to inform farmers how to diversify their crops. Knapp encouraged agricultural educators to teach using practical and applicable instruction (Knobloch, 2003). Knapp believed in the philosophy of learning by doing. Knapp used the principle of learning by doing to solve and investigate agricultural problems (Knobloch, 2003).

Another notable scholar was John Dewey who believed that education should be applied to real life experiences (Knobloch, 2003). Dewey was an influential philosopher that had a great influence on the field of education. After graduating from University of Vermont he continued his formal education by receiving a Ph.D. from The John Hopkins University. Dewey not only wrote about his educational philosophy he also assisted in operating a “laboratory school”. Dewey (1938) notes that not all educational experiences are necessarily good ones. The importance of an experience is the quality of that experience and how it influences the students (Dewey, 1938). Additionally, Dewey (1938) explains that finding material for overseeing experiential learning is only the first step, the next step is analyzing what is already experienced and transform to a richer and more organized system. Dewey argued that the purpose of vocational agriculture is for students to develop transferable life skills from an integrated approach (Roberts & Ball, 2009). Dewey believed that education should be centered around the child or learner’s creativity, experiences, and interests (Howell, 1997). Moreover, Dewey’s philosophical concept of experiential learning is the foundation that agricultural education programs are built on (Knobloch, 2003). During the time period of when Agricultural Education was being introduced into secondary schools, Dewey was in the peak of his career, which is a large reason why so many of the early agricultural educator were influenced by Dewey’s ideas (Parr & Edwards, 2004).

Walter H. French graduated from Michigan State Normal College in 1888 and received a Master of Science degree from the University of Michigan. Early in his career in education he was a principal for five years and commissioner of schools for Hillsdale County for eight years. Walter H. French served as the president of Michigan State Teachers Association and in 1908 he was chosen as the first department head of the Michigan Agricultural College's Department of Agricultural Education. Furthermore, he devoted time into furthering agricultural education in elementary, high school, and adult settings (Foor & Connors, 2010). Additionally French was a ground breaker in the establishment of the Association for the Advancement of Agricultural Teaching. French also was an important role in the agricultural section of the National Society for Vocational Education (Hamlin, 1929). According to Hamlin, (1929) French was one of the first individuals to persuade others to accept federal aid for vocational education, made a plan of how vocational education is administered, and influenced drafting of a law for the Michigan Board of Control for Vocational Education. (Hamlin, 1929).

According to Foor and Connors (2010), Kary Davis received a master's degree from Kansas State College and then became a principal and agricultural teacher at the first county agricultural school in the United States which was located in Menomonie, Wisconsin. Dr. Kary C. Additionally, Davis was the first student to earn a Ph.D in agriculture (Foor & Connors, 2010). Davis was also a professor of agronomy at Rutgers College in New Jersey for a few years. During his time at Rutgers College, Davis began to apply his principles of education through directing the summer school and short courses there. The work he was doing was that of a pioneer in agricultural education for that time era. Dr. Davis also taught agriculture to boys and girls that left school and went back to work on the farm (Chesnutt, 1929). "Davis was recognized nationally and internationally for his methods concerning solutions to problems in agricultural education" (Foor &

Connors, 2010). In 1913 Davis was recruited by the Peabody College to be the head of the school of country (Foor & Connors, 2010). “He wasn’t satisfied to teach agriculture in the academic, school-fashion routine and so he taught it differently.” (Chesnutt, 1929). Davis developed a series of textbooks that provided teachers the resources to encourage the job analysis method in teaching agriculture content. Dr. Davis taught in a method that allowed students to learn in way that was more tangible, useful, and meaningful (Chesnutt, 1929).

Ashely Storm was formerly a school superintendent and later became one of the first agricultural education teachers. Storm was a natural born leader, he taught in country and city schools and was an extension professor (Field, 1929). He established and led the Division of Agricultural Education at the University of Minnesota. According to Field, (1929) Storm was endorsed as “a great organizer of short courses in America.” Furthermore he assisted Davis in writing the textbook “How to Teach Agriculture” (Foor & Connors, 2010).

History of Agriculture Education in Texas

“In Texas, the teaching of agriculture was introduced in 1903 by Mr. B Youngblood, who taught an elementary agriculture course in the public schools of Henderson” (Stockton Dillingham, Cepica, & Eggenberger, 1988, p. 1). Soon after, other elementary education programs developed (Stockton et al., 1988). Shortly after, the Smith-Hughes Act of 1917 was passed, Texas approved this act on June 15, 1917, and soon went into effect 90 days later (Stockton et al., 1988). Some of the requirements school districts needed to meet to have a vocational agricultural department included: provide a minimum of $200 in equipment, pay a teacher’s 12 month salary of $1,200, provide land for each student enrolled in plant production, provide transportation, require each student to have a home project, and devote 50% of school time each year to agriculture education (Stockton et al., 1988). Due to very strict state guidelines and a small supply of trained teachers, very few vocational agriculture programs were established after the Smith-Hughes Act of 1917 (Stockton et al., 1988).

According to Stockton, Dillingham, Cepica, & Eggenberger (1988), from 1917-1967, Texas approved 9 teacher education institutions to educate vocational agriculture teachers. The first college designated as a teacher education institution for white vocational agricultural teachers was Texas A&M University. Two years later, West Texas Normal College was approved to train teachers. Two years afterwards Sam Houston State Normal was approved, but was delayed until 1920- 21 due to lack of program financing. In 1919, Prairie View A&M was approved to train black vocational agricultural teacher (Stockton et al., 1988). North Texas State Teachers college submitted an application but was postponed for future consideration and was not brought up for consideration again.

A recommendation was made to evaluate and study the 4 institutions that were approved (Texas A&M, Texas Tech, Sam Houston, and Texas A&I) and the 3 schools that were not approved yet (Stephen F. Austin State Teachers College, East Texas State Teachers College, and Southwest Texas State State Teachers College). Eventually all 3 of the schools under review were approved in 1950 (Stockton et al.). Additionally, in 1967, Tarleton State University was the final institution approved to train vocational agricultural teachers (Stockton et al.).

School-Based Agricultural Education Programs

According to Phipps, Osborne, Dyer, & Ball (2008), "a complete school-based, agricultural education program consists of three essential and interdependent components: classroom and laboratory instruction; Supervised Agricultural Experience (SAE) projects; and membership in the National FFA Organization" (p. 4). Classroom and laboratory instruction should include demonstrations, activities, and learning experiences that happen during the allotted class period (Talbert, Vaughn, & Croom, 2006). "Supervised Agricultural Experience (SAE) is an independent learning program for students enrolled in agricultural education courses" (Croom, 2008, p.110). Furthermore, a successful agriculture education program should encompass a mixture of all three of these components (Croom, 2008; Phipps et al. 2008).

"The roots of FFA originate from a time when boys were losing interest and leaving the farm. Walter S. Newman, who in September 1925, became the Virginia State Supervisor of Agricultural Education, sought a solution to the problem with Edmund C. MaGill, Harry W. Sanders, and Henry C. Groseclose, staff members of the Virginia Polytechnic Institute Agricultural Education Department" (National FFA, n.d. A). According to National FFA, (n.d. A), the organization proposed establishing an organization that allowed these farm boys opportunities for leadership development and a sense of pride in being a farm boy. "The idea was presented during an annual vocational rally in the state in April 1926, where it was met positively. The Future Farmers of Virginia was born" (National FFA, n.d., A). "Henry Groseclose's work served as a basis for the constitution and bylaws that were adopted by the FFA at the first national FFA Convention in 1928" (William G. Camp, John R. Crunilton, 1985, p.59-60). Since 1928, millions of agriculture students have donned the official FFA jacket and championed the FFA Creed (National FFA, n.d. A). Today, there are 7,859 local FFA chapters and over 800,000 students who participate in formal agricultural education instructional programs offered in grades seven-adult throughout the 50 states, and three U. S. territories (National FFA, n.d., A).

Supervised Agricultural Experiences (SAE) provide students with additional learning experiences in a career pathway of their choice (Croom, 2008). SAE's are designed to allow students the ability to apply information they learn in the classroom to their personal lives and experiences. "This education plan is carried outside of normal daily instruction in agricultural education." (Croom, 2008, p.110). SAE's are intended to be outside of normal classroom instruction, in order to further enhance the learning experience. Along with participating in the experience of SAE's, students maintain records of their experience (Croom, 2008). SAE projects are a required component of a complete agriculture education program (National FFA, n.d., B). According to the National FFA (n.d. B), there are six different types of SAE's that include: Entrepreneurship/ Ownership, Placement/ Internship, Research, Exploratory, School-Based Enterprise, and Service Learning. Concluding a review of literature, these different SAE options allow each student to choose a SAE that meets their educational needs and interests. Through SAE's, students learn how to apply what they are learning in the classroom as they prepare to transition into the world of college and career opportunities (National FFA, n.d., B).

Agricultural Mechanics in School-Based Agriculture Education Programs

Agricultural mechanics courses are a significant sector of an Agriculture, Food, and Natural Resources (AFNR) program (Shultz, Anderson, Shultz, & Paulsen, 2014).

According to Phipps, Osborne, Dyer, & Ball (2008), the agricultural mechanics courses main purpose is to provide the opportunities for students to develop the skills and abilities needed to complete the mechanical activities needed in agriculture. Agricultural mechanics curriculum allows students the opportunity to engage in hands on learning activities that focus on mechanical skills, academic applications, and cognitive learning. (Wells, Perry, Anderson, Shultz, & Paulsen, 2013). In addition, agricultural mechanics is a science based curriculum that provides teachers with the opportunities to integrate concepts of physics, chemistry, and mathematics (Leiby, Robinson, Key, 2013; Miller, 1991). A study conducted by Burris, Robinson, & Terry (2005) identified nine agricultural mechanics content areas taught in secondary programs. 90% of agricultural mechanic teachers respondents indicated that the areas they teach include: metal fabrication, operating hand and power tools, project planning, and designing, electricity, and building/ construction. Additionally 80% of the respondents noted that plumbing, concrete, and machinery where included in their state's secondary curriculum. (Buris et al., 2005). Furthermore, agricultural mechanics curriculum allows for hands-on application of heat, thermodynamics, measurements, chemical reactions, and electricity concepts (Miller, 1991.) According to Burris, Robinson, & Terry (2005), agricultural mechanics has historically been a cornerstone in secondary agricultural programs and still remains a strong interest for students. Moreover, the agriculture industry has indicated a need for entry-level employees to be skilled in basic mechanic areas (Ramsey & Edwards, 2011; Wells et al., 2013). This need has led to industry support of secondary agricultural mechanics programs (Wells et al., 2013), and is a driving force in the enrollment in these courses (Burris et al., 2005; Hubert & Leising, 2000).

The national FFA hosts the National Agricultural Technology and Mechanical Systems (ATMS) CDE for students to practice and improve their skills related to agricultural mechanics curriculum (National FFA, n.d. D). Furthermore, the national ATMS CDE assesses student's abilities in 5 different areas as individuals and as a team. The 5 areas include: machinery and equipment, electricity, compact equipment, structures, and environmental and natural resources. Certain competencies are selected each year from these 5 areas. The individual portion of the contest consists of each student being evaluated in each of the 5 areas. The team portion involves each student working with their team to solve multi-system agricultural problem that is designated from the skills and problem solving portion of the 5 system areas (National FFA, n.d. D). P. R. Saucier (personal communication, December 7, 2017) noted that "all states have some type of ATMS CDE where they can send a state qualifying team to the National ATMS CDE contest. Most states also have some sort of state project show or county level project shows." In order to explore what some of the states have to offer when it comes to agricultural mechanics related contests and project shows, 3 representatives were asked to provide information in regards to their state. According to M. Spiess (personal communication, November 30, 2017) "The state of California offers the ag mechanics CDE (no power component), Farm Power CDE, Small Engines CDE, and welding CDE. California also has a state fair; however, agricultural mechanics is not a huge part. Although there are many county fairs that offer agricultural mechanics project shows. The state of California has 58 county shows and participation varies widely." E. A. Franklin (personal communication, November 30, 2017) noted that "The state of Arizona has a state- level Agricultural Mechanics CDE's, which is hosted by the University of Arizona. Due to space and time constraints this contest is limited to 25 teams of 4 contestants per team. County fairs may or may not have agricultural mechanic projects shows; however, the state fair in Arizona does offers a division for agricultural mechanics related projects." According to R. G. Anderson (personal communications, November 30, 2017) "The state of Illinois has a state agricultural mechanics CDE where each of the 25 sections can send one team and the top individual to the state contest. Illinois also has some colleges that host invitational agricultural mechanics contests, welding contests, and one community college hosts a small engine contest though none of these are FFA sanctioned, but are open to FFA members. Illinois doesn't not have a state wide agricultural mechanics projects show; however, students can participate in section FFA fairs as well as county fairs."

School-Based Agricultural Mechanics Curriculum in Texas

The Texas Essential Knowledge and Skills (TEKS) are a state mandated curriculum developed by the Texas State Board of Education for students in kindergarten through 12th grade. According to the Texas Education Agency (TEA) (n.d. D), the State Board of Education (SBOE) has the legislative authority to adopt the TEKS for each subject of the required curriculum. SBOE members nominate educators, parents, business and industry representatives, and employers to serve on TEKS review committees. In addition, "TEKS objectives direct the teaching of all curricula in Texas" (Wigenbach, White, Degenhart, Pannkuk, & Kujawski, 2007, p.116). According to Wigenbach, White, Degenhart, Pankuk, & Kujawski, (2007) TEKS objectives provide uniform guidelines for the mastery of knowledge and skills expected in all classes (K-12). The TEKS objectives for the agriculture mechanics related courses are designed to prepare students for careers in agriculture power, structural, and technical systems. In order to be prepared for these types of careers, students must be skilled and knowledgeable in those agriculture systems and industries, develop and understand career opportunities, and industry certifications, and expectations (TEA, n.d. D).

According to TEA (n.d. D), the Agricultural Mechanics and Metal Technologies course is recommended for students in grades 10-12; however, 9th graders may take the course if they meet the prerequisite of Principles of Agriculture, Food, and Natural Resources. The curriculum for this course states that students must learn employability skills, develop a Supervised Agricultural Experience (SAE) program, and properly use tools and equipment (TEA, n.d. D). Additionally in this course, students will gain skills in electrical wiring, plumbing, concrete construction, carpentry, fencing, and hot and cold metal techniques (TEA, n.d. D). The Agricultural Facilities Design and Fabrication course is recommended for students in grades 11-12 (TEA, n.d. D). In this course students will learn principles of facilities design and fabrication, explore different types of power systems used in agricultural facilities, construct structures, and develop a SAE program (TEA, n.d. D). Finally, the Agricultural Power Systems course is recommended for students in grades 10-12. “This course is designed to develop an understanding of power and control systems as related to energy sources, small and large power systems, and agricultural machinery” (TEA, n.d. D). Furthermore, students enrolled in this course should also select and identify standard tools and equipment, monitor electrical systems, and describe hydraulic systems related to agricultural machines (TEA, n.d. D).

The Texas FFA hosts hands-on contests that test the knowledge and skills taught in these agricultural mechanics related courses. These contests include the Tractor Technician CDE and the Agricultural Technology & Mechanical Systems CDE. This event tests both technical and agricultural mechanics skills (Texas FFA Association, n.d.). Specifically a team of either three or four students must validate their ability to work as a team to solve problems. Individually each team member must complete a test and preform hands-on skills. This contest focuses on several different systems such as: machinery and equipment systems, marketing systems, structural systems, and environmental systems (Texas FFA Association, n.d.). This second agricultural related CDE contest is called Tractor Technician. This contest consist consists of three team members completing three different parts. The first part includes members appraising parts of tractors and make service recommendations. Next each member will take a written exam, finally the team will correct five deliberately placed malfunctions in diesel fueled tractors and then drive the repaired tractor through a course all within 25 minutes. These contests are a way for students to apply what they are learning in the classroom (Texas FFA Association, n.d.). Additionally P. R. (personal communications, December 7, 2017) noted that “the state of Texas also offers multiple regional, & state invitational welding contests.” According to P. R. (personal communication, December 7, 2017), “The state of Texas has multiple state level agricultural mechanics project shows which are supported by industry and community donation. The state level project shows include: State Fair of Texas, Fort Worth Stock Show and Rodeo, San Angelo Stock Show and Rodeo, San Antonio Stock Show and Rodeo, and Houston Livestock Show and Rodeo.” Most of these state project shows gives students the opportunity to individually or as a team to design and build all types of agricultural mechanics projects and tractor restoration. Judging is not solely based on the project itself but also the proper documentation and the student’s interaction with the judges (San Antonio Stock Show, n.d.).

Agricultural Mechanics Laboratories

Laboratories are vital educational tools for agriculture mechanic courses and provide students with the opportunity to develop skills and knowledge pertaining to agriculture mechanics (Phipps, Osborne, Dyer, & Ball, 2008). According to Shinn (1987), the agricultural mechanics laboratory must be a safe and organized environment in order for optimum learning. In order for laboratory instruction to occur in a safe environment, the agricultural mechanics teacher must be knowledgeable and competent in managing the laboratory (Saucier, Terry, & Schumacher, 2009; Saucier, Vincent, & Anderson, 2011). Additionally, for laboratories to be beneficial, they need to duplicate real life situations as close as possible, supply enough materials, and provide enough space to perform educational tasks (Blackburn & Kelsey, 2012; Byrd, Anderson, & Paulsen, 2015). Opportunity of injury, or mishaps, are common in agricultural mechanics shops or laboratories, moreover, sometimes these instances are overlooked by the teacher and are not properly addressed (Huebert, Ullrich, Lindner, & Murphy, 2003). “To combat the prospect of student injury in shops or laboratories, a strong safety climate must be instituted in programs” (Hubert et al., 2003, p. 3). It is recognized that safety is not the most interesting topic; however, it is a crucial component of the success of the course (Huebert et al.). There are several preventative measures that should be conducted to decrease risk of injury. Some of these measures include: properly working fire extinguishers, wearing proper protective equipment, maintaining a laboratory that is in compliance with OSHA standards, regular safety inspections, ensuring proper ventilation, and maintaining a well-organized shop (Huebert et al., 2003; Frank, Hubert, & Gilmore, 2000; Saucier, Vincent, & Anderson, 2011).

According to Johnson and Fletcher (1990), students enrolled in agricultural mechanics courses are exposed to equipment, supplies, and materials that could potentially be dangerous. Opportunity of injury, or mishaps, are common in agricultural mechanic laboratories, moreover, sometimes these instances are overlooked by the teacher and are not properly addressed (Hubert, Ullrich, Lindner, & Murphy, 2003). “To combat the prospect of student injury in shops or laboratories, a strong safety climate must be instituted in programs” (Hubert et al., 2003, p. 3). The proper personal protective equipment should include leather shoes with steel toes, leather gloves, safety glasses, and face masks. According to Herren (2015), hard hats are needed when working where objects are above head or when flying objects could possibly occur. Additionally, masks that cover the nose and mouth are needed to filter out particles including spray paint and dust (Herren, 2015). Ear plugs are also recommended for hearing protection when working with certain levels of noise (Herren, 2015). It is recognized that safety is not the most interesting topic; however, it is a crucial component of the success of the course (Huebert et al.).

Saucier, McKim, & Tummons (2012), identified a list of 23 essential agricultural mechanics skills that need to be taught in secondary agricultural mechanic programs. These skills vary from very simple skills like using hand and measurement tools to extremely technical skills like Gas Tungsten Arc Welding (GTAW). Other essential agricultural mechanic skills include soldering, surveying, plumbing, concrete, small gas engines, carpentry, Oxygen/Acetylene Welding (OAW), Oxygen/Acetylene Cutting (OAC), Plasma Arc Cutting (PAC), carpentry, Gas Metal Arc Welding (GMAW), Shielded Metal Arc Welding (SMAW), and project development (Saucier et al., 2012). According to Herren (2015), tools and equipment needed in an agricultural mechanics laboratory vary from simple tools like hand tools, to more complex equipment such as several types of welding machines. There are certain hand tools that are necessary in an agricultural mechanics laboratory. These hand tools include grinders, tape measures, levels, squares, various types of saws, hammers, pliers, clamps, wrenches, screw drivers, drills, chipping hammers, and wire brushes. Welding equipment could include OAC equipment, SMAW welding machine and equipment, welding table or booth, GMAW and GTAW welding machine and equipment. Virtual reality welding simulations can also be used in laboratories to train students to obtain basic skills for job in a technical field (Byrd, Anderson, & Stone, 2015). "Training within a virtual reality can prepare a trainee to anticipate and recognize when situations go awry, as well as to test and individual's decision-making skills under normal and stressful conditions" (Byrd et al., 2015, p. 390). According to Byrd et al. (2015), virtual realities simulators could also be used as a tool for employers to find skilled employees. Allowing students the opportunity to use this type of simulator could give them an advantage when attempting to enter industry jobs (Byrd et al., 2015).

Agricultural Science Teacher Certification, Preparation, and Demand Agricultural Science Teacher Certification Requirements

The federal government provides additional federal funding for education; however, each state develops its own requirements for certification of teachers (NAAE, n.d.). Most states require passing a knowledge and skills test, completing a teacher preparation program, earning a bachelor's degree, passing a background check. Please see Table 1 for a description of the agricultural science teacher certification requirements for all 50 states.

Table 1

National Agricultural Science Teacher Certification Requirements (N=50)

State	Bachelor's Degree Required	Certification Test(s)	Background Check Required	Work Experience Required	Teacher Preparation Program Required	Other Requirements
Alabama	Yes	Basic Skills & Praxis II	Yes	No	Yes	GPA of 2.75 or higher, CTE Provisional & Interim certificates available but must requested from a superintendent
Alaska	Yes	Competency and Praxis II	Yes	No	Yes	6 semester hours of Alaskan & multicultural studies
Arkansas	Yes	Praxis Core & Praxis Subject	Yes	No	No, Nontraditional routes available	N/A
California	Yes	The California Basic Educational Skills Test & subject matter exam or program	Yes	No	No; can be substituted	Alternative route available
Colorado	Yes	Praxis Content	Yes	No	No; can be substituted	Alternative route available
Connecticut	Yes	Praxis Core	Yes	1 year	No; can be substituted	Interim certificate available
Delaware	No	Can be substituted	Approved General Knowledge Exam	Yes	6 years and 2 years of technical training	Yes; can be substituted

(continued)

Florida	Yes	General Knowledge, Professional Education, and subject area Test.	Yes	No	Yes; can be substituted	Alternative certification available
Georgia	Yes	Georgia Educator Ethics and GACE ag education assessments	Yes	No	Yes	Induction pathway 4 is available but only valid for 3 years
Hawaii	No, Can be substituted	Praxis content or 30 semester hours of content	No	3 years substitutes for an agriculture education degree	Yes, work experience, pedagogy courses and an associate's degree can substitute	1 time renewable 5 year permit available
Idaho	Yes	Praxis II	Yes	No	No; can be substituted	N/A
Illinois	Yes	Test of Basic Skills, content area test & edTPA	Yes	No	No, can be substituted	Student teaching or equivalent experience required
Indiana	Yes	Core Educator Skills Assessment & content test	(not on website)	No	No, can be substituted	Suicide prevention and CPR/AED training
Iowa	Yes	Praxis Pedagogy, Praxis Content, edTPA, & PRAT Pedagogy	Yes	No	No, can be substituted by Intern Program	Teacher intern program available, & career & technical authorization
Kansas	Yes	Content test & The Principles of Learning and Teaching	Yes	No, can be a route for alternative certification	No, can be substituted with experience	Restricted teaching license & CTE Experience license available

(continued)

Kentucky	Yes	Agriculture 147 Content Exam & Principles of Learning and Teaching	Required by local school districts	No, can be a route for alternative certification	No, can be substituted by an alternative route	8 alternative options with different requirements
Louisiana	Yes	Agriculture 5701 Content & Principles of Learning and Teaching	Required by local school districts	No, can be a route for alternative certification	No, can be substituted by an alternative route	3 alternative options with different Requirements
Maine	Yes	Praxis I	Yes	No	Yes	N/A
Michigan	Yes	Teacher Certification Professional Readiness Exam & Content Area Exam	Yes	No,	No, can be substituted by work experience	Interim Occupational certificate requires 6 hours of occupational credits
Minnesota	Yes	Basic Skills Test, MTLE Pedagogy and Content Exams	Yes	No	Yes	N/A
Mississippi	No	Praxis I	Yes	No, Work Experience can substitute for a degree in education	No, can be substituted by an alternative program	3 different licenses for non-education degrees with different requirements
Missouri	No	015 Agriculture content exam & MO Pre-service Teacher Assessment	Yes	No, can substitute for a degree in education	No, can be substituted by work experience and alternative programs	Temporary route certification require 6 college hours for renewal

(continued)

Montana	No	Praxis Agriculture 5701	Yes	No, can substitute for a degree in education	No, can be substituted by work experience and alternative programs	3 types of CTE licenses
Nebraska	Yes	Praxis Core & Praxis content or competency test	Yes	No, Career education Permit requires 5 years of experience	No, can be substituted by work experience and alternative programs	Human Relations Training and special education training for initial certification
Nevada	Yes	Praxis Core & Principles of Learning and Teaching 7-12	Yes	No	No, can be substituted by alternative programs	N/A
New Hampshire	Yes	Basic Skills & Praxis Subject	Yes	No	No, can be substituted by alternative programs	Alternative certifications have specific requirements
New Jersey	No	Praxis II and Examination in Physiology and Hygiene	Yes	No, can substitute for a degree in education	No can be substituted by alternative Programs	24 hour requirement of pedagogy
New Mexico	Yes	CKA in Agriculture	Yes	No, can substitute for a degree in education	No, can be substituted by an alternative program	24- 36 hours in agriculture education

(continued)

New York	Yes	edTPA Safety Net, Education All Students Test, & Content Specialty Test	Yes	No	No, can be substituted by an alternative program	N/A
North Carolina	Yes	Praxis II & Pearson Testing for North Carolina: foundations of Reading & General Curriculum	Yes	No	No, can be substituted by an alternative program	Lateral Entry Certification is available and has program requirements
North Dakota	Yes	Praxis I & Praxis II	Yes	No	Yes	Alternate Access license are available during shortages; must complete education degree within 3 years
Ohio	Yes	Agriscience 005 & OAE Assessment of Professional Knowledge Adolescence to Young Adult (7-12)/ 003	Yes	No, can qualify for career technical teaching program	No, Can be substituted by an alternative program	N/A
Oklahoma	No	Oklahoma General Education Test, Subject Area Test, & Professional Teaching Exam	Yes	No, 2 years of experience can qualify for a provisional certification	No, can be substituted by an alternative program	Must complete hours towards a degree with a university alternative program
Oregon	Yes	Civil Rights/ Ethics exam & Subject mastery Exam	Yes	No	Yes	Must have a CTE license

(continued)

Pennsylvania	Yes	Fundamental Subject Content in Agriculture	Yes	No, 2 years of work experience can qualify for a certificate	No, can be substituted with work experience	Must have a GPA of 3.0 or higher
Rhode Island	No	Principles of Learning & Teaching 7-12, & Agriculture (5701)	Yes	No, 5 years of work experience qualifies for a Career and Technology Certification	No, can be substituted with work experience or an alternative program	60 hours of field experience & 12 weeks of student teaching
South Carolina	No	Principles of Learning & Teaching 7-12, & Agriculture (5701)	Yes	No, work experience can qualify for a work based certification program	No, can be substituted with work experience or an alternative program	Teachers with a work based certification have five years to complete the professional certificate requirements
South Dakota	Yes	Principles of Learning & Teaching 7-12, & Agriculture (5701)	Yes	No	No, can be substituted with an alternative program	3 hours in South Dakota Indian Studies, Suicide Awareness & Prevention Training

(continued)

Tennessee	Yes	Principles of Learning & Teaching 7-12, & Agriculture (5701)	No	5 years of work experience will qualify for occupational certificate	Yes	Occupational certificate option
Texas	Yes	160 PPR & 272 Agricultural, Food, and Natural Resources	Yes	No	No, can be substituted with an alternative program	N/A

(continued)

Utah	Yes	Praxis content Exam, ACTFL & ABCTE	Yes	No	No, can be substituted by an alternative program	Educator ethics review
Virginia	Yes	Virginia Communication and Literacy Assessment-VCLA	Yes	No, Initial industry certification needs an industry certification; experiential learning certification-5 years of experience	No, can be substituted by an alternative program	Awareness training & Emergency First Aid, CPR, & AED training required by all certification

(continued)

Washington	Yes	Content Exam	Yes	Yes, 1 year for university; could also lead to a conditional teacher certification	No, can be substituted by an alternative program	Must also apply for residency teacher certificate or add an endorsement to teacher certificate
Virginia	Yes	Virginia Communication and Literacy Assessment-VCLA	Yes	No, Initial industry certification needs an industry certification; experiential learning certification-5 years of experience	No, can be substituted by an alternative program	Awareness training & Emergency First Aid, CPR, & AED training required by all certification
Washington	Yes	Content Exam	Yes	Yes, 1 year for university; could also lead to a conditional teacher certification	No, can be substituted by an alternative program	Must also apply for residency teacher certificate or add an endorsement to teacher certificate

(Continued)

West Virginia	No	Basic Skills Test	Yes	No, can be substituted by an agricultural education degree	No, can be substituted by an alternative program or work experience	Agriculture, Food, and Natural Resources alternative certification has work experience requirements
Wisconsin	Yes	Praxis Core & Praxis II Content	Yes	No	Yes	Alternative programs for a Supplemental teacher certification
Wyoming	Yes	Praxis Agriculture 5701	Yes	No	Yes	The alternative route is being certified out of state and taught 3 out of the last 6 years

Note: Arizona has many different routes to certification that include: Bachelor's degree in agriculture & 240 clock hours; 6,000 clock hours & 15 hours of professional knowledge coursework; or a bachelor's degree in agriculture education and 240 clock hours. Iowa offers a Career and Technical Authorization for those that either have 6000 hours in an approved career area or 4000 hours and a bachelor's degree. The district must conduct a diligent search to find a fully-licensed applicant prior to this authorization. The initial career and technical authorization is valid for three years. To convert to the full career and technical authorization, the applicant must complete the requirements in 282-22.9(6). Kansas offers a restricted CTE pathway for those who meet the requirements but can teach while completing pedagogy. Massachusetts allows 5 years of recent work experience in field to substitute for a degree. Michigan allows 2 years of occupational work from the last 6 years to substitute for a degree in education. Mississippi has very many endorsements to teach certain classes and each endorsement has separate requirements. Missouri has a career education temporary authorization certificate that leads to an initial certification. The qualification options include: Bachelor's degree and 4000 occupational hours; an associate's degree and 5,000 occupational hours; or no degree and 6,000 occupational hours. Montana's CTE Licenses include: Class 4 A, for teachers with another teaching license; Class 4 B, requires a bachelor's degree and 10,000 hours of experience; Class 4 C requires 10,000 hours of work experience. In New Jersey the requirements for the three alternative routes include: a bachelor's degree and a GPA of 2.75 or greater; an associate's degree and two years of occupational experience; or at least 4 years of experience. In Tennessee the options for completing 5 years of work experience include: a postsecondary training certificate and 2 years of work experience; associates degree and 1 year of work experience; a bachelor's degree in endorsement area; or 5 years of work experience. West Virginia has an Agriculture, Food, and Natural Resources alternative certification that includes: 8,000 clock hours; bachelor's degree and 4,000 clock hours; or an associate's degree and 4,000 clock hours. A year of training from an education program may count towards a half year of work experience.

Agricultural Science Teacher Certification in Texas

According to Texas Education Agency (TEA; TEA, n.d. B), applicants must take and pass both the 272 Agricultural Food and Natural Resources and the 160 Pedagogy and professional responsibilities test to be certified to teach agriculture courses in Texas. Additionally the Agricultural, Food, and Natural Resources Grades 6-12 (TAC 233.13) certification does require a college degree; however, does not require wage earning experience, a licensure, or an additional certification (TEA, n.d. B). “The 2007 Texas Legislature passed Senate Bill 9 requiring fingerprint based criminal background reviews for certain school employees in Texas Public schools. Senate Bill 9 is codified in Texas Education Code (TEC), Chapter 22, Subchapter C” (TEA, n.d. C). Moreover, Chapter 22 Subchapter C states “a certified educator shall submit fingerprint, photograph, and identification information to the Texas Department of Public Safety (DPS)” (Texas Administrative code, 2017). Texas Education Agency (TEA) conducts a national criminal history check on all applicants for teacher certification (TEA, n.d. A). As of September 1, 2011, a certified educator is not allowed to be employed by a school if they have not had a national criminal record information has been entered into the criminal history clearinghouse and that is available to the TEA and the school that the educator is employed at (Texas Administrative Code, n.d.).

Agricultural Education Teacher Preparation in Texas

The traditional teacher certification process in Texas includes an agricultural education preparation program. The state of Texas has 11 universities that offer this program. The number of hours required from each university are listed in Table 2. According to TEA (n.d. E), there are alternative certification programs that allow individuals to teach prior to completing the state requirements. This non- traditional type of certification requires very limited formal training prior to teaching. TEA's website provides a list of approved non- traditional programs and requirements.

Table 2

Hour requirements of universities with agricultural education preparation programs (N=11)

University	# Hours for Degree	# Hours in Agriculture	# Hours in Education	Hours in Ag Mechanics
Angelo State University	120	51	24	9
Sam Houston State University	120	64	15	9
Texas State University	120	60	12	9
Sul Ross State University	125	56	21	9
Tarleton State University	123	65	12	9
Stephen F. Austin State University	120	58	18	13
Texas A&M Commerce University	120	76	6	9
West Texas A&M University	120	56	24	9
Texas A&M University	120	75	6	6
Texas A&M Kingsville University	120	56	15	9
Texas Tech University	120	70	9	6

Supply and Demand of Agriculture, Food, and Natural Resources Teachers

Research studies show that there is a critical shortage of AFNR teachers at the secondary level. These studies document that there is a strong link between the teacher shortages throughout all facets of education and beginning teacher attrition. Some attrition is inevitable since some teachers leave for personal reasons, a small number are encouraged to leave, and some teachers do retire (Shakrani, 2008). According to Shakrani (2008) university teacher preparations programs are producing adequate numbers of teachers to meet the demands; however, too many teachers are leaving the teaching profession for other occupations.

Moreover, a current problem concerning high school AFNR teacher educators are teachers leaving the profession prematurely (McIntosh, 2017). According to Blackburn & Robinson (2008), nearly half of all beginning teachers will change professions with in their first 7 years of teaching. Understanding why so many beginning teachers are leaving the profession is crucial to keeping teachers in the profession longer (Blackburn & Robinson, 2008). In order for the agriculture education profession to prosper, it will need to maintain an adequate supply of qualified teachers (Boone & Boone, 2007). Respondents of the 2015-2016 National Agricultural Education Supply & Demand Study reported that a total of 721 AFNR teachers in the U.S. who taught in the 2015- 2016 school year would not be returning to the teaching profession in 2016- 2017 (Smith, Lawyer, & Foster, 2016). According to NAAE’s Agriculture Teacher Supply and Demand Overview (2016), the Southern Region alone had 91 new positions, 65 new programs, 99 retirements, and 344 individuals leaving the teaching profession. According to Smith, Lawyer, & Foster (2016), the main reasons that the younger teachers are leaving include: seeking employment in industry and agribusiness, graduate school, or teaching another subject. A study conducted by McIntosh (2017) noted that AFNR teachers considered leaving the teaching profession because of the stress related to FFA and SAE projects. Additionally, this study noted that current teachers identified that managing stress and controlling student discipline were the major issues first year teachers encountered (McIntosh). Boone & Boone (2007) developed an open ended questionnaire asking what problems beginning AFNR teachers faced as well as the problems teachers with 3 or more years of experience faced. This study identified a key problem faced by both beginning and more experienced teachers alike was administrative support. Many of the problems that beginning teachers face, that the more experienced teachers do not, was developing a course of instruction, self-confidence, undergraduate preparation, and mentorship (Boone & Boone). These problems could build up and convince a teacher that they are not an effective and an adequate teacher, resulting in them switching professions (Boone & Boone).

Theoretical Framework

Theory of Andragogy

To guide this study, researcher utilized Knowle's Theory of Andragogy (Knowles, Holton III, & Swanson, 2015). Knowles et al. (2015 p.27) defines andragogy is "a set of core adult learning principles that apply to all adult learning situations." The term *adult* has four different definitions. First the biological definition refers to when an individual can reproduce. Additionally, the legal definition is when an individual can legally vote, obtain a driver's license, marry without consent etc. Another definition is defined by the social status of the individual performing an adult role. Lastly, the psychological definition which means when an individual realizes that they are fully responsible for their own lives. The word pedagogy is derived from the Greek work that means *child*. Therefore, “pedagogy literally means the art and science of teaching children” (Knowles et al., 2015, p.85). The Pedagogical teaching model puts full responsibility of determining what is learned, how and when it is learned on the teacher. In contrast, andragogy focuses on adult learners and centered on the fact that most adults learn best when they are involved in the methods, content, timing, and reflection of their own learning. The six principles of andragogy include: the learners need to know why, what, and how, the self-concept of the learner, the learner’s previous experiences, eagerness, orientation, and motivation to learn (Knowles et al., 2015).

Adult learners are more motivated to learn if they know why that information or skill is important and useful and how it benefits them. Therefore, a crucial task of an adult educator is to help the students understand why they need this proposed knowledge (Knowles, Holton III, & Swanson, 2015). The learner’s self- concept principle addresses that adults desire to be responsible for their own decisions, life, and learning. Adult learners learn best when they are involved in the planning of their learning. Despite this principle adults that attend a class typically retrieve back to a dependent learning point of view. This conflict has a tendency to be the reason that there is a high dropout in non-mandatory adult education. It is crucial that adult educator help make a smooth shift from dependent learning to self-directed learning (Knowles, Holton III, & Swanson, 2015). Additionally, adults have many experiences that aid the individual in learning new knowledge and skills. The richest tool that an adult educator can use is the previous experiences that the learners have (Knowles et al., 2015). Knowles et al. (2015) noted that some ways to expose those experiences is to facilitate group discussions, activities that stimulate problem-solving skills, and hands-on laboratory activities. In order to learn effectively learners must be ready and prepared to learn the information. For example a sophomore in high school whose dream is to be an astronaut; however, the only experience they have is a few science and math classes. The best action to do in this example is to move forward to the next step of getting prepared instead of waiting for readiness to develop naturally (Knowles et al., 2015). Instead of being subject-centered learners, adults are oriented to learning based on their life, task, or problem. According to Knowels et al. (2015) Children learn best when learning is subject centered; however, adults learn best when the orientation of learning is centered on life or a problem. Adults are more motivated to learn new knowledge when they acquire different needs and interests. Therefore, adults learn better when material is presented to be applicable to real-life circumstances. Lastly, adults are receptive to small amounts of external motivators; however, the greatest motivator is an individual's self-motivation to be successful (Knowles et al., 2015). Figure 1 illustrates a summary of andragogy in practice. This diagram shows the six core principles of andragogy. (Knowles, Holton III, & Swanson, 1998; Knowles et al., 2015). In conclusion, adult learners learn best when their learning is self-derived, influenced by their experiences, and can make a connection to why this information is useful. This theory can be practical in understanding the best ways to teach entry-level teachers since they fit under at least one of the adult definitions defined previously. As an educator it is crucial to understand the reasons and factors that are involved in adult learning (Knowles et al., 2015).

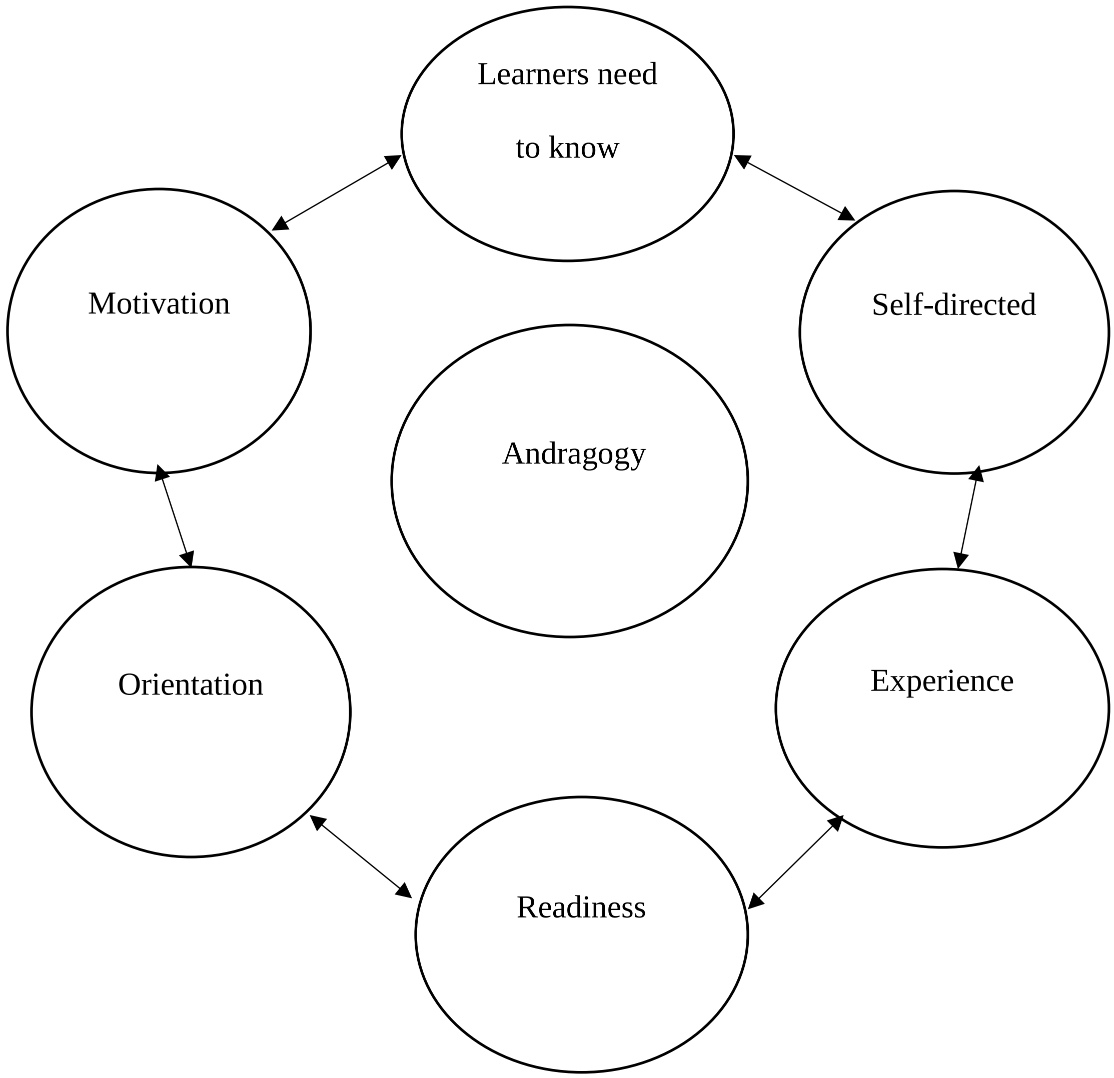

Figure 1. Visual description of Knowles Andragogy Theory

Self-Efficacy Theory

To further guide this study, researchers also utilized Bandura's Theory of Self-efficacy. Self- efficacy is defined by Bandura (1986) to be the "beliefs in one's capabilities to organize and execute the course of action required to produce given attainments" (p. 3). Bandura (1997) noted that self- efficacy involves an individual's personal judgements of their own capabilities. Self-efficacy influences an individual's decisions, behaviors, amount of determination, reactions to obstacles and difficulties, as well as the overall level of achievement they accomplish (Bandura, 1986). Additionally, it is essential for people to have firm confidence in their self- efficacy to sustain the effort required to be successful (Bandura, 1997). Pajares (1996) addressed that knowledge and skills are poor predictors of continuous achievements because the belief that an individual holds about their own knowledge and abilities influences the end result of how they will behave (Bandura, 1986, & Pajares, 1996).

According to Bandura (1997), Self- efficacy is achieved through mastery experiences, physiological and emotional arousal, vicarious experience and social persuasion. Mastery experiences have the biggest impact of efficacy and occur when an individual succeeds in accomplishing a task (Blackburn & Robinson, 2008). Furthermore, success builds a vigorous belief in ones self-efficacy; however, failure moderates it, especially if self-efficacy is not yet established. According to Bandura (1994), “some setbacks and difficulties in human pursuits serve a purpose in teaching that success usually requires sustained effort” (p. 71). Vicarious experiences are instances when a task is modeled by another individual prior to the attempt of the subject (Tschannen- Moran, Woolfolk- Hoy, & Hoy, 1998). These experiences are more than providing a standard to judge one’s own capabilities against. Additionally, “people seek proficient models who possess the competencies to which they aspire” (Bandura, 1994, p. 72). Another way of strengthening an individual’s self- efficacy is through social persuasion. When people are persuaded verbally that they possess the capabilities to succeed at a task they are more likely to put forth a greater effort (Bandura, 1994). Lastly, individuals rely partially on their emotional state, or emotional arousal, during the judgement of their competences (Bandura, 1994; Bandura, 1977). Bandura (1994) noted that positive mood enriches perceived self-efficacy, yet a despairing mood weakens it. Furthermore, “fear reactions generate further fear of impending stressful situation through anticipatory self- arousal” (Bandura, 1977, p. 199). Through fear- provoking thoughts of their potential incompetence, individuals can arouse themselves to amplified anxiety that far surpasses the fear experienced during the actual situation (Bandura, 1977).

Tschannen- Moran, Woolfolk- Hoy, & Hoy (1998) defined teacher efficacy as “the teacher's belief in his or her capability to organize and execute courses of action required to successfully accomplish a specific teaching task in a particular context” (p. 233). Ross, Cousins, & Gadalla (1996) noted that teacher efficacy encompasses an individual teacher's expectation that he or she will be able to convey student learning. Additionally, teacher efficacy is a teacher’s conviction that they can influence how a student learns (Whittington, MccConnell, & Knoblach, 2006). Through experiences, teachers are better able to develop a stable belief about their own abilities (Ross, 1998). When a task is routine and has been successful several times, there is little active analysis. During a routine situation, one’s efficacy is based on their memory of how the task was handled previously (Tschannen- Moran et. al., 1998). Swan, Wolf, & Cano (2011) further projected that a teacher that has a high sense of self-efficacy can better combat teacher burnout, hence reducing the amount of teachers leaving the education profession. Beliefs that an individual has about their own confidence and abilities to teach a certain subject, such as agricultural mechanics, can influence how well they teach the content to their students (Shultz, Anderson, Shultz, & Paulsen, 2014). Ones confidence in their own abilities is extremely important when teaching students how to perform tasks that could be potentially dangerous to themselves as well as everyone else. After a review of literature, it is determined that Bandura's theory of self- efficacy is beneficial to analyze when studying confidence levels and preparation of AFNR teachers who teach agricultural mechanic curriculum. Figure 2 illustrates a visual explanation of this theory.

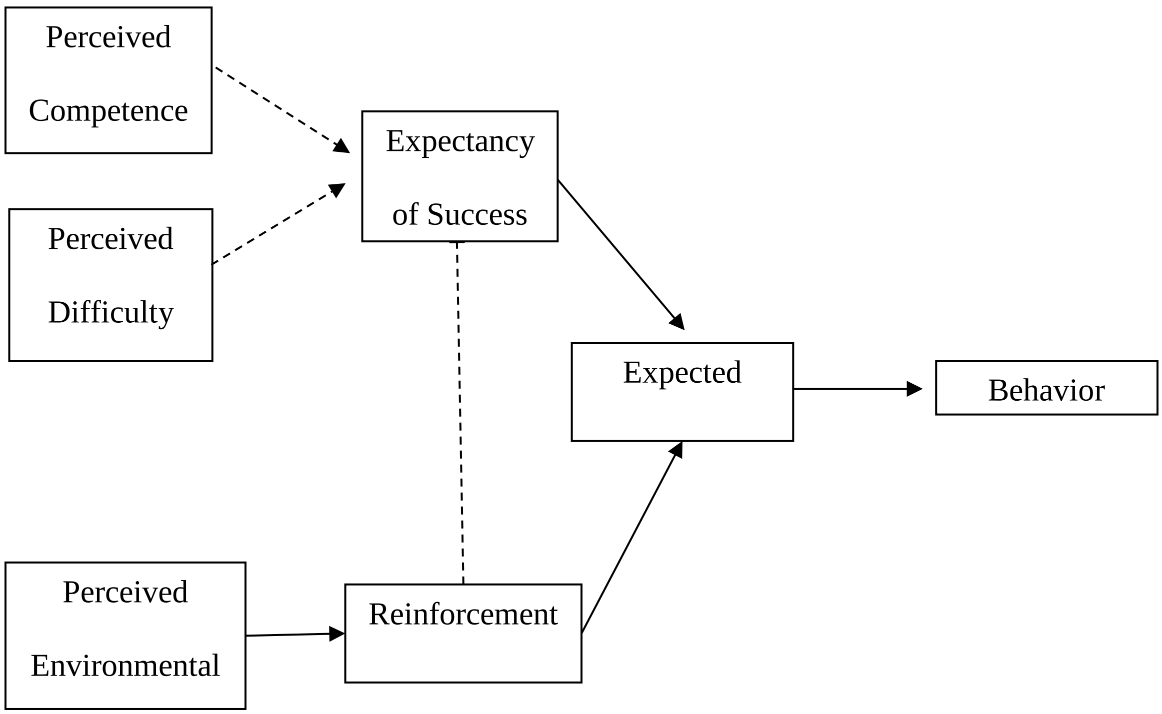

Figure 2. Visual description of Bandura's Self-Efficacy Theory.

Expertise Theory

An *expert* is described as "one who is very skillful and well-informed in some special field" (Webster's New World Dictionary, 1968, p. 168). Additionally, *expertise* refers to the characteristics, skills, and knowledge that differentiates experts from novices and those with less experiences (Ericsson, 2006). Ericsson's Theory of Expertise focuses on the characteristics of expert performance and mastery knowledge (Ericsson, 2006). Ericsson & Charness (1994, p. 731) "define expert performance as consistently superior performance on a specified set of representative tasks for the domain that can be administered to any subject. Furthermore, Ericsson & Charness (1994) found that "the study of expert performance has important implications for our understanding of the structure and limits of human adaptation and optimal learning."

It is common for people to believe that expert performance is a result of innate talent, a gift, or genetics (Ericsson & Charness, 1994). However, researchers (Ericsson & Lehman, 1996; Ericsson, Krampe, & Tesch- Romer, 1993; Ericsson & Charness, 1994) argue that environmental factors, (ie. Building, materials, support), a person's motivation, a person's knowledge, a person's training, amount of time, and practice are essential factors in reaching expert performance. Research in numerous domains highlights that expert performance is arbitrated by acquired cognitive, perceptual-motorskills, physiological, and anatomical adaptations (Ericsson & Charness, 1994; Ericsson & Lehmann, 1996). Ericsson, Krampe, & Tesch- Romer (1993) noted that expert performers usually begin by engaging in playful activity of a certain domain at a young age, then reveal *talent*, which results in their parents providing instruction from a teacher, and parental encouragement to practice. Moreover, Krampe, & Tesch- Romer (1993) further explained that there are three constraints when dealing with expert performance. The resource constraint states that individuals are oftentimes limited to their resources. Additionally, initial motivation and exerting effort is imperative to improve performance (Ericsson, Krampe, & Tesch-Romer,1993). According to Ericsson & Charness (1994) acquired knowledge and skills, or physiological adaptations effected by training, are the difference between expert and less accomplished performers. Individuals must also receive direct informative feedback after their performance (Ericsson, Krampe, & Tesch- Romer, 1993). Therefore, when no feedback is given, efficient learning is impossible and improvements of the task or performance is limited. According to Ericsson & Charness (1994) acquired knowledge and skills or physiological adaptations effected by training is the difference between expert and less accomplished performers. When all of the previously mentioned aspects are met, then practice improves the accuracy and efficiency of an individual's performance. Ericsson, Krampe, & Tesch- Romer (1993) explained that expert performance is developed slowly over a long period of training and that the highest level of expertise requires at least 10 years of intense preparation and deliberate practice.

One of the main components of Ericsson's theory is deliberate practice. Thus, deliberate practice must be practice that is full of effort, intensity, and full of concentration (Theiler, 2003). In order to gain the greatest results from deliberate practice, individuals must sustain full attention during the entire practice period (Ericsson, Krampe, & Tesch-Romer, 1993). Therefore, deliberate practice should be conducted daily, during extended periods of time, without reaching the point of exhaustion (Ericsson, Krampe, & Tesch-Romer, 1993). The second constraint for expert performance is the effort restraint. This constraint deals with the greatest amount of time that can be devoted to deliberate practice without reaching injury or motivational burnout (Ericsson, Krampe, & Tesch- Romer, 1993). Research shows that there is no benefit from practice that surpasses four hours a day and practice times greater than two hours actually show reduced benefits to the individual (Ericsson, Krampe, & Tesch- Romer, 1993). The improvements that deliberate practice has towards expert performance is greater than most people consider (Ericsson & Charness, 1994).

Another constraint for expert performance is the motivational constraint. If an individual does not have the goal of refining their performance, the motivation to participate in tedious practice disappears (Ericsson, Krampe, & Tesch- Romer, 1993). Ericsson, Krampe, & Tesch- Romer (1993) identified the three phases for the period of preparation. The first phase starts with the introduction to the activity and ends with the beginning of instruction and deliberate practice. The second phase includes a large time period of preparation and ends with full time commitment to that activity. The third phase begins with full-time commitment to improving ones skills and ends with the individual being a professional or full time engagement in the domain. According to Ericson & Charness (1994), there is a weak relationship between experience and performance due to many activities such as work or competitions that allow for few opportunities of effective learning and skill improvement. In almost every domain, methods of effective training and instruction run parallel with relevant knowledge and techniques (Ericson & Charness, 1994). Ericsson & Charness (1994), further noted that most amateurs and employees spend very limited time on deliberate efforts once they meet an acceptable level of success.

All of the requirements discussed that are needed for expertise can be directly used to teach students how to master agricultural mechanic related skills. For example, for an individual to learn how to Shielded Metal Arc Welding (SMAW), the student must first be motivated and interested in learning the skill. Next, it is crucial that the student has the resources and materials needed to perform the task. In this case, the student would need proper personal protection equipment (PPE) and welding equipment including: a welding hood, gloves, safety glasses, proper clothes, as well as an electrode holder, and welding machine. Then the teacher needs to teach the student how to perform the task. After the student learns the knowledge and techniques needed to perform the task, they must then practice the skill over a long period of time until the skill is mastered. In order for the student to make improvements, the teacher needs to monitor the students practice and provide the student with immediate feedback on how the student is performing. Using the teacher's feedback, the student needs to reflect on their performance and make needed adjustments. These procedures should continue until the student masters the skill of SMAW.

After a review of literature, Ericsson's expertise theory is relevant when studying AFNR teacher's experiences and preparation to teach agricultural mechanics skills and curriculum. Successful teachers and coaches manage training programs personalized to fit the individual needs of the learner. Moreover, "these training activities are created to improve specific characteristics of performance through repetition and consecutive refinement" (Ericsson & Charness, 1994 p. 738). Likewise, repetition and continuing to strive for improvements in agricultural mechanics related laboratory activities is beneficial for success. This theory is relevant because agricultural teachers as well as agricultural teacher educators instruct students with varying abilities and experiences and it is important to understand the process of mastering a skill. This theory also suggests that the best way to do that is through repetition, effective training, intensive preparation, and deliberate practice. Figure 3 illustrates a visual explanation of this theory.

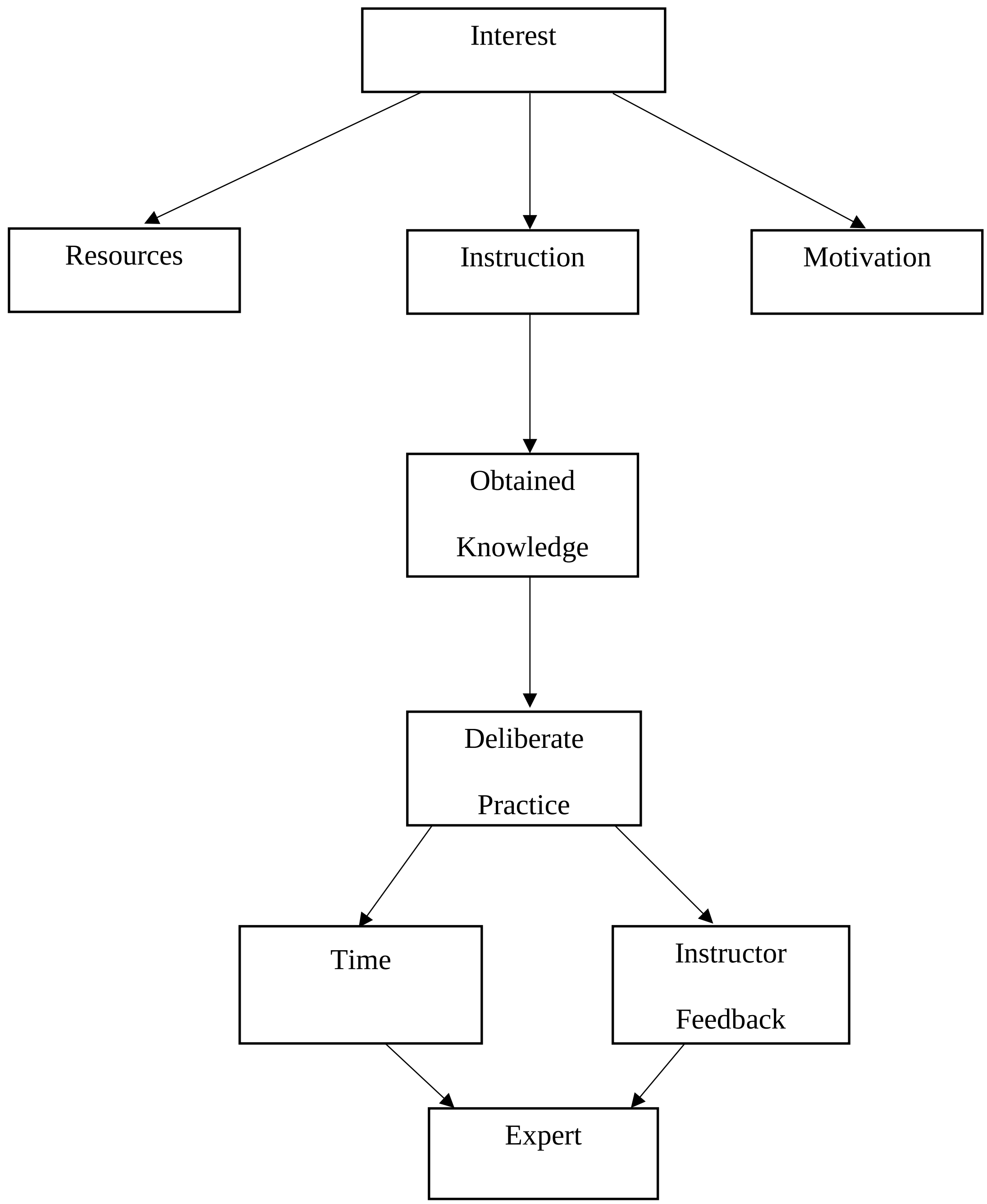

Figure 3. Visual explanation of Ericsson's Expertise Theory.

Summary

Learning about agricultural practices dates back to the 1600's when settlers learned through personal hands-on experiences. Later a systematic way of teaching agriculture was created (Barrick, 1989). Agricultural education has emerged to what it is today due to several key federal legislative acts and with the help of few pioneers in agriculture education (Foor, 2010). Additionally, agricultural mechanics courses have provided students with instruction and hands-on experiences that are based on agricultural mechanic related skills. Furthermore, leaders in industry have noted a high demand for employees with skills learned in secondary agriculture mechanics courses (Wells, Perry, Anderson, Shultz, & Paulsen, 2013). Laboratories hold a vital role in providing students the opportunity to develop knowledge and skills related to agriculture mechanics curriculum (Phipps, Osborne, Dyer, & Ball, 2008). Injury or accidents could easily occur in agricultural mechanics laboratories due to inherent danger of the equipment and learning environment involved (Huebert, Ullrich, Lindner, & Murphy, 2003). Therefore, it is pertinent that Agriculture, Food, and Natural Resources teachers that are teaching agricultural mechanic related curriculum are proficient in laboratory management and safety (Saucier, Terry, & Schumacher, 2009). According to a review of literature, there is critical shortage of secondary Agriculture, Food, and Natural Resources teachers. Additionally, there is a large agricultural science teacher turnover rate and large amount of teachers leaving the profession within three years of beginning the teaching profession (Boe, Cook, & Sunderland, 2008; Saucier, Roe, & Muller, 2015). Understanding why teachers are leaving the profession early, and preparing teachers for the different situations and responsibilities required of a teacher is vital to keeping teachers in the profession longer (Blackburn & Robinson, 2008) Research has shown that prior experiences specific to a certain content area curriculum generates a higher level of one’s self-confidence to teach that content (Wells et al., 2013). Moreover, it is critical to understand which teaching methods are used to instruct future Agriculture, Food, and

Natural Resources teachers agricultural related skills that will yield the highest levels of confidence. By understanding the confidence levels of novice agricultural science teacher in Texas, teacher educators can make adjustments to training at the university level and provide appropriate professional development opportunities for existing teachers.

CHAPTER III

Methodology

This chapter is comprised of the procedures and methods utilized to collect, measure, and analyze data. Specifically, the research design, population, accounting for measurement error, and data collection. Additionally, data analysis for each research question in this study was addressed.

Purpose of the Study

The purpose of this study was to examine the confidence levels of entry year, Texas Agriculture, Food, and Natural Resources teachers that attended the VATAT professional development conference new teacher workshop regarding the instruction of agricultural mechanics related Texas Essential Knowledge and Skills (TEKS) and determine their level of university preparation to teach these agricultural mechanics related TEKS.

Research Questions

The following research questions were developed to guide this study:

1. What are the personal, professional, and program demographics of entry year Texas Agriculture, Food, and Natural Resources (AFNR) teachers in regards to agricultural mechanic related Texas Essential Knowledge and Skills (TEKS)?
2. What are the confidence levels of entry year, Texas AFNR teachers regarding the instruction of agricultural mechanics related TEKS?
3. What knowledge and skills did entry year, Texas AFNR teachers learn while a student in their agricultural mechanics university courses?

4. What teaching methods were used to teach entry year, Texas AFNR teachers agricultural mechanics related knowledge and skills in their university agricultural mechanics courses?
5. What professional development format would be the most beneficial in assisting entry year, Texas AFNR teachers regarding the instruction of agricultural mechanics related TEKS?
6. Can teaching methods used at the university level to instruct agricultural mechanics curriculum to entry year, Texas AFNR teachers explain their confidence levels to teach agricultural mechanics related skills?

Research Design

Descriptive research methods were utilized for this study. To accomplish the purpose and objectives of this study, a purposive census was conducted that included every first year Agriculture, Food and Natural Resources Teacher (AFNR) for the 2018-2019 academic school year that attended the 2018 Vocational Agricultural Teachers Association of Texas VATAT professional development conference new teacher workshop. To ensure that the entire target population was reached, a survey instrument was developed and administered at the VATAT professional development conference new teacher workshop that was held during the summer of 2018.

Descriptive research determines and describes the facts and characteristics of a particular population (Dulcok, 1993). Gay and Airasian (2000), explained that often times descriptive research utilizes surveys, interviews, and observations to gather information from a target population. Common descriptive research studies are focused on answering questions such as “attitudes, opinions, preferences, demographics, practices, and procedures” (Gay & Airasian, 2000, p. 275).

Consistent with all descriptive research, internal and external validity of the study must be addressed. Internal validity confirms that the data collected is accurate and true. To ensure internal validity, the researcher must be confident that the instrument used to collect data is collecting true data and measurement error must be minimal. External validity refers to the extent that the results of the study can be generalized across a population (Johnson & Christensen, 2017). All concerns involved with internal validity will be addressed in the validity section.

Population and Sampling

Population

The target population consisted of all Texas, entry year, school based AFNR teachers during the 2018-2019 academic school year that attended the VATAT professional development conference new teacher workshop (*N* = 143).

Due to this study being a census of entry year AFNR teachers that attended the 2018 VATAT professional development conference new teacher workshop and the researchers in ability to access a frame of all entry year AFNR teachers, a type of non-probability sampling method was used. Non-probability is a method that does not contain a random sampling at any stage of the sampling process (Gay & Airasian, 2003). More specifically, researchers decided to use a purposive sample. According to Gay and Airasian (2003), a purposive sample refers to when a researcher’s sample is based on his or her experience and knowledge of the group they are sampling. In this type of sampling, the researcher uses their best judgement to sample who they believe will provide the necessary data that they need (Fraenkel & Wallen, 2005).

Instrumentation

Data was collected through a researcher-designed survey. This instrument, titled *Agricultural Mechanics Skills Assessment*, was distributed to all first year Texas AFNR teachers during the 2018-2019 school year that attended the VATAT professional development conference new teacher workshop. To reach this population, a booklet style survey was given to participants of the 2018 first year Agriculture, Food, and Natural Resources (AFNR) teacher meeting held at the VATAT Professional Development Conference during the summer of 2018.

The *Agricultural Mechanics Skills Assessment* consisted of four sections. Section one was comprised of 24 agricultural mechanics related skills areas and the teachers were asked to rate their confidence level in teaching each skill area. A five-point, Likert-type scale was utilized to collect this information from the teachers. The response scale included: No Confidence (0), Little Confidence (1), Some Confidence (2), Moderate Confidence (3), and High Confidence (4). Development of section one was based on the Theory of Self- Efficacy (Bandura, 1997) and the Expertise Theory (Ericsson, Krampe, & Tesch- Romer, 1993). Section two of the instrument included the same 24 agricultural mechanics related skill areas as section one. The participants were then asked if they had been taught each of these skill areas while earning their university degree, utilizing answer choices of yes or no. If the answer was yes, the participants were asked to identify all of the methods that were used by their university instructors to teach them that skill area. The five teaching method options included: classroom learning, teacher demonstration, laboratory practice, real world application project, and student skill presentation (University of Central Florida, n.d.). Section three consisted of one question that addressed professional development preferences. This question asked the participants which format of professional development workshops they believe will benefit them the most regarding agricultural mechanics skill development. The answer choices included: Professional Development Conference (VATAT) workshop, single day (during school), single day (during summer), multi-day (during summer), week long (during school), week long (during summer), 3 weeks (during summer), winter break (during school), online university course, workshop during stock shows, and university course. The participants were asked to check all of the boxes that applied. This question was structured around the Theory of Andragogy (Knowles, Holton III, & Swanson, 2015). Lastly, section four was comprised of 22 questions that were designed to collect professional, personal, and program demographic information from the participants that included: highest degree earned, type of degree, community size where their school is located, previous agricultural mechanics work experience, and description of work experience. Additionally, the entry year teachers were asked if they participated in Agriculture, Food, and Natural Resource classes/ FFA as a student, and if yes, how many years of participation, 4H member as a student, and if yes, how many years of participation. Teachers were also asked what their current teaching contract length, if they receive a stipend for FFA advisor duties, if yes, the amount, if they receive a stipend in lieu of extended contract, size of school in which they teach (UIL system), total AFNR teachers that work in the AFNR program at the school where they teach. Participants were also asked other personal demographics such as: age, sex, ethnicity, marital status, type of teacher certification program, how many university credit hours earned in agricultural mechanic courses. Lastly, teachers were asked if they completed agricultural mechanics courses as a student in high school.

Accounting for Measurement Error

When conducting research, a researcher must make a substantial effort to reduce error and inconsistency (Ary, Jacobs, & Razavieh, 2010). However, measurement error can never be completely eliminated. By understanding the random and systematic type of errors that can occur, error can be minimized (Ary et al.). Specifically in this study, several steps were taken to ensure validity and reliability. According to Ary et al, reliability explains how consistent you are with measuring and is not concerned with the actual meaning or interpretation, while validity is focused on the interpretation. An instrument can be reliable without being valid; however, it cannot be valid without first being reliable (Ary et al.). The specifics about the validity and reliability of this study are discussed in more detail in the next three sections.

Validity of Agricultural Mechanics Skills Assessment

According to Johnson and Christensen (2017), research validity refers to the accuracy of the conclusions formed from the results of the study. “Validity is the most important characteristic a test or measuring instrument can possess” (Gay & Airasian, 2000, p. 161). For this study, the researcher focused on face and content validity to determine the validity of the *Agricultural Mechanics Skills Assessment* instrument.

Face validity refers to the face of the instrument appearing to look appropriate and useful (Gay & Airasian, 2000). According to Ary, Jacobs, and Razavieh (2002), face validity is significant because participants are more inclined to complete a survey if they believe that it is meaningful. Content validity is the amount in which an instrument measures the specific content area intended (Gay & Airasian).

To ensure that the instrument was carefully designed to minimize systematic error, a panel of experts reviewed the instrument. The panel of experts comprised of three university faculty members familiar with secondary agricultural education and two experienced high school agricultural mechanics teachers. Panel members were sent a letter via email asking for their assistance in determining the validity of the instrument. Additionally, the researcher provided the panel with a document that explained the purpose and research questions that the study was structured around, a copy of the instrument, and a comments page. The purpose and research questions for the study were given to the expert panel so that they could understand the purpose of the study before they provided any feedback concerning content validity. Moreover, the expert panel were asked to give comments based on the overall instrument design, clearness of questions, word choices, and if they felt that the word choices used were appropriate. Collaboratively, this feedback reduced systematic error. Based on the comments provided by the expert panel, the instrument was updated and deemed valid.

Pilot Testing

Pilot testing is a common tool used to determine the reliability of an instrument. Gall, Gall, and Borg (2005) noted that “it is impossible to predict how the items will be interpreted by respondents unless the researcher tries out the questionnaire and analyzes the responses of a small sample of individuals before starting the main study” (p. 133). The results concluded from a pilot test can be used to clarify or eliminate questions (Ary, Jacobs, & Sorensen, 2010). A pilot test should address if all of the participants interpret the items to have the same meaning. Additionally, a pilot test should assess if the questionnaire instructions are clear (Ary, et al.).

Johnson and Christensen (2017) noted that a pilot test should consist of a minimum of 5 to 10 people that are similar to the targeted population of the study. Prior to administering the instrument for this study in person, a pilot test was conducted with 19 agricultural education student teachers at Kansas State University on March 5, 2018. These participants were selected for the pilot test because they will be first year AFNR teachers just like the targeted population. Participants of the pilot test were asked to complete section one of the instrument. Of the 19 student teachers selected, 19 (100%) completed section one.

Reliability of the Agricultural Mechanics Skills Assessment

Reliability refers to the degree of consistency of measurement an instrument consists of (Gay & Airasain, 2000). This study utilized reliability coefficients for the concepts found in section one and was calculated by using the pilot test responses. *Cronbach's alpha,* which is an approach to measure internal consistency was used. Johnson and Christensen (2017) noted that *Cronbach's alpha coefficient* can be utilized when items range from many different answer choices such as the Likert-type categories that are used in section one of the instrument used for this study. The *Cronbach's alpha coefficients* for the scale confidence level, was determined to be .96. According to Johnson and Christensen, for most research a coefficient alpha should be .70 or greater. The *Cronbach's alpha coefficient* collected from the pilot test indicated that the instrument used for this study was reliable.

Institutional Approval

Before implementing the instrument, the researcher submitted a proposed plan of the data collection processes to the Sam Houston State University's Intuitional Review Board (IRB). After approval from IRB, the data collection process began. The project number 38352 was given to identify the study.

Data Collection

Data was collected by providing a survey instrument, face to face, at the first year AFNR teacher meeting at the 2018 VATAT professional development conference. Teachers at this conference completed the instrument and completed a contact information sheet that was entered into a drawing to win one of two new auto-darkening welding hood as an incentive. Salant and Dillman (1994), noted that sometimes a raffling of a gift is more appropriate than a financial incentive. The winners of the welding hood incentive was contacted via email and phone.

Data Analysis

Data was analyzed primarily using the IBM Statistical Package for the Social Sciences (SPSS) 22.0 for Windows ™. Data analysis methods were determined based upon the scale of measurements for the variables that were analyzed.

Research Question One

The first research question was: What are the personal, professional, & program demographics of entry year, Texas Agriculture, Food, and Natural Resources (AFNR) teachers who instruct agricultural mechanic related Texas Essential Knowledge and Skills (TEKS)? Descriptive statistics were used to describe the data associated with this research question. Specifically, frequency counts and percentages were used to analyze all of the demographic information except FFA years of membership, 4H years of membership, teaching contract length, stipend amount for FFA advisor duties, age, and university semester credit hours of agricultural mechanics. Measures of central tendency (mean, median, and mode) and measures of variability (standard deviation, range, min, max, and variance) were analyzed for these demographics.

Research Question Two

What are the confidence levels of entry year, Texas AFNR teachers regarding the instruction of agricultural mechanics related TEKS? Frequency counts and percentages were used to describe the data related to the confidence levels of entry year, Texas AFNR teachers regarding agricultural mechanics related TEKS. Additionally, measures of central tendency (mean, median, & mode) were utilized. Furthermore, measures of variability (standard deviation, range, min, max, and variance) regarding the confidence levels of entry year, Texas AFNR teachers were also calculated.

Research Question Three

What knowledge and skills did entry year, Texas AFNR teachers learn while a student in their university agricultural mechanics courses? Frequency counts and percentages were used to describe the data related to the agricultural mechanics knowledge and skills of entry year, Texas teachers.

Research Question Four

What teaching methods were used to teach entry year, Texas AFNR teachers agricultural mechanics related knowledge and skills in their university agricultural mechanics courses? Frequency counts and percentages were calculated to describe the data that addressed the methods used to teach entry year, Texas AFNR teachers at the university level.

Research Question Five

What professional development format would be the most beneficial in assisting entry year, Texas AFNR teachers regarding the instruction of agricultural mechanics related TEKS? Frequency counts and percentages were calculated to describe the data that addressed the professional development preferences of entry year, Texas AFNR teachers.

Research Question Six

Can teaching methods used at the university level to instruct agricultural mechanics curriculum to entry year, Texas AFNR teachers explain their confidence levels to teach agricultural mechanics related skills? To address this question, a multiple linear regression was used. More specifically, the forced entry (enter) method was used to determine if the independent variables (teaching methods; i.e. classroom learning, teacher demonstration, laboratory practice, real world application project, and student skill presentation) can explain the dependent variable (confidence levels; i.e. no confidence, little confidence, some confidence, moderate confidence, high confidence) (Field, 2009). The enter method forces all independent variables into the model simultaneously (Field, 2009). With this method the researcher needs theoretical reasons for choosing the predictor variables; however, they do not make any decisions about the order that the independent variables are entered (Field, 2009).

Data was entered into (SPSS) 22.0 for Windows ™ and the output contained five tables. The first table provided the researcher with the descriptive statistics (mean, standard deviation, and population) of all of the variables (independent and dependent) (Hinton, McMurray, & Brownlow, 2014). The second table consisted of a correlation matrix of all of the variables. This table contained Pearson correlation *r* value, probability, and number of participants for each pair of variables. Additionally, this table gave the researcher an idea of the variable pairs that have a significant correlation (Hinton et al.). The third output table consisted of a model summary, which included a *R* value, R^2 value, Adjusted R^2 value, and Standard Error of the Estimate (Hinton et al.). According to Hinton et al., The R^2 value that is shown in the model summary demonstrated the variance of the dependent variable that can be explained by the independent variables. Additionally, the Standard Error of the Estimate expresses the accuracy of the prediction (Hinton et al.). The ANOVA table provided a significance value for the regression model. According to Hinton et al., a significance value that is $p < .05$ means that the independent variables explain a statistically significant amount of the variance in the dependent variable. Lastly, the coefficients table displayed the individual independent variables that significantly predict the dependent variable. The Unstandardized Regression Coefficients B column on this table indicates the contribution that each variable adds to the model. Additionally, the beta weight demonstrates the amount that the dependent variable increases as the independent variable increases by one standard deviation while the other independent variables remain constant. Moreover, this table showed which independent variables are significant as predictors of the dependent variable (Hinton et al.).

Effect size is the method that was utilized to explain the relative magnitude of the effects of the independent variables. Additionally, unlike significance tests, effect sizes are not influenced by sample sizes (Becker, 2000; Fritz & Morris, 2011). Moreover, different sample sizes that have the same descriptive statistics will have different significance values, but will have the same effect size estimates (Fritz & Morris). Therefore, effect size provides the practical meaningfulness of the results (Kotrlik & Williams, 2003). To have accurate effect sizes, the sample responses must be reliable. Additionally, effect sizes differ depending on the statistical methods utilized (Ferguson, 2009). According to Kotrlik and Williams (2003), a researcher should determine the applicable statistical test to analyze the results, then decide the accurate way to calculate effect size based on the statistical test chosen. Furthermore, Kotrlik and Williams noted that R^2 is the multiple regression coefficient that denotes the variance in the dependent variables that is described by the independent variables. In order to determine the effect size of this coefficient, Cohens f^2 should be utilized (Kotrlik & Williams). Specifically, Daniel Soper's Effect Size for Multiple Regression was used to calculate the effect size based on the R^2 value derived from the model summary from SPSS (Soper, 2019). Next, a set of descriptors needs to be selected in order to interpret the effect size. Selecting these descriptors is similar to a researcher choosing different statistical significance levels when analyzing their data. For example using an *alpha* level of .01 instead of the rule of thumb .05, in order to be more confident in their findings. Cohen (1988) and Wuensch (2015) noted that f^2 effect size descriptors should include: small (.02), medium (.15), and large (.35). While Kotrlik and Williams (2003) suggested a more conservative approach, being that effect sizes descriptors should include: small (.10), medium (.25), large (.40).

CHAPTER IV

Findings

Chapter Four is a report of the findings from this study. For each research question a description of the results of the data analysis is reported.

Purpose of the Study

The purpose of this study was to examine the confidence levels of entry year, Texas Agriculture, Food, and Natural Resources teachers regarding the instruction of agricultural mechanics related Texas Essential Knowledge and Skills (TEKS) and determine their level of university preparation to teach these agricultural mechanics related TEKS.

Research Questions

1. What are the personal, professional, & program demographics of entry year Texas Agriculture, Food, and Natural Resources (AFNR) teachers in regards to agricultural mechanic related Texas Essential Knowledge and Skills (TEKS)?
2. What are the confidence levels of entry year, Texas AFNR teachers regarding the instruction of agricultural mechanics related TEKS?
3. What knowledge and skills did entry year, Texas AFNR teachers learn while a student in their agricultural mechanics university courses?
4. What teaching methods were used to teach entry year, Texas AFNR teachers agricultural mechanics related knowledge and skills in their university agricultural mechanics courses?

5. What professional development format would be the most beneficial in assisting entry year, Texas AFNR teachers regarding the instruction of agricultural mechanics related TEKS?
6. Can teaching methods used at the university level to instruct agricultural mechanics curriculum to entry year, Texas AFNR teachers explain their confidence levels to teach agricultural mechanics related skills?

Results

Research Question One

The first research question sought to describe the personal, professional, and program demographics i.e. (highest degree earned, type of degree, community size where the school is located, previous agricultural mechanics work experience, description of work experience, participation in Agriculture, Food, and Natural Resource classes/ FFA as a student, and number of years, participation in 4H as a student, and number of years, current contract length, stipend for FFA advisor duties, and amount, stipend in lieu of extended contract, size of school in which they teach (UIL designation), total AFNR teachers that work in the AFNR program at the school where they teach, age, sex, ethnicity, and marital status, type of teacher certification program, number of university semester credit hours in agricultural mechanic courses, and completion of agricultural mechanics courses as a student in high school) of participating entry year AFNR teachers in Texas. Frequencies and percentages were analyzed for the majority of these demographic questions. Measures of central tendency (mean, median, and mode) and measures of variability (standard deviation, range, high, low, and variance) were analyzed for the following demographics: FFA years of membership, 4H years of membership, teaching contract length, stipend amount for FFA advisor duties, age, and university semester credit hours of agricultural mechanics.

Of the 143 teachers who participated in this study, 64% were female (*n* = 91) and 34% were male (*n* = 49). See Figure 4 for an illustration of this information.

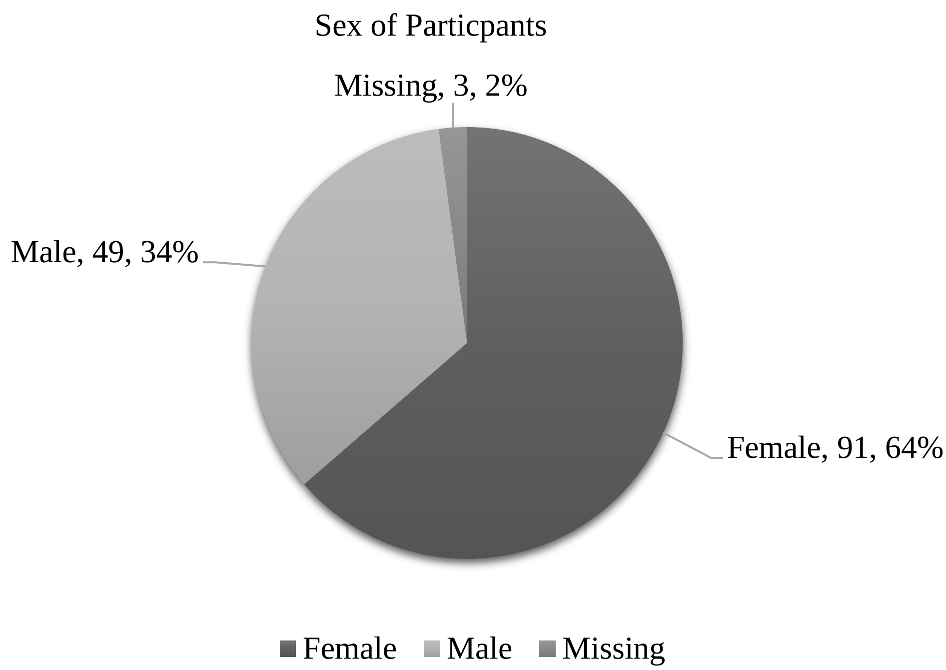

Figure 4. Sex of Texas, entry year AFNR teachers that participated in this study (n = 143)

88% of the participants from this study earned a bachelor's degree (*n* = 126), 10% earned a master's degree (*n* = 15), 1% earned a doctorate degree (*n* = 1), and 1% of the participants noted that they earned a different degree other than the provided choices (*n* =1). Figure 5 demonstrates a summary of this data.

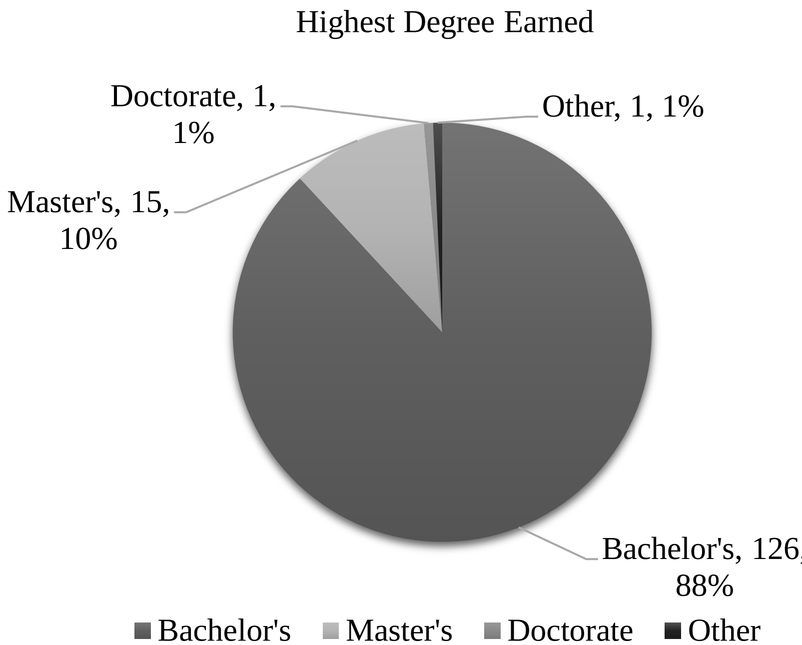

Figure 5. Highest degree earned of Texas, entry year AFNR teachers that participated in this study (n = 143)

Participants of this study earned an undergraduate degree that fit into eight different degrees. The majority of teachers earned an agriculture education degree (n = 63), 44%. Furthermore, 17% earned a general agriculture degree (*n* = 25), 14% earned an animals science degree (*n* = 20), 8% earned a degree other degree that did not pertain to agriculture, 6% did not complete this questions (*n* = 12), 5% earned an agricultural business/ economics degree (*n* = 7), 1% earned a horticulture degree (*n* = 2), 1% earned an agriculture engineering technology (*n* = 2), 1% earned an agricultural communications degree (*n* = 2), and 1% earned an agriculture and natural resources degree (*n* = 1). This data is displayed below in Table 3.

Table 3

Type of degree earned by participating Texas, entry year AFNR teachers (n = 143)

Degree	*f*	%
Agriculture Education	63	44.10
Agriculture	25	17.48
Animal Science	20	14.00
Other	12	08.40
Missing	9	06.30
Agriculture Business/Economics	7	05.00
Horticulture	2	01.40
Agriculture Engineering Technology	2	01.40
Agricultural Communications	2	01.40
Agriculture and Natural Resources	1	00.70

The majority of the participants were white/ non- Hispanic (n = 120), 83.9%, additionally, 6.3% were Hispanic/ Latino (n = 9), 2.8% were African American (n = 4), 2.8% were multi-racial/ bi-racial (n = 4), 2.1% did not complete the question (n = 3), .7% were American Indian (n = 1), and .7% indicated other (n = 1). A summary of this data is displayed below in Table 4.

Table 4

Ethnicity of participating Texas, entry year AFNR teachers (n = 143)

Ethnicity	*f*	%
White/ Non-Hispanic	120	83.90
Hispanic/ Latino	9	06.30
African American	4	02.80
Multi- racial/ Bi-racial	4	02.80
Missing	3	02.10
American Indian	1	00.70
Other	1	00.70
Asian	0	00.00
Pacific Islander	0	00.00

The majority of teachers that participated in this study were enrolled in an AFNR class and or FFA as a student (n = 133), 93%. 46% of the participants were 4H members, 53% completed an agricultural mechanics course in high school as a student (n = 76), 64% receive a stipend for FFA advisor duties (n = 92), and 28% receive a stipend in lieu of an extended contract. A little more than half of the participants completed a traditional certification program (n = 96), 67%. This information is displayed below in Figures 6 through 11.

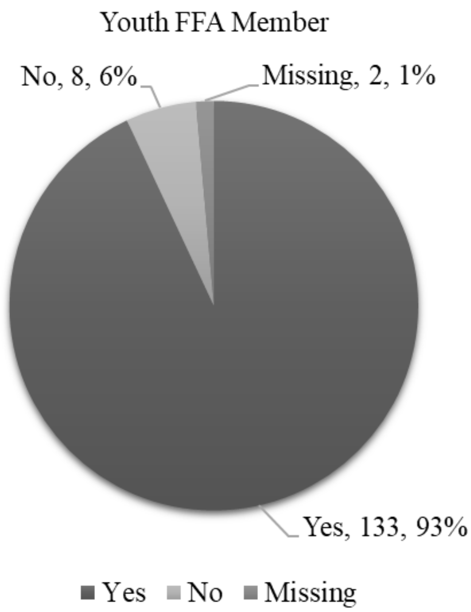

Figure 6. Agriculture, Food, and Natural Resource (AFNR) classes/ FFA participation of participating Texas, entry year AFNR teachers as a student (n = 143).

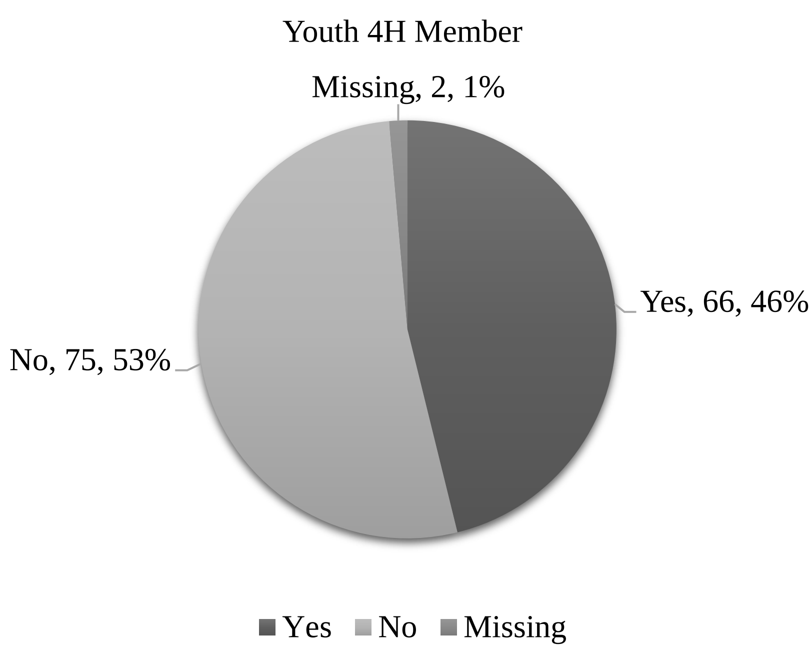

Figure 7. 4H participation of participating Texas, entry year AFNR teachers as a student (n = 143)

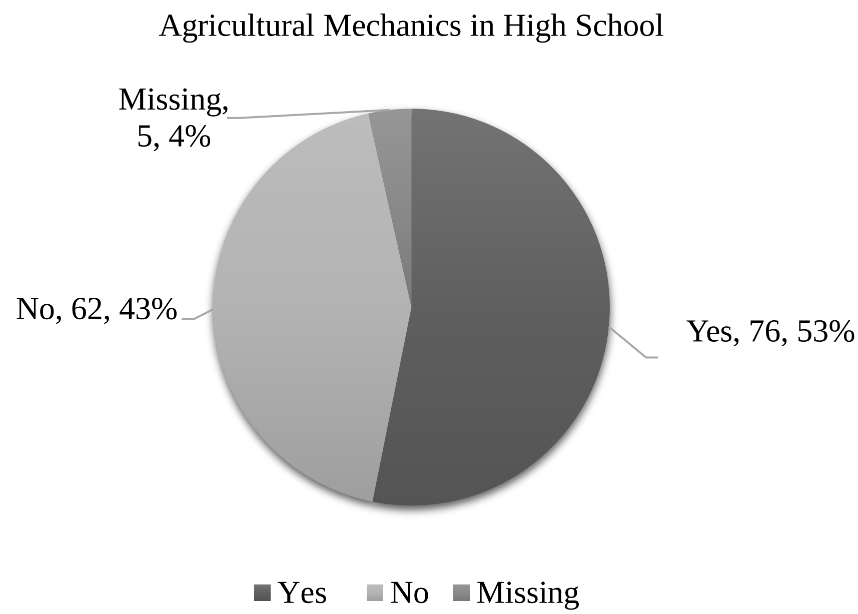

Figure 8. Completion of agricultural mechanics courses in high school of participating Texas, entry year AFNR teachers (*n* = 143)

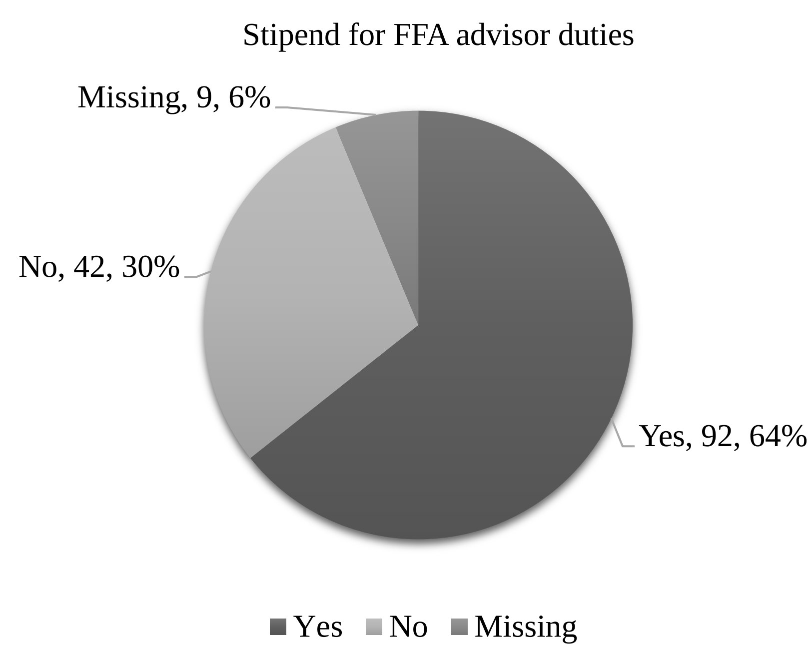

Figure 9. Participating Texas, entry year AFNR teachers receiving a stipend for FFA advisor duties (n = 143)

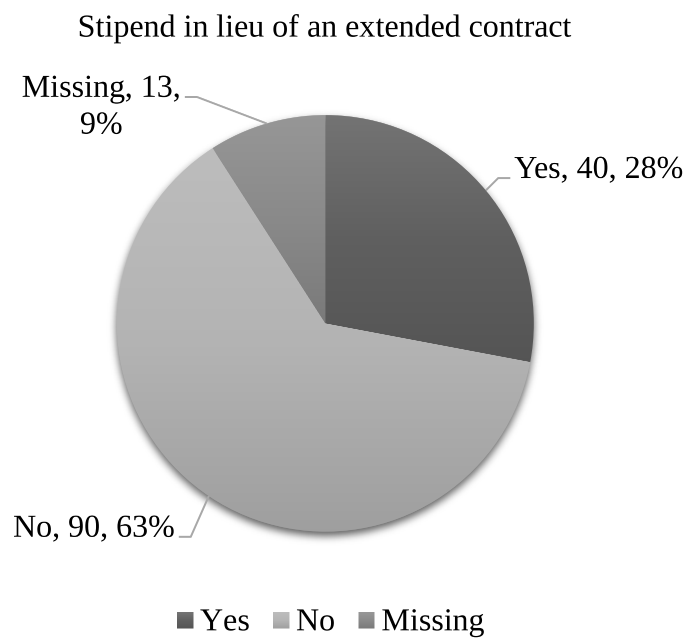

Figure 10. Participating Texas, entry year AFNR teachers receiving a stipend in lieu of an extended contract (n = 143)

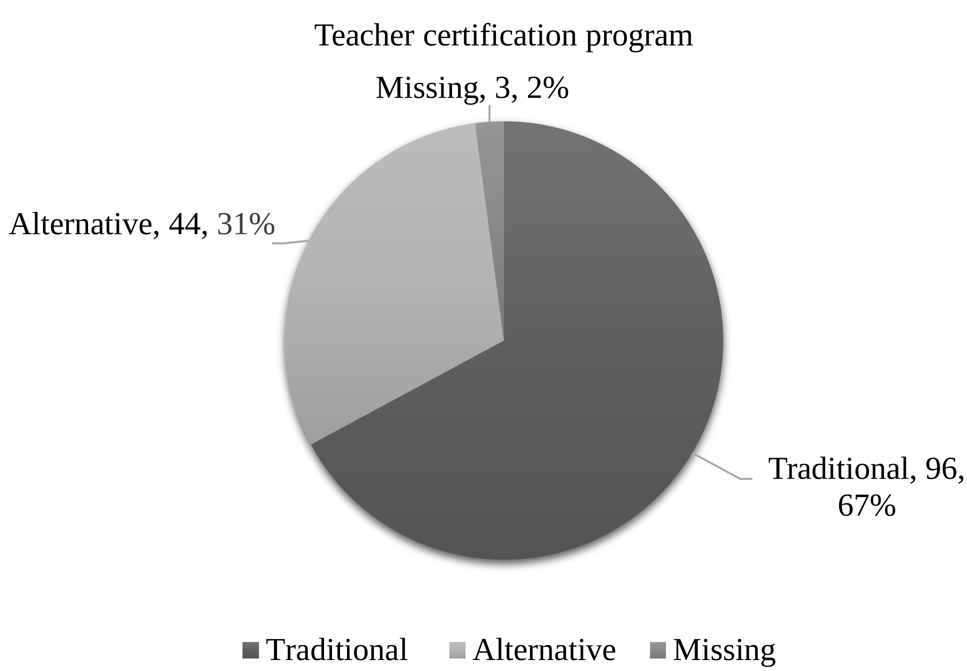

Figure 11. Type of teacher certification program participating Texas entry year AFNR teachers completed (n = 143)

The mean age of participants was 26.23 years (Median = 23.00; Mode = 22; SD = 7.55; Range = 47; Max = 68; Min 21; Variance = 56.95). On average, participants that were in AFNR classes/ FFA as a student were involved for 4.27 years (Median = 4.00; Mode = 4; SD = 1.83; Range = 10; Max = 11; Min = 1; Variance = 3.35). For the participants that were 4H members, the mean number of years for membership was 7.5 years (Median = 8; Mode = 10; SD = 3.19; Range = 15; Max = 16; Min = 1; Variance = 10.16). The mean teaching contract length was 222.19 days (Median = 226.00; Mode = 226; SD = 36.35; Range = 262; Max = 365; Min = 103; Variance = 1321.53). The mean stipend amount for FFA advisor duties was $3,759.11 (Median = $3,500; Mode = $3,000; SD = $2,267.28; Range = $9,920; Max = $10,000; Min = $80; Variance = $5,140,544. On Average, the total AFNR teachers in a program was 2.70 (Median = 2; Mode = 2; SD = 1.40; Range = 10; Max = 1-; Min = 0; Variance 1.96). The mean university semester credit hours of agricultural mechanics taken by participants was 9.40 (Median = 9.00; Mode = 0; SD = 9.98; Range = 75; Max = 75; Min = 0; Variance = 99.56). A summary of these results are displayed below in Table 5.

Table 5

Demographics of Entry Year AFNR Teachers to Teach Agricultural Mechanics Skills (n = 143)

Characteristic	Central Tendency			Measures of Variability				
	M	*Mdn*	Mode	*SD*	Range	Max	Min	Var.
FFA Years of Membership	4.27	4.00	4	1.83	10	11	1	3.35
4H Years of Membership	7.50	8.00	10	3.19	15	16	1	10.16
Teaching Contract Length (days)	222.19	226.00	226	36.353	262	365	103	1321.53
Stipend for FFA Advisor Duties	3,759.11	3,500.00	3,000.00	2,267.28	9,920.00	10,000.00	80.00	5,140,544.00
Total ag teachers in the program	2.70	2.00	2	1.4	10	10	0	1.96
Age	26.23	23.00	22	7.55	47	68	21	56.95
University Semester Credit Hours of Agricultural Mechanics	9.40	9.00	0	9.98	75	75	0	99.56

Twenty-six percent of the participants teach at a 3A UIL size school district (*n* = 37), 20% teach at a 2A school (*n* = 28), 13% teach at a 4A school (*n* = 19), 11% teach at 1A school (*n* = 16), 10% teach at a 5A school (*n* = 15), 10% teach at a 6A school (*n* = 14), and 10% did not respond to this question (*n* = 14). A summary of this information is provided in Figure 12.

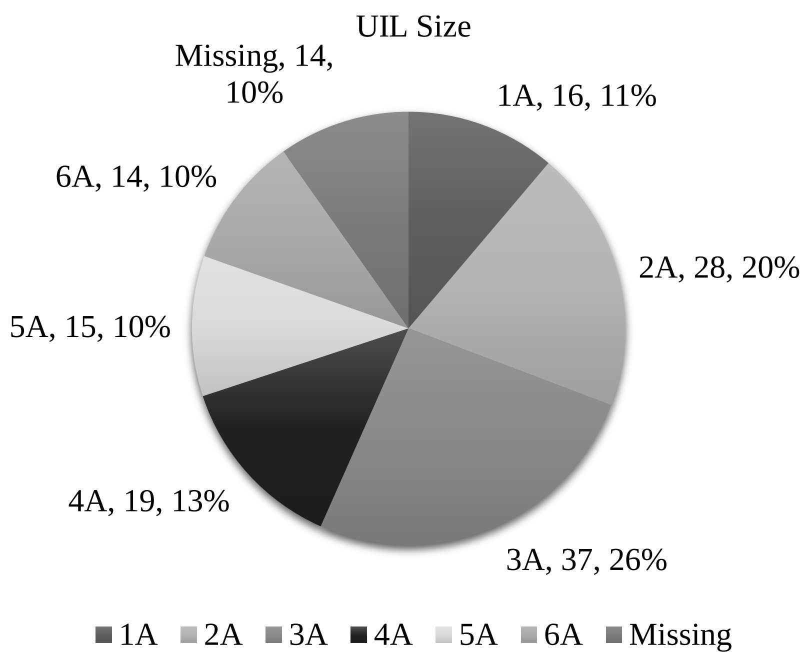

Figure 12. UIL school size that participating Texas, entry year AFNR teachers work at (n = 143)

More than half of the participants were not married (*n* = 87), 61%. 28% of the teachers were married (*n* = 40), 7% were engaged (*n* = 10), 1% were divorced (*n* = 2), and 3% did not complete this question (*n* = 4). See Figure 13 for a summary of this information.

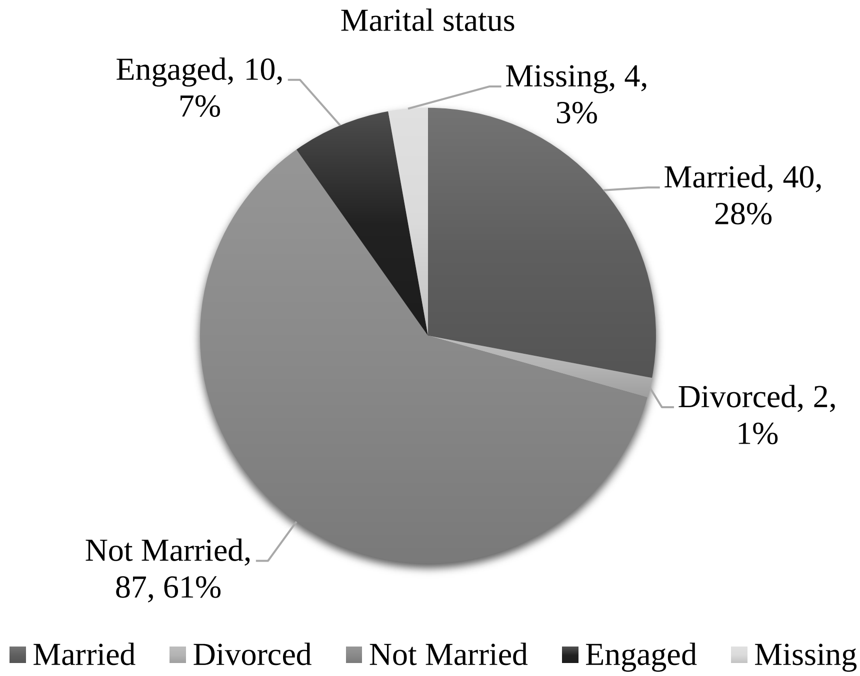

Figure 13. Marital status of participating Texas, entry year AFNR teachers (n = 143)

The majority of the participating teachers did not have previous agricultural mechanics industry work experience (*n* = 98), 69%; however, 29%, (*n* = 42) did have work experience. This data is displayed below in Figure 14. Additionally, the teachers that did indicate that they had work experience were asked to describe the details of that work. A summary of these results are presented in Table 6.

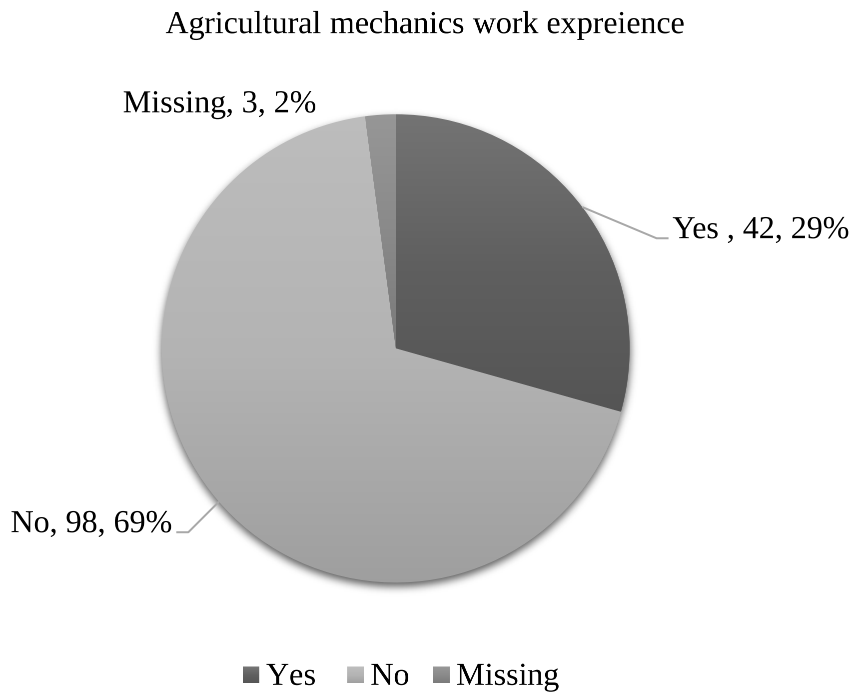

Figure 14. Previous agricultural mechanics work experience of participating Texas, entry year AFNR teachers (n = 140)

Table 6

Details of work experience for participating Texas, entry year AFNR teachers (n = 143)

- Construction and ranching
- Built custom horse barns and carpentry
- Built working pens and barns
- Carpentry, electrical, plumbing, and fencing
- Certified welder for 1 year
- City employee for 3 years and golf cart mechanic for 4 years
- Concrete and masonry for 1 year
- Construction for 2 years
- Construction for 25 years/ ranch owner for 30 years
- Employee at sun pacific
- Farm work
- Farm work, welding, and fabrication
- Metal fab/ welding for 5 years
- Operator at fuel distillation plant, covered maintenance shifts
- Ranch work
- Ranch work and chemical plant operator for 3 years
- Ranch work/ mechanic service technician for 1 year, construction supervisor for 1 year
- Shop help
- Shop work for 7 years
- Telco manager for 17 years
- Tractor technician for 2 years and welder for 4 years
- Welder and fabricator
- Welder and fabricator for 9 years
- Welder and ranch manager for 9 years
- Welder and shop worker
- Welder on family ranch
- Welder
- Welder/pipefitter/sheet metal for 10 years
- Welding fence
- Welding for 28 years
- Welding for 5 years
- Welding industry for 1 year
- Welding, odd jobs, shop assistant at SHSU art department
- Worked on a ranch, welding, and building fence

More than half of the participants teach in a rural community (n = 83), 58%. Whereas, 29%, (*n* = 42) teach in a suburban community, 10% teach in an urban community (*n* = 14), and 3% did not complete this question (*n* = 4). Figure 15 displayed below presents this information.

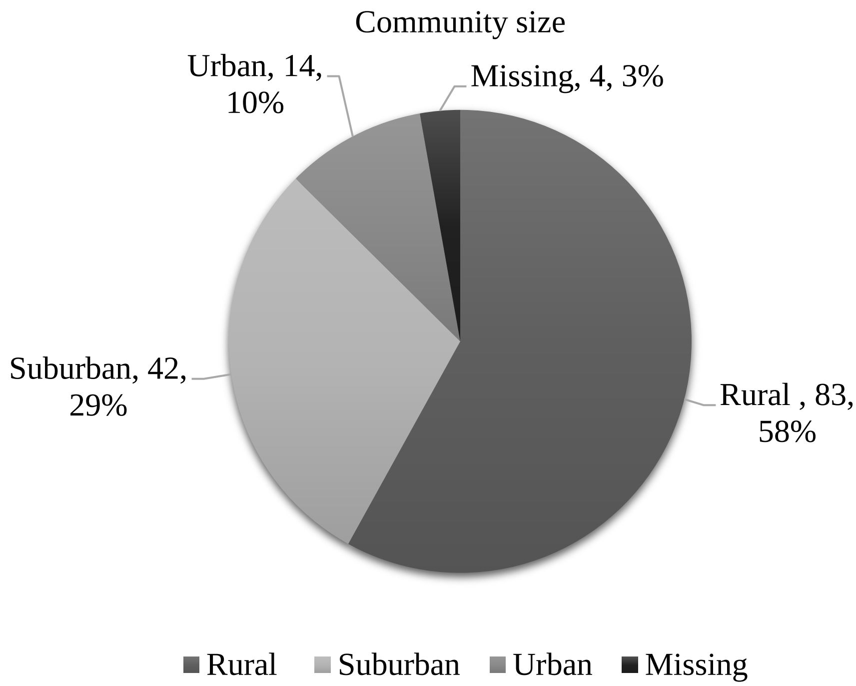

Figure 15. Community size that school is located in (n = 143).

Research Question Two

Research question two sought to determine the confidence levels of entry year AFNR teachers regarding the instruction of agricultural mechanics related TEKS. The 24 curriculum areas utilized for this study included: Employability/Career Skills, Supervised Agricultural Experiences (SAE), Hand Tools, Handheld Power Tools, Stationary Power Tools, Electrical, Plumbing, Concrete, Carpentry, Fencing, Cold Metal, Oxygen/Fuel Cutting, Oxygen/Fuel Welding, Oxygen Fuel Brazing, Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW), Gas Tungsten Arc Welding (GTAW), Plasma Arc Cutting (PAC), Construction Methods, Small Gas Engines, Multi-Cylinder Engines, Modern Machinery Technology, Hydraulics, and Pneumatics. Respondents (*n* = 143) were asked how confident they are in teaching agricultural related curriculum areas to their students based on the scale: 0 = No Confidence, 1 = Little Confidence, 2 = Some Confidence, 3 = Moderate Confidence, and 4 = High Confidence.

Regarding the *Carpentry Skill*, respondents (*n* = 143) identified with the following confidence levels: No Confidence (*n* = 24; 16.80%), Little Confidence (*n* = 35; 24.50%), Some Confidence (*n* = 32; 22.40%), Moderate Confidence (*n* = 22; 15.40%), High Confidence (*n* = 30; 21.00%). For the *Cold Metal Skill*, respondents identified with the following confidence levels: No Confidence (*n* = 40; 28.00%), Little Confidence (*n* = 38, 26.60%), Some Confidence (*n* = 19; 13.30%), Moderate Confidence (*n* = 27; 18.90%), High Confidence (*n* = 18; 12.60%). Respondents identified confidence levels of the following skills to include: *Concrete Skill*, No Confidence (*n* = 38; 26.6%), Little Confidence (*n* = 41; 28.7%), Some Confidence (*n* = 30; 21.0%), Moderate Confidence (*n* = 23; 16.1%); High Confidence (*n* = 11; 12.6%); *Construction Methods Skill*, No Confidence (*n* = 41; 28.7%), Little Confidence (*n* = 34; 23.8%), Some Confidence (*n* = 30; 21.0%), Moderate Confidence (*n* = 16; 11.2%), High Confidence (*n* = 20; 14.0%); *Electrical Skill*, No Confidence (*n* = 28; 19.6%), Little Confidence (*n* = 34; 23.8%), Some Confidence (*n* = 31; 21.7%), Moderate Confidence (*n* = 17; 11.9%), High Confidence (*n* = 27; 18.9%); *Employability/ Career Skills*, No Confidence (*n* = 4; 2.80%), Little Confidence (*n* = 12; 8.4%), Some Confidence (*n* = 16; 11.2%), Moderate Confidence (*n* = 39; 27.3%), High Confidence (*n* = 68; 47.6%); *Fencing Skill*, No

Confidence (*n* = 24; 16.8%), Little Confidence (*n* = 26; 18.2%), Some Confidence (*n* = 31; 21.7%), Moderate Confidence (*n* = 28; 19.6%), High Confidence (*n* = 33; 23.1%).

In addition, the respondents identified confidence levels of the following skills: *Gas Metal Arc Welding (GMAW),* No Confidence (*n* = 33; 23.1%), Little Confidence (*n* = 29; 20.3%), Some Confidence (*n* = 21; 14.7%), Moderate Confidence (*n* = 28; 19.6%), High Confidence (*n* = 29; 20.3%); *Gas Tungsten Arc Welding (GTAW),* No Confidence (*n* = 54; 37.8%), Little Confidence (*n* = 36; 25.2%), Some Confidence (*n* = 21; 14.7%), Moderate Confidence (*n* = 20; 14.0%), High Confidence (*n* = 11; 7.7%); *Hand Tools Skill,* No Confidence (*n* = 3; 2.1%), Little Confidence (*n* = 9; 6.3%), Some Confidence (*n* = 24; 16.8%), Moderate Confidence (*n* = 35; 24.5%), High Confidence (*n* = 67; 46.9%); *Handheld Power Tools,* No Confidence (*n* = 5; 3.5%), Little Confidence (*n* = 16; 11.2%), Some Confidence (*n* = 32; 22.4%), Moderate Confidence (*n* = 32; 22.4%), High Confidence (*n* = 54; 37.8%); *Hydraulics Skill,* No Confidence (*n* = 66; 46.2%), Little Confidence (*n* = 66; 46.2%), Some Confidence (*n* = 34; 23.8%), Moderate Confidence (*n* = 14; 9.8%), High Confidence (*n* = 10; 7.0%).

Respondents identified confidence levels of the following skills to include: *Modern Machinery Technology Skill*, No Confidence (*n* = 65; 45.5%), Little Confidence (*n* = 29; 20.3%), Some Confidence (*n* = 21; 14.7%), Moderate Confidence (*n* = 16; 11.2%), High Confidence (*n* = 9; 6.3%); *Multi- Cylinder Engines Skill,* No Confidence (*n* = 55; 38.5%), Little Confidence (*n* = 42; 29.4%), Some Confidence (*n* = 20; 14.0%), Moderate Confidence (*n* = 12; 8.4%), High Confidence (*n* = 12; 8.4%); *Oxygen/ Fuel Brazing Skill,* No Confidence (*n* = 45; 31.5%), Little Confidence (*n* = 39; 27.3%), Some Confidence (*n* = 28; 19.6%), Moderate Confidence (*n* = 15; 10.5%), High Confidence (*n*

= 16; 11.2%); *Oxygen/ Fuel Cutting Skill*, No Confidence (*n* = 27; 18.9%), Little Confidence (*n* = 28; 19.6%), Some Confidence (*n* = 26; 18.2%), Moderate Confidence (*n* = 23; 16.1%), High Confidence (*n* = 38; 26.6%); *Oxygen/ Fuel Welding Skill*, No Confidence (*n* = 30; 21.0%), Little Confidence (*n* = 39; 27.3%), Some Confidence (*n* = 19; 13.3%), Moderate Confidence (*n* = 27; 18.9%), High Confidence (*n* = 26; 18.2%). Regarding the *Plasma Arc Cutting (PAC) Skill*, respondents indicated the confidence levels included: No Confidence (*n* = 41; 28.7%), Little Confidence (*n* = 32; 22.4%), Some Confidence (*n* = 19; 13.3%), Moderate Confidence (*n* = 19; 13.3%), High Confidence (*n* = 31; 21.7%). For the *Plumbing Skill*, participants identified the following confidence levels: No Confidence (*n* = 39; 27.3%), Little Confidence (*n* =35; 24.5%), Some Confidence (*n* = 31; 21.7%), Moderate Confidence (*n* = 18; 12.6%), High Confidence (*n* = 20; 14%).

Lastly, participating teachers indicated confidence levels of the following skill areas: *Pneumatics Skill*, No Confidence (*n* = 80; 55.9%), Little Confidence (*n* = 27; 18.9%), Some Confidence (*n* = 14; 9.8%), Moderate Confidence (*n* = 10; 7.0%), High Confidence (*n* = 10; 7.0%); *Shielded Metal Arc Welding (SMAW) Skill*, No Confidence (*n* = 30; 21.0%), Little Confidence (*n* = 28; 19.6%), Some Confidence (*n* = 28; 19.6%), Moderate Confidence (*n* = 27; 18.9%), High Confidence (*n* = 30; 21.0%); *Small Gas Engines Skill*, No Confidence (*n* = 41; 28.7%), Little Confidence (*n* = 40; 28.0%), Some Confidence (*n* = 26; 18.2%), Moderate Confidence (*n* = 16; 11.2%), High Confidence (*n* = 17; 11.9%); *Stationary Power Tools Skill*, No Confidence (*n* = 8; 5.6%), Little Confidence (*n* = 22; 15.4%), Some Confidence (*n* = 33; 23.1%), Moderate Confidence (*n* = 25; 17.5%), High Confidence (*n* = 50; 35.0%); *Supervised Agricultural Experience*

Skill, No Confidence (*n* = 6; 4.2%), Little Confidence (*n* = 12; 8.4%), Some Confidence (*n* = 52; 36.4%), Moderate Confidence (*n* = 47; 32.9%), High Confidence (*n* = 21; 14.7%). Table 7 displays a summary of this data.

Respondents (*n* = 143) were asked to rate their perceived confidence level in teaching agricultural related curriculum areas to their students based on the scale: 0 = No Confidence, 1 = Little Confidence, 2 = Some Confidence, 3 = Moderate Confidence, and 4 = High Confidence. The mean confidence levels were broken up to the following categories: No Confidence = 0.00 – 0.50, Little Confidence = .51 – 1.50, Some Confidence = 1.51 – 2.50, Moderate Confidence = 2.51 – 3.50, High Confidence = 3.51 – 4.00. Participants indicated that the three skills with the highest confidence level means were *Hand Tools Skill* (*M* = 3.12; SD = 1.05), *Employability/ Career Skills* (*M* = 3.12; SD = 1.10), and *Handheld Power Tools Skill* (*M* = 2.82; SD = 1.18). Furthermore, *Stationary Power Tools Skill* (*M* = 2.63; SD = 1.28), *Supervised Agricultural Experiences Skill* (*M* = 2.47; 1.00), *Fencing Skill* (*M* = 2.14; SD = 1.41), *Oxygen/ Fuel Cutting Skill* (M = 2.12; SD = 1.48), and *Carpentry Skill* (M = 1.99; SD = 1.39). This was followed by *Shielded Metal Arc Welding (SMAW) Skill* (*M* = 1.99; SD = 1.44), *Gas Metal Arc Welding (GMAW)* (*M* = 1.94; SD = 1.48), *Electrical Skill* (*M* = 1.86; SD = 1.41), *Oxygen/ Fuel Welding Skill* (M = 1.86; SD = 1.43), *Plasma Arc Cutting (PAC) Skill* (*M* = 1.77; SD = 1.53), *Plumbing Skill* (*M* = 1.62; SD = 1.37), and *Cold Metal Skill* (*M* = 1.61; SD = 1.40). Additionally, the following skills were also rated by participants: *Construction Methods Skill* (*M* = 1.57; SD = 1.39), *Concrete Skill* (*M* = 1.50; *SD* = 1.26), *Small Gas Engines Skill* (*M* = 1.49; SD = 1.34), *Oxygen/ Fuel Brazing Skill* (*M* = 1.43; SD = 1.33), *Gas Tungsten Arc Welding (GTAW) Skill* (*M* = 1.28; SD = 1.31), and *Multi- Cylinder*

Engines Skill (*M* = 1.18; 1.27). Lastly, the participants identified the *Modern Machinery Skill* (*M* = 1.11; SD = 1.29), *Hydraulics Skill* (*M* = 1.06; SD = 1.28, and *Pneumatics Skill* (*M* = .89; SD = 1.26) as the three skills with lowest the lowest confidence level means. A summary of this data can be found in Table 8.

Table 7

Confidence Levels of Entry Year AFNR Teachers to Teach Agricultural Mechanics Skills (n = 143)

Agricultural Mechanics	0		1		2		3		4		Missing	
Skills	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Carpentry	24	16.80	35	24.50	32	22.40	22	15.40	30	21.00	0	0.00
Cold Metal	40	28.00	38	26.60	19	13.30	27	18.90	18	12.60	1	0.70
Concrete	38	26.60	41	28.70	30	21.00	23	16.10	11	7.70	0	0.00
Construction Methods	41	28.70	34	23.80	30	21.00	16	11.20	20	14.00	2	1.40
Electrical	28	19.60	34	23.80	31	21.70	17	11.90	27	18.90	6	4.20
Employability/ Career Skills	4	2.80	12	8.40	16	11.20	39	27.30	68	47.60	4	2.80
Fencing	24	16.80	26	18.20	31	21.70	28	19.60	33	23.10	1	0.70
Gas Metal Arc Welding- (GMAW)	33	23.10	29	20.30	21	14.70	28	19.60	29	20.30	3	2.10

(continued)

Gas Tungsten Arc Welding- (GTAW)	54	37.80	36	25.20	21	14.70	20	14.00	11	7.70	1	0.70
Hand Tools	3	2.10	9	6.30	24	16.80	35	24.50	67	46.90	5	3.50
Handheld Power Tools	5	3.50	16	11.20	32	22.40	32	22.40	54	37.80	4	2.80
Hydraulics	66	46.20	34	23.80	17	11.90	14	9.80	10	7.00	2	1.40
Modern Machinery Technology	65	45.50	29	20.30	21	14.70	16	11.20	9	6.30	3	2.10
Multi-Cylinder Engines	55	38.50	42	29.42	20	14.00	12	8.40	12	8.40	2	1.40
Oxygen/ Fuel Brazing	45	31.50	39	27.30	28	19.60	15	10.50	16	11.20	0	0.00
Oxygen/ Fuel Cutting	27	18.90	28	19.60	26	18.20	23	16.10	38	26.60	1	0.70
Oxygen/ Fuel Welding	30	21.00	39	27.30	19	13.30	27	18.90	26	18.20	2	1.40
Plasma Arc Cutting- (PAC)	41	28.70	32	22.40	19	13.30	19	13.30	31	21.70	1	0.70
Plumbing	39	27.30	35	24.50	31	21.70	18	12.60	20	14.00	0	0.00
Pneumatics	80	55.90	27	18.90	14	9.80	10	7.00	10	7.00	2	1.40

(continued)

Shielded Metal Arc Welding- (SMAW)	30	21.00	28	19.60	28	19.60	27	18.90	30	21.00	0	0.00
Small Gas Engines	41	28.70	40	28.00	26	18.20	16	11.20	17	11.90	3	2.10
Stationary Power Tools	8	5.60	22	15.40	33	23.10	25	17.50	50	35.00	5	3.50
Supervised Agricultural Experience	6	4.20	12	8.40	52	36.40	47	32.90	21	14.70	5	3.50

Note. 0 = No Confidence, 1 = Little Confidence, 2 = Some Confidence, 3 = Moderate Confidence, 4 = High Confidence

Table 8

Confidence levels of entry year, Texas, school-based AFNR teachers to instruct agricultural mechanics curriculum (n = 143)

Skill	Central Tendency			Measures of Variability				
	M	*Mdn*	Mode	*SD*	Range	Max	Min	Var.
Hand Tools	3.12	3.00	4	1.05	4	4	0	1.11
Employability/ Career Skills	3.12	3.00	4	1.10	4	4	0	1.20
Handheld Power Tools	2.82	3.00	4	1.18	4	4	0	1.38
Stationary Power Tools	2.63	3.00	4	1.28	4	4	0	1.64
Supervised Agricultural Experience	2.47	2.00	2	1.00	4	4	0	1.00
Fencing	2.14	2.00	4	1.41	4	4	0	1.98
Oxygen/ Fuel Cutting	2.12	2.00	4	1.48	4	4	0	2.19
Carpentry	1.99	2.00	1	1.39	4	4	0	1.92
Shielded Metal Arc Welding- (SMAW)	1.99	2.00	0	1.44	4	4	0	2.08
Gas Metal Arc Welding- (GMAW)	1.94	2.00	0	1.48	4	4	0	2.19

(continued)

Electrical	1.86	2.00	1	1.41	4	4	0	1.97
Oxygen/ Fuel Welding	1.86	2.00	1	1.43	4	4	0	2.05
Plasma Arc Cutting- (PAC)	1.77	1.00	0	1.53	4	4	0	2.35
Plumbing	1.62	1.00	0	1.37	4	4	0	1.89
Cold Metal	1.61	1.00	0	1.40	4	4	0	1.96
Construction Methods	1.57	1.00	0	1.39	4	4	0	1.92
Concrete	1.50	1.00	1	1.26	4	4	0	1.58
Small Gas Engines	1.49	1.00	0	1.34	4	4	0	1.81
Oxygen/ Fuel Brazing	1.43	1.00	0	1.33	4	4	0	1.77
Gas Tungsten Arc Welding- (GTAW)	1.28	1.00	0	1.31	4	4	0	1.72
Multi-Cylinder Engines	1.18	1.00	0	1.27	4	4	0	1.62
Modern Machinery Technology	1.11	1.00	0	1.29	4	4	0	1.65
Hydraulics	1.06	1.00	0	1.28	4	4	0	1.63
Pneumatics	0.89	0.00	0	1.26	4	4	0	1.59

Note. No Confidence = 0.00 – 0.50, Little Confidence = .51 – 1.50, Some Confidence = 1.51 – 2.50, Moderate Confidence = 2.51 – 3.50, High Confidence = 3.51 – 4.00. Tying mean score were broke by lowest standard deviation.

Research Question Three

Research question three sought to determine the knowledge and skill areas taught to entry year, Texas AFNR teachers while students in their agricultural mechanics university courses. The 24 curriculum areas that this question focused on included: Employability/Career Skills, Supervised Agricultural Experiences (SAE), Hand Tools, Handheld Power Tools, Stationary Power Tools, Electrical, Plumbing, Concrete, Carpentry, Fencing, Cold Metal, Oxygen/Fuel Cutting, Oxygen/Fuel Welding, Oxygen Fuel Brazing, Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW), Gas Tungsten Arc Welding (GTAW), Plasma Arc Cutting (PAC), Construction Methods, Small Gas Engines, Multi-Cylinder Engines, Modern Machinery Technology, Hydraulics, and Pneumatics. Participants (*n* = 143) were asked if they were taught each of these skills in their university agricultural mechanics courses.

Participating teachers indicated that the top three skill areas that were taught the most in university agricultural mechanics courses included: *Employability/ Career Skills* (*n* = 124; % = 86.70), *Hand Tools Skill* (*n* = 116, % = 81.10), *Handheld Power Tools Skill (n* = 116, % = 81.10). Respondents also identified the following skills being taught in there university courses *Stationary Power Tools Skill* (*n* = 114; % = 79.70), *Oxygen/ Fuel Cutting Skill* (*n* = 104; % = 72.70), *Supervised Agricultural Experience Skill* (*n* = 103; % = 72.00), *Electrical Skill* (*n* = 96; % = 67.10), *Shielded Metal Arc Welding (SMAW) Skill* (*n* = 96, % = 67.10), *Gas Metal Arc Welding (GMAW) Skill* (*n* = 94; % 65.70), and *Oxygen/ Fuel Welding Skill* (*n* = 94; % = 65.70). The following skill areas were also documented as being taught in university courses: *Plasma Arc Cutting (PAC) Skill* (*n* = 89; % = 62.20), *Carpentry Skill* (*n* = 87; % = 60.80), *Cold Metal Skill* (*n* = 87;

% = 60.80), *Small Gas Engines Skill* (*n* = 86; % = 60.10), *Gas Tungsten Arc Welding (GTAW) Skill* (*n* = 71; % = 49.70), and *Oxygen/ Fuel Brazing Skill* (*n* = 71; % = 49.70). This was followed by *Construction Method Skill* (*n* = 69; % = 48.30), *Plumbing Skill* (*n* = 64; % = 44.80), *Multi- Cylinder Engines Skill* (*n* = 55; % = 38.50), *Concrete Skill* (*n* =5 2; % = 36.40), and *Fencing Skill* (*n* = 52; % = 36.40). Furthermore, the three skills that were taught the least in university agricultural mechanics courses included: *Hydraulics Skill* (*n* = 43, % = 30.10), *Modern Machinery Technology Skill* (*n* = 38, % = 26.60), *Pneumatics Skill (n* = 24, % = 16.80). A summary of this data can be referenced in Table 9.

Table 9

Knowledge and skills taught to entry year AFNR teachers in their university agricultural mechanic's courses (n = 143)

Skills	Yes		No		Missing	
	f	%	*f*	%	*f*	%
Employability/ Career Skills	124	86.70	18	12.60	1	0.70
Hand Tools	116	81.10	27	18.90	0	0.00
Handheld Power Tools	116	81.10	27	18.90	0	0.00
Stationary Power Tools	114	79.70	29	20.30	0	0.00
Oxygen/ Fuel Cutting	104	72.70	39	27.30	0	0.00
Supervised Agricultural Experience	103	72.00	39	27.30	1	0.70
Electrical	96	67.10	47	32.90	0	0.00
Shielded Metal Arc Welding- SMAW	96	67.10	46	32.20	1	0.70
Gas Metal Arc Welding- GMAW	94	65.70	49	34.30	0	0.00
Oxygen/ Fuel Welding	94	65.70	48	33.60	1	0.70
Plasma Arc Cutting- PAC	89	62.20	54	37.80	0	0.00
Carpentry	87	60.80	56	39.20	0	0.00
Cold Metal	87	60.80	55	38.50	1	0.70
Small Gas Engines	86	60.10	57	39.90	0	0.00

(continued)

Gas Tungsten Arc Welding-GTAW	71	49.70	72	50.30	0	0.00
Oxygen/ Fuel Brazing	71	49.70	72	50.30	0	0.00
Construction Methods	69	48.30	73	51.00	1	0.70
Plumbing	64	44.80	79	55.20	0	0.00
Multi-Cylinder Engines	55	38.50	88	61.50	0	0.00
Concrete	52	36.40	91	63.60	0	0.00
Fencing	52	36.40	91	63.60	0	0.00
Hydraulics	43	30.10	100	69.90	0	0.00
Modern Machinery Technology	38	26.60	104	72.70	1	0.70
Pneumatics	24	16.80	118	82.50	1	0.70

Research Question Four

Research question four was designed to identify what teaching methods were used to teach entry year teachers agricultural mechanics knowledge and skills in their university agricultural mechanics courses. The 24 curriculum areas that this question focused on included: Employability/Career Skills, Supervised Agricultural Experiences (SAE), Hand Tools, Handheld Power Tools, Stationary Power Tools, Electrical, Plumbing, Concrete, Carpentry, Fencing, Cold Metal, Oxygen/Fuel Cutting, Oxygen/Fuel Welding, Oxygen Fuel Brazing, Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW), Gas Tungsten Arc Welding (GTAW), Plasma Arc Cutting (PAC), Construction Methods, Small Gas Engines, Multi-Cylinder Engines, Modern Machinery Technology, Hydraulics, and Pneumatics. For each of these skills participants were asked which teaching methods were used to teach them that skill during their university agricultural mechanics courses. The five teaching method options given to the participants were classroom learning, teacher demonstration, laboratory practice, projects, and student presentation. The participants (*n* = 143) were instructed to mark all of the teaching methods used to teach them each of the given skills.

In regards to the classroom learning teaching method the three skill areas that used this method the most was *Employability Career Skills* (*n* = 97; % = 67.80), *Supervised Agricultural Experience Skill (n* = 79; % = 55.20), and *Oxygen Fuel Cutting Skill* (*n* = 68, % = 47.60). Furthermore, the following skill areas were also taught by using the classroom learning teaching method: *Shielded Metal Arc Welding (SMAW) Skill* (*n* = 68; % = 47.60), *Small Gas Engines Skill* (*n* = 66; % = 46.20), *Gas Metal Arc Welding (GMAW) Skill* (*n* = 64; % = 44.80), *Hand Tools Skill* (*n* = 64; % = 44.80), *Handheld Power Tools Skill* (*n* = 64; % = 44.80), *Stationary Power Tools Skill* (*n* = 63; % = 44.10), and *Electrical Skill* (*n* = 61; % = 42.70). This is followed by O*xygen/ Fuel Welding Skill* (*n* = 61; % = 42.70), *Cold Metal Skill* (*n* = 59; % = 41.30), *Plasma Arc Cutting (PAC) Skill* (*n* = 58; % = 40.60), *Carpentry Skill* (*n* = 52, % = 36.40), and *Construction Methods Skill* (n = 49; % = 34.30). In addition, the following skill areas were also analyzed: *Oxygen/ Fuel Brazing Skill* (*n* = 45; % = 31.50), *Gas Tungsten Arc Welding (GTAW) Skill* (*n* = 43; % = 30.10), *Multi- Cylinder Engines Skill* (*n* = 42; % = 29.40), *Plumbing Skill* (*n* = 40, % = 28.00), and *Concrete Skill* (*n* = 29, % = 20.30). Further skill areas that utilized the classroom learning teaching method include: *Modern Machinery Technology* (*n* = 28; % = 19.60), and *Hydraulics Skill* (*n* = 28; % = 19.60). Participants indicated that the two skill areas where the classroom learning teaching method was used the least was *Fencing Skill* (n = 23, % = 16.10), and *Pneumatics Skill* (n = 16; % = 11.20). This data is displayed in Table 10.

Table 10

Classroom learning teaching method used to teach agricultural mechanics skills to entry year AFNR teachers (n = 143)

	Classroom Learning			
Skills	Yes		No	
	f	%	*f*	%
Employability/ Career Skills	97	67.80	45	31.50
Supervised Agricultural Experience	79	55.20	63	44.10
Oxygen/ Fuel Cutting	68	47.60	75	52.40
Shielded Metal Arc Welding- SMAW	68	47.60	74	51.70
Small Gas Engines	66	46.20	77	53.80
Gas Metal Arc Welding- GMAW	64	44.80	79	55.20
Hand Tools	64	44.80	79	55.20
Handheld Power Tools	64	44.80	79	55.20
Stationary Power Tools	63	44.10	80	55.90
Electrical	61	42.70	82	57.30
Oxygen/ Fuel Welding	61	42.70	81	56.60
Cold Metal	59	41.30	83	58.00
Plasma Arc Cutting- PAC	58	40.60	85	59.40
Carpentry	52	36.40	91	63.60
Construction Methods	49	34.30	93	65.00
Oxygen/ Fuel Brazing	45	31.50	98	68.50

(continued)

Gas Tungsten Arc Welding- GTAW	43	30.10	100	69.90
Multi-Cylinder Engines	42	29.40	101	70.60
Plumbing	40	28.00	103	72.00
Concrete	29	20.30	114	79.70
Modern Machinery Technology	28	19.60	114	79.70
Hydraulics	28	19.60	115	80.40
Fencing	23	16.10	120	83.90
Pneumatics	16	11.20	126	88.10

Note. Data from non-response responses are not shown in the chart above

Participants indicated that the three skill areas that were taught by the teacher demonstration teaching method the most were *Oxygen Fuel Cutting Skill* (*n* = 65; % = 45.50), *Oxygen Fuel Welding Skill* (*n* = 59; % = 41.30), *Stationary Power Tools Skill* (*n* = 59; % = 41.30). Additionally, the following skills were also taught to participants using the teacher demonstration method: *Handheld Power Tools Skill* (*n* =57; % = 39.90), *Shielded Metal Arc Welding (SMAW) Skill* (*n* = 57; % = 39.90), *Supervised Agricultural Experience Skill* (*n* =54; % = 37.80), *Gas Metal Arc Welding (GMAW) Skill* (*n* = 53; % = 37.10), *Hand Tools Skill* (*n* =53; % = 37.10), *Plasma Arc Cutting (PAC) Skill* (*n* = 53; % = 37.10), and *Cold Metal Skill* (*n* = 51; % = 35.70). This is followed by *Employability/ Career Skills* (*n* = 51; % = 35.70), *Electrical Skill* (*n* = 50; % = 35.00), *Small Gas Engines Skill* (*n* = 48; % = 33.60), *Gas Tungsten Arc Welding (GTAW) Skill* (*n* = 41; % = 28.70), and *Oxygen/ Fuel Brazing Skill* (*n* = 41; % = 28.70). Other skill areas that were taught to participants utilizing the teacher demonstration teaching method include: *Carpentry Skill* (*n* = 40; % = 28.00), *Construction Methods Skill* (*n* = 30; % = 21.00), *Plumbing Skill* (*n* = 28; % = 19.60), *Multi- Cylinder Engines Skills* (*n* = 19; % = 13.30), *Concrete Skills* (*n* = 17; % = 11.90), *Hydraulics Skill* (*n* = 16; % = 11.20). The three skill areas where the teacher demonstration teaching method was used the least was *Fencing Skill* (*n* = 15; % = 10.50), *Modern Machinery Technology Skill* (*n* = 9; % = 6.30), and *Pneumatics Skill* (*n* = 8; % = 5.60). A summary of these results is displayed in Table 11.

Table 11

Teacher demonstration teaching method used to teach agricultural mechanics skills to entry year AFNR teachers (n = 143)

Skills	Teacher Demonstration			
	Yes		No	
	f	%	*f*	%
Oxygen/ Fuel Cutting	65	45.50	78	54.50
Oxygen/ Fuel Welding	59	41.30	83	58.00
Stationary Power Tools	59	41.30	84	58.70
Handheld Power Tools	57	39.90	86	60.10
Shielded Metal Arc Welding- SMAW	57	39.90	85	59.40
Supervised Agricultural Experience	54	37.80	88	61.50
Gas Metal Arc Welding- GMAW	53	37.10	89	62.20
Hand Tools	53	37.10	90	62.90
Plasma Arc Cutting- PAC	53	37.10	90	62.90
Cold Metal	51	35.70	91	63.60
Employability/ Career Skills	51	35.70	91	63.60
Electrical	50	35.00	93	65.00
Small Gas Engines	48	33.60	95	66.40
Gas Tungsten Arc Welding- GTAW	41	28.70	102	71.30
Oxygen/ Fuel Brazing	41	28.70	102	71.30
Carpentry	40	28.00	103	72.00

(continued)

Construction Methods	30	21.00	112	78.30
Plumbing	28	19.60	115	80.40
Multi-Cylinder Engines	19	13.30	124	86.70
Concrete	17	11.90	126	88.10
Hydraulics	16	11.20	127	88.80
Fencing	15	10.50	128	89.50
Modern Machinery Technology	9	6.30	133	93.00
Pneumatics	8	5.60	134	93.70

Note. Data from non-response responses are not shown in the chart above

Participants identified that skill areas that were taught using the laboratory practice teaching method the most included: Handheld Power Tools Skill (*n* = 89; % = 62.20), Oxygen/ Fuel Cutting Skill (*n* = 86; % = 60.10), and Hand Tools Skill (*n* = 85; % = 59.40). Furthermore, participants indicated that the following skill areas were also taught using the laboratory practice teaching Method: *Stationary Power Tools Skill* (*n* = 83; % = 58), *Oxygen/ Fuel Welding Skill* (*n* = 79; % = 55.20), *Shielded Metal Arc Welding (SMAW) Skill* (*n* = 78; % = 54.50), *Gas Metal Arc Welding (GMAW) Skill* (*n* = 76; % = 53.10), and *Electrical Skill* (*n* = 72; % 50.30). This is followed by *Cold Metal Skill* (*n* = 67; % = 46.90), *Small Gas Engines Skill* (*n* = 67; % = 46.90), *Plasma Arc Cutting (PAC) Skill* (*n* = 66; % = 46.20), *Carpentry Skill* (*n* = 63; % = 46.10), *Gas Tungsten Arc Welding (GTAW) Skill* (*n* = 49; % = 34.30), *Oxygen/ Fuel Brazing Skill* (*n* = 49; % = 34.30), and *Plumbing Skill* (*n* = 47; % = 32.90). Additional skill areas that were taught using the laboratory practice teaching method include: *Supervised Agricultural Experience Skill* (*n* = 43; % = 30.10), *Construction Methods Skill* (*n* = 42; %

= 29.40), *Concrete Skill* (*n* = 32; % = 22.40), *Employability/ Career Skills* (*n* = 29; % = 20.30), *Hydraulics Skill* (*n* = 29; % = 20.30), *Multi-Cylinder Engines Skill* (*n* = 29, % = 20.30). The three skill areas that were taught using the laboratory practice teaching method the least include: *Fencing Skill* (*n* = 22; % = 15.40), *Modern Machinery Technology Skill* (*n* = 14; % = 9.80), *Pneumatics Skill* (*n* = 12; % = 8.40). Table 12 displays this data further.

Table 12

Laboratory practice teaching method used to teach agricultural mechanics skills to entry year AFNR teachers (n = 143)

Skills	Laboratory Practice Yes *f*	Yes %	No *f*	No %
Handheld Power Tools	89	62.20	54	37.80
Oxygen/ Fuel Cutting	86	60.10	57	39.90
Hand Tools	85	59.40	58	40.60
Stationary Power Tools	83	58.00	60	42.00
Oxygen/ Fuel Welding	79	55.20	63	44.10
Shielded Metal Arc Welding- SMAW	78	54.50	64	44.80
Gas Metal Arc Welding- GMAW	76	53.10	67	46.90
Electrical	72	50.30	71	49.70
Cold Metal	67	46.90	75	52.40
Small Gas Engines	67	46.90	76	53.10
Plasma Arc Cutting- PAC	66	46.20	77	53.80
Carpentry	63	44.10	80	55.90
Gas Tungsten Arc Welding- GTAW	49	34.30	94	65.70
Oxygen/ Fuel Brazing	49	34.30	94	65.70
Plumbing	47	32.90	96	67.10
Supervised Agricultural Experience	43	30.10	99	69.20

(continued)

Construction Methods	42	29.40	100	69.90
Concrete	32	22.40	111	77.60
Employability/ Career Skills	29	20.30	113	79.00
Hydraulics	29	20.30	114	79.70
Multi-Cylinder Engines	29	20.30	114	79.70
Fencing	22	15.40	121	84.60
Modern Machinery Technology	14	9.80	128	89.50
Pneumatics	12	8.40	130	90.90

Note. Data from non-response responses are not shown in the chart above

Respondents identified that the three skill areas that used the application project teaching method the most included: *Employability/ Career Skills* (*n* = 66; % = 46.20), *Hand Tools Skills* (*n* = 57; % = 39.90), and *Handheld Power Tools Skills* (*n* = 51; % = 35.70). Additionally, the following skill areas also utilized the application project teaching method: *Stationary Power Tools Skills* (*n* = 50; % = 35.00), *Carpentry Skills* (*n* = 48; % = 33.60), *Supervised Agricultural Experience Skills* (*n* = 48; % = 33.60), *Oxygen/ Fuel Cutting Skill* (*n* = 46; % = 32.20), *Electrical Skill* (*n* = 43; % = 30.10), and *Shielded Metal Arc Welding (SMAW) Skill* (*n* = 42; % = 29.40). Followed by *Oxygen/ Fuel Welding* (*n* = 40; % = 28.00), *Cold Metal Skill* (*n* = 39; % = 27.30), *Gas Metal Arc Welding (GMAW) Skill* (n = 39; % = 27.30*), Plasma Arc Cutting (PAC) Skill* (*n* = 35; % = 24.50), *Small Gas Engines Skill* (*n* = 35; % = 24.50), and *Fencing Skill* (*n* = 32; % = 22.40). Further skills areas that teachers were taught using the application project teaching method include: *Construction Methods Skill* (*n* = 30; % = 21.00), *Plumbing Skill* (*n* = 30; % = 21.00), *Gas Tungsten Arc Welding (GTAW) Skill* (*n* = 28; % = 19.60), *Oxygen/ Fuel Brazing Skill* (*n* = 25; % = 17.50), *Concrete Skill* (*n* = 20; % = 14.00), and *Multi-Cylinder Engines* (*n* = 17; % = 11.90). The three skill areas that were taught by utilizing the application project teaching method the least include: Hydraulics Skill (n = 15; % = 10.50), Modern Machinery Technology Skill (n = 11; % = 7.70), and Pneumatics Skill (n = 9; % = 6.30). Table 13 further displays this information.

Table 13

Application project teaching method used to teach agricultural mechanics skills to entry year AFNR teachers (n = 143)

Skills	Application Project: Yes *f*	Yes %	No *f*	No %
Employability/ Career Skills	66	46.20	76	53.10
Hand Tools	57	39.90	89	60.10
Handheld Power Tools	51	35.70	92	64.30
Stationary Power Tools	50	35.00	93	65.00
Carpentry	48	33.60	95	66.40
Supervised Agricultural Experience	48	33.60	94	65.70
Oxygen/ Fuel Cutting	46	32.20	97	67.80
Electrical	43	30.10	100	69.90
Shielded Metal Arc Welding- SMAW	42	29.40	100	69.90
Oxygen/ Fuel Welding	40	28.00	102	71.30
Cold Metal	39	27.30	103	72.00
Gas Metal Arc Welding- GMAW	39	27.30	104	72.70
Plasma Arc Cutting- PAC	35	24.50	108	75.50
Small Gas Engines	35	24.50	108	75.50
Fencing	32	22.40	111	77.60
Construction Methods	30	21.00	112	78.30

(continued)

Plumbing	30	21.00	113	79.00
Gas Tungsten Arc Welding- GTAW	28	19.60	115	80.40
Oxygen/ Fuel Brazing	25	17.50	118	82.50
Concrete	20	14.00	123	86.00
Multi-Cylinder Engines	17	11.90	126	88.10
Hydraulics	15	10.50	128	89.50
Modern Machinery Technology	11	7.70	131	91.60
Pneumatics	9	6.30	133	93.00

Note. Data from non-response responses are not shown in the chart above

Participating teachers noted that the three skill areas that were taught by using the student skill presentation teaching method the most were Oxygen/ Fuel Cutting Skills (*n* = 36; % = 25.20), Employability/ Career Skills (*n* = 34; % = 23.80), and Handheld Power Tools Skill (*n* = 34; % = 23.80). Additional skill areas that were taught by the student skill presentation method include: *Hand Tools Skill* (*n* = 32; % = 22.40), *Stationary Power Tools Skill* (*n* = 31; % = 21.70), *Shielded Metal Arc Welding (SMAW) Skill* (*n* = 30; % = 21.00), *Oxygen/ Fuel Welding Skill* (*n* = 28; % = 19.60), *Supervised Agricultural Experience Skill* (*n* = 28; % = 19.60), and *Cold Metal Skill* (*n* = 27; % = 18.90). Followed by *Electrical Skill* (*n* = 27, % = 18.90), *Gas Metal Arc Welding (GMAW) Skill* (*n* = 26; % = 18.20), *Carpentry Skill* (*n* = 25; % = 17.50), *Small Gas Engines Skill* (*n* = 23; % = 16.10), *Plasma Arc Cutting (PAC) Skill* (*n* = 22; % = 15.40), and *Construction Methods Skill* (*n* = 20; % = 14.00). Further skill areas that were taught to teachers by the student skill presentations include: *Oxygen/ Fuel Brazing Skill* (*n* = 19; % = 13.30), *Gas Tungsten Arc Welding (GTAW) Skill* (*n* = 18; % = 12.60), *Plumbing Skill* (*n* = 13; % =

9.10), *Concrete Skill* (*n* = 12; % = 8.40), *Fencing Skill* (*n* = 12; % = 8.40), and *Multi-Cylinder Engines Skill* (*n* = 11; % = 7.70). The three skill areas that used the student skill presentation teaching method the least include: *Hydraulics Skill* (*n* = 10; % = 7.00), *Modern Machinery Technology* (*n* = 6; % = 4.20), and *Pneumatics* (*n* = 5; % = 3.50). A summary of this information is displayed in Table 14.

Table 14

Student skill presentation teaching method used to teach agricultural mechanics skills to entry year AFNR teachers (n = 143)

Skills	Student Skill Presentation			
	Yes		No	
	f	%	*f*	%
Oxygen/ Fuel Cutting	36	25.20	107	74.80
Employability/ Career Skills	34	23.80	108	75.50
Handheld Power Tools	34	23.80	109	76.20
Hand Tools	32	22.40	111	77.60
Stationary Power Tools	31	21.70	112	78.30
Shielded Metal Arc Welding- SMAW	30	21.00	112	78.30
Oxygen/ Fuel Welding	28	19.60	114	79.70
Supervised Agricultural Experience	28	19.60	114	79.70
Cold Metal	27	18.90	115	80.40
Electrical	27	18.90	116	81.10
Gas Metal Arc Welding- GMAW	26	18.20	117	91.80
Carpentry	25	17.50	118	82.50
Small Gas Engines	23	16.10	120	83.90
Plasma Arc Cutting- PAC	22	15.40	121	84.60
Construction Methods	20	14.00	122	85.30
Oxygen/ Fuel Brazing	19	13.30	124	86.70

(continued)

Gas Tungsten Arc Welding- GTAW	18	12.60	125	87.40
Plumbing	13	9.10	130	90.90
Concrete	12	8.40	131	91.60
Fencing	12	8.40	131	91.60
Multi-Cylinder Engines	11	7.70	132	92.30
Hydraulics	10	7.00	133	93.00
Modern Machinery Technology	6	4.20	136	95.10
Pneumatics	5	3.50	137	95.80

Note. Data from non-response responses are not shown in the chart above

Research Question Five

Research question five focused on the professional development format that entry year, Texas AFNR teachers would prefer regarding agricultural mechanics related curriculum. Participants (*n* = 143) were given 13 professional development formats and were instructed to choose all of the choices that they felt would be beneficial for them. The professional development formats provided included: two Hour VATAT Workshop; three Weeks, During Summer; Informal Online Video (i.e. YouTube); Monday, all day VATAT workshop; multi-day, during summer; online, university course; single day, during school year; single day, during summer; university course; week long, during school year; week long, during summer; winter break, during school year; and workshop during stock shows.

Respondents identified that the top three most beneficial professional development formats were *Multi-day, During Summer* (*n* = 75; % = 52.40), *two Hour VATAT Workshop* (*n* = 61; % = 42.70), and *Monday, All Day VATAT Workshop* (*n* = 53; % = 37.10). Followed by *Single Day, During Summer* (*n* = 38; % = 26.60), *Week Long, During Summer* (*n* = 37; % = 25.90), *University Course* (*n* = 30; % = 21.00), and *Informal Online Video (i.e. YouTube)* (*n* = 18; % = 12.60). Additional professional development formats include: *three Weeks, During Summer* (*n* = 18; % = 12.60), *Single Day, During School Year* (*n* = 16; % = 11.20), and *Online, University Course* (*n* = 15; % = 10.50). The three professional development formats that teachers preferred the least included: *Winter Break, During School Year* (*n* =10; % = 7.00), *Workshop During Stock Shows* (*n* = 9; % = 6.30), and *Week Long, During School Year* (*n* = 9; % = 6.30). A summary of this data is displayed in Table 15.

Table 15

Knowledge and skills learned by entry year, Texas AFNR teachers in their University Courses (n = 143)

Skills	Beneficial		Not Beneficial		Missing	
	f	%	*f*	%	*f*	%
Multi-day, During Summer	75	52.40	68	47.60	0	0.00
Two Hour VATAT Workshop	61	42.70	82	57.30	0	0.00
Monday, All Day VATAT Workshop	53	37.10	90	62.90	0	0.00
Single Day, During Summer	38	26.60	105	73.40	0	0.00
Week Long, During Summer	37	25.90	106	74.10	0	0.00
University Course	30	21.00	113	79.00	0	0.00
Informal Online Video (i.e. YouTube)	18	12.60	125	87.40	0	0.00
Three Weeks, During Summer	18	12.60	125	87.40	0	0.00
Single Day, During School Year	16	11.20	127	88.80	0	0.00
Online, University Course	15	10.50	128	89.50	0	0.00

(continued)

Winter Break, During School Year	10	7.00	133	93.00	0	0.00
Workshop During Stock Shows	9	6.30	134	93.70	0	0.00
Week Long, During School Year	9	6.30	134	93.70	0	0.00

Research Question 6

Research question six sought to determine if teaching methods used at the university level to instruct agricultural mechanics curriculum to entry year, Texas AFNR teachers can explain their confidence levels to teach agricultural mechanics related skills. To address this question, a multiple linear regression was used. More specifically, the forced entry (enter) method was used to determine if the independent variables (teaching methods; i.e. classroom learning, teacher demonstration, laboratory practice, real world application project, student skill presentation) can explain the dependent variable (confidence levels; i.e. no confidence, little confidence, some confidence, moderate confidence, high confidence). A simultaneous Multiple Linear Regression was used to determine if the independent variables (teaching methods) could explain the dependent variable (confidence levels) for each skill area addressed in this study.

Relationship of Confidence Levels of Teaching Employability/Career Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching employability/career skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, real world application project, and student skill presentation). Table 16 displays the regression model, which indicates the instructional methods found to be significant in the regression equation for participating teacher's confidence levels of teaching employability/career skills. Results indicate that 12% of the variability in the participant's confidence levels can be explained by the model. Subsequently, 88% of the variability in the participant's confidence levels is explained by unknown variables that were not used in the model. The application project teaching method was the variable that had the greatest positive affect ($\beta = 0.269$) on teacher's confidence level to teach employability/ career skills, as well as the independent variable with the highest significance ($p < 0.01$). While teacher demonstration ($\beta = 0.132$; $p > 0.05$), classroom learning ($\beta = 0.103$; $p > 0.05$), and laboratory practice ($\beta = 0.065$; $p > 0.05$) teaching methods had smaller positive affects on the confidence levels of teachers to teach employability and career skills. Whereas, student skill presentation ($\beta = 0.013$; $p > 0.05$) had close to no affect on the confidence levels of participants to teach employability and career skills. Additionally, the model was found to have a small effect size (Cohens f =.12; Soper, 2019). Furthermore, the regression model predicted by the independent variables cannot explain a significant amount of the variance in confidence levels to teach employability/career skills ($F(5,133) = 3.467$; $p > .05$). In summary, the model indicates that only one independent variable, application project, can be used to explain the dependent variable, teacher's confidence level to teach employability/career skills. While, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation could not explain the dependent variable, confidence level of teaching employability/career skills.

Table 16

Relationship of instructional curriculum methods and confidence levels of teaching employability and career skills (n = 143)

Variable	*R*	*R²*	*B*	ß	*T*	*p*	VIF
Characteristics	.34	.12					
Classroom Learning			.240	.103	1.168	.245	1.16
Teacher Demonstration			.298	.132	1.271	.206	1.61
Laboratory Practice			-.174	.065	-.606	.546	1.71
Real World Application Project			.589	.269	2.910	.004*	1.28
Student Skill Presentation			-.034	.013	-.118	.906	1.93
(Constant)			2.612		15.206	.000*	

Note. For the Model: F(5,133) = 3.467, Adjusted R^2 = .08; *p* > .05; * *p* < .05.
Effect Size = .12 (Small effect; Koltrik & Williams, 2003).
Teaching methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Supervised Agricultural Experiences and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching supervised agricultural experience (SAE) skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, application project, and student skill presentation). The regression model that indicates the instructional methods found to be significant in the regression equation for the participant's confidence level to teach supervised agricultural experiences is illustrated in Table 17. Results indicate that 7% of the variability in the participant's confidence levels can be explained by the model. This illustrates that 93% of the variability in the participant's confidence levels is explained by unknown variables that were not used in the model. Additionally, the model was found to have a small effect size (Cohen's d = .08; Soper, 2019). Furthermore, the regression line predicted by these independent variables does not explain a significant amount of the variance in the dependent variable ($F(5,132) = 1.930$; $p > .05$). This model indicates that the application project teaching method was the variable with the greatest effect on (β = 0.195; $p > 0.05$) teachers confidence to teach SAE skills. Followed by laboratory practice (β = 0.075; $p > 0.05$) and classroom learning (β = 0.062; $p > 0.05$) teaching methods having a positive effect on confidence in teaching SAE skills. While student skill presentation (β = -0.010; $p > 0.05$) and teacher demonstration (β = -0.019; $p > 0.05$) had small negative effects on confidence levels. In summary, the independent variables: classroom learning, teacher demonstration, laboratory practice, real world application project, and student skill presentation could not explain the dependent variable, confidence level to teach SAE skills.

Table 17

Relationship of instructional curriculum methods and confidence levels of teaching Supervised Agricultural Experiences skills (n = 143)

Variable	*R*	*R²*	*B*	ß	*T*	*p*	VIF
Characteristics	.26	.07					
Classroom Learning			0.124	0.062	0.608	.544	1.47
Teacher Demonstration			-0.039	-0.019	-0.183	.855	1.55
Laboratory Practice			0.164	0.075	0.597	.551	2.25
Real World Application Project			0.408	0.195	1.844	.067	1.58
Student Skill Presentation			-0.026	-0.010	-0.101	.920	1.52
(Constant)			2.235		17.091	.000*	

Note. For the Model: $F(5,132) = 1.930$, Adjusted $R^2 = .03$; $p > .05$; * $p < .05$.
Effect Size = .08 (Small effect; Koltrik & Williams, 2003).
Teaching methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Hand Tools skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching hand tools skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, real world application project, and student skill presentation). The regression model that illustrates the teaching methods found to be significant in the regression equation for the participant's confidence level to teach hand tool skills can be reviewed in Table 18. Results indicate that 10% of the variability in the participant's confidence levels can be explained by the model. Subsequently, 90% of the variability in the participant's confidence levels is explained by unknown variables that were not used in this model. The regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,132) = 2.936$; $p < .05$). In addition, the model was found to have a small effect size (Cohen's $f = .11$; Soper, 2019). In this model the application project teaching method was the variable with the greatest affect ($\beta = 0.222$), as well as the only significant predictor in predicting confidence to teach hand tool skills ($p < .05$). Followed by student skill presentations ($\beta = 0.096$; $p > 0.05$) and teacher demonstration ($\beta = 0.096$; $p > 0.05$) teaching methods that had smaller positive effects on the dependent variable. Whereas, the classroom learning ($\beta = -0.007$; $p > 0.05$) and laboratory practice ($B = 0.004$; $p > 0.985$) had close to no relationship with confidence levels to teach hand tool skills. In summary, the model indicates that only one independent variable, application project, could explain the dependent variable, teacher's confidence to teach hand tool skills. However, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation could not explain the dependent variable.

Table 18

Relationship of instructional curriculum methods and confidence levels of teaching hand tools skills (n = 143)

Variable	*R*	*R²*	*B*	ß	*T*	*P*	VIF
Characteristics	.32	.10					
Classroom Learning			-.014	-.007	-.070	.944	1.382
Teacher Demonstration			.149	.069	.599	.550	1.933
Laboratory Practice			.004	.002	.019	.985	1.504
Real World Application Project			.477	.222	2.342	.021*	1.322
Student Skill Presentation			.243	.096	.961	.338	1.475
(Constant)			2.819		19.071	.000*	

Note. (Adjusted R^2 = .100; (F(5,132) = 2.936; p < .05)
Effect Size = .11 (Small effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Handheld Power Tools skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain if there is a relationship between the dependent variable, confidence level of entry year teachers to teach handheld power tools skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, real world application project, and student skill presentation). Table 19 illustrates the regression model of the instructional methods found to be significant in the regression equation for the participant's confidence level to teach handheld power tool skills. Results indicate that 16% of the variability in the participant's confidence levels can be explained by the model. Moreover, this means that 84% of the variability in the participating teacher's confidence levels is explained by unknown variables that were not measured and included in the model. In addition, the model was found to have a small effect size (Cohen's $f = 0.19$). However, the regression line predicted by these independent variables does explain a statistically significant amount of the variance in the dependent variable ($F(5,132) = 5.230$; $p < .05$). Out of the independent variables included in this model, the application project teaching method ($\beta = 0.406$; $p < 0.001$) had the largest effect on teacher's confidence to teach handheld power tool skills. Followed by the student skill presentation ($\beta = 0.115$; $p > 0.05$) method having a positive effect on confidence. Whereas, laboratory practice ($\beta = -0.003$; $p > 0.05$) had close to no effect on confidence levels. While classroom learning ($\beta = -0.69$; $p > 0.05$) and teacher demonstration ($\beta = -0.152$; $p > 0.05$) had a negative effect on confidence levels to teach handheld power tool skills. In summary, the model indicates that only one independent variable, application project, can be used to explain the dependent variable, teachers' confidence level to teach handheld power tool skills. Whereas, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation could not explain the dependent variable, confidence level of teaching power tool skills.

Table 19

Relationship of instructional curriculum methods and confidence levels of teaching handheld power tools skill (n = 143)

Variable	*R*	*R²*	*b*	ß	*t*	*p*	VIF
Characteristics	.41	.16					
Classroom Learning			-.162	-.069	-.720	.473	1.44
Teacher Demonstration			-.364	-.152	-1.361	.176	2.00
Laboratory Practice			-.008	-.003	-.035	.972	1.43
Real World Application Project			.994	.406	4.234	.000*	1.46
Student Skill Presentation			.315	.115	1.141	.256	1.61
(Constant)			2.619		16.348	.000*	

Note. For the model: ($F(5,132) = 5.230$; $p < .05$), Adjusted $R^2 = .16$; $p < .05$; *$p < .05$)
Effect size = 0.19 (Small effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Stationary Power Tools skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain if there is a relationship between the dependent variable, confidence level of entry year teachers to teach stationary power tools skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, real world application project, and student skill presentation). Table 20 illustrates the regression model of the instructional methods found to be significant in the regression equation for the participant's confidence level to teach stationary power tool skills. Results indicated that 13% of the variability in the participant's confidence levels could be explained by the model. Which leaves 87% of the variability in the participating teachers' confidence levels can be explained by unknown variables that were not measured and included in the model. Additionally, the model was found to have a small effect size (Cohen's $f = 0.15$). However, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,132) = 4.009$; $p < .05$). Out of the independent variables included in this model, the application project teaching method had the greatest affect ($\beta = 0.325$; $p < .01$) on teacher's confidence to teach stationary power tool skills. Followed by the student skill presentation ($\beta = 0.082$; $p > 0.05$) and the laboratory practice ($\beta = 0.063$; $p > 0.05$) methods having smaller positive effects on the dependent variable. Whereas, the teacher demonstration method ($\beta = 0.001$; $p > 0.05$) had close to no effect on the confidence levels of the teachers. While classroom learning ($\beta = -0.129$; $p > 0.05$) had a negative effect on confidence levels to teach stationary power tool skills. In summary, the model indicates that only one independent variable, application project, can be used to explain the dependent variable, teachers' confidence level to teach stationary power tool skills. Whereas, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation could not explain the dependent variable, confidence level of teaching stationary power tool skills.

Table 20

Relationship of instructional curriculum methods and confidence levels of teaching stationary power tools skill (n = 143)

Variable	*R*	*R²*	*b*	ß	*t*	*p*	VIF
Characteristics	.36	.13					
Classroom Learning			-.332	-.129	-1.298	.197	1.51
Teacher Demonstration			.001	.001	.005	.996	1.83
Laboratory Practice			.164	.063	.661	.510	1.40
Real World Application Project			.871	.325	3.343	.001*	1.44
Student Skill Presentation			.255	.082	.739	.462	1.89
(Constant)			2.320		13.466	.000*	

Note. For the model: (F(5,132) = 4.009; $p < .05$). Adjusted $R^2 = .099$; $p < .05$; *$p < .05$)
Effect size = 0.15 (Small effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Electrical Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching electrical skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, application project, and student skill presentation). The regression model that indicates the teaching methods found to be significant in the regression equation for the participating teacher's confidence level to teach electrical skills is shown in Table 21. Results indicate that 7% of the variability in the participant's confidence levels can be explained by the model. Which tells the researcher that 93% of the variability in the participant's confidence levels is explained by unknown variables that were not used in the model. Additionally, the model was found to have a small effect size (Cohen's $f = .08$; Soper, 2019). Moreover, the regression line predicted by these independent variables does not explain a significant amount of the variance in the dependent variable ($F(5,131) = 1.868$; $p > .05$). This model indicates that the application project teaching method ($\beta = 0.240$; $p < 0.05$) was the variable with the greatest effect on teachers confidence to teach electrical skills. Followed by student skill presentation ($\beta = 0.075$; $p > 0.05$) teaching method having a smaller positive affect on confidence levels to teach electrical skills. While classroom learning ($\beta = -0.009$; $p > 0.05$) had close to no effect on confidence levels. Whereas, laboratory practice ($\beta = -0.120$; $p > 0.05$) and teacher demonstration ($\beta = -0.022$; $p > 0.05$) had a negative effect on the dependent variable, confidence levels to teach electrical skills. In summary, the independent variable, application project could explain the dependent variable, confidence level to teach electrical skills. However, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation could not explain the dependent variable, confidence level to teach electrical skills.

Table 21

Relationship of instructional curriculum methods and confidence levels of teaching electrical skill (n = 143)

Variable	*R*	R^2	*B*	ß	*t*	*P*	VIF
Characteristics	.26	.07					
Classroom Learning			-.026	-.009	-.076	.940	2.00
Teacher Demonstration			-.066	-.022	-.172	.864	2.40
Laboratory Practice			-.336	-.120	-1.055	.293	1.82
Real World Application Project			.734	.240	2.213	.029*	1.65
Student Skill Presentation			.269	.075	.652	.515	1.87
(Constant)			1.799		10.239	.000*	

Note. For the model: $F(5,131) = 1.868$, .Adjusted $R^2 = 0.031$; $p > .05$; $*p < .05$)
Effect size = 0.08 (Small effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Plumbing Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching plumbing skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, application project, and student skill presentation). Table 22 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teacher's confidence level to teach plumbing skills. Results indicate that 18% of the variability in the participant's confidence levels can be explained by the model. Subsequently, 82% of the variability in the participant's confidence levels is explained by unknown variables that were not used in the model. Additionally, the model was found to have a small effect size (Cohen's $f = .22$; Soper, 2019). Moreover, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,137) = 1.604$; $p < .05$).This model indicates that the application project teaching method was the variable with the greatest affect ($\beta = 0.319$; $p < 0.01$) on teachers' confidence to teach plumbing skills. Followed by classroom learning ($\beta = 0.121$; $p > 0.05$), student skill presentation ($\beta = 0.038$; $p > 0.05$), and teacher demonstration ($\beta = 0.037$; $p > 0.05$) teaching methods having a smaller positive affect on confidence levels to teach plumbing skills. Whereas, the laboratory practice ($\beta = 0.001$; $p > 0.05$) teaching method had close to no effect on confidence levels. In summary, the independent variable, application project could explain the dependent variable, confidence level to teach plumbing skills. However, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation could not explain the dependent variable, confidence level to teach plumbing skills.

Table 22

Relationship of instructional curriculum methods and confidence levels of teaching plumbing skill (n = 143)

Variable	*R*	*R²*	*B*	ß	*t*	*p*	VIF
Characteristics	.42	.18					
Classroom Learning			.369	.121	1.067	.288	2.14
Teacher Demonstration			.126	.037	.293	.770	2.61
Laboratory Practice			.002	.001	.007	.994	2.14
Real World Application Project			1.071	.319	3.363	.001*	1.50
Student Skill Presentation			.181	.038	.365	.716	1.82
(Constant)			1.246		9.205	.000*	

Note. For the model: F(5,137) = 1.604, Adjusted R^2 = 0.150; $p < .05$; *$p < .05$)
Effect size = 0.22 (Small effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Concrete Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching concrete skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, real world application project, and student skill presentation). Table 23 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teacher's confidence level to teach concrete skills. Results indicate that 13% of the variability in the participant's confidence levels can be explained by the model. Which tell the researcher that 87% of the variability in the participant's confidence levels is explained by unknown variables that were not used in the model. Additionally, the model was found to have a small effect size (Cohen's $f = .15$; Soper, 2019). Moreover, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,137) = 4.119$; $p < .05$). This model indicates that the application project teaching method was the variable with the greatest affect ($\beta = 0.224$; $p < 0.05$) on teachers' confidence to teach concrete skills. Followed by laboratory practice ($\beta = 0.131$; $p > 0.05$) and teacher demonstration ($\beta = 0.037$; $p > 0.05$) teaching methods having a smaller positive affect on confidence levels to teach concrete skills. Whereas, the student skill presentation ($\beta = -0.066$; $p > 0.05$) and classroom learning ($\beta = -0.020$; $p > 0.05$) teaching methods had negative effects on confidence levels. In summary, the only independent variable, application project that could explain the dependent variable, confidence level to teach concrete skills. However, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation could not explain the dependent variable, confidence level to teach concrete skills.

Table 23

Relationship of instructional curriculum methods and confidence levels of teaching concrete skill (n = 143)

Variable	*R*	*R²*	*b*	ß	*T*	*p*	VIF
Characteristics	.36	.13					
Classroom Learning			-.062	-.020	-.186	.852	1.82
Teacher Demonstration			.144	.037	.298	.767	2.46
Laboratory Practice			.394	.131	1.251	.213	1.73
Real World Application Project			.808	.224	2.216	.028*	1.61
Student Skill Presentation			.299	-.066	-.548	.584	2.30
(Constant)			1.266		10.691	.000*	

Note. For the model: F(5,137) = 4.119, Adjusted R^2 = 0.131; $p < .05$; *$p < .05$)
Effect size = 0.15 (Small effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Carpentry Skills and Teaching Methods

Simultaneous multiple linear regressions were utilized to explain the relationship between the dependent variable, confidence level of teaching carpentry skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, real world application project, and student skill presentation). Table 24 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teacher's confidence level to teach carpentry skills. Results indicate that 13% of the variability in the participants' confidence levels can be explained by the model. Subsequently, 87% of the variability in the participant's confidence levels is explained by unknown variables that were not used in the model. Additionally, the model was found to have a small effect size (Cohen's f = .15; Soper, 2019). Moreover, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,137) = 4.233$; $p < .05$). This model indicates that the lab practice teaching method was the variable with the greatest affect ($\beta = 0.258$; $p < 0.05$) on teachers confidence to teach carpentry skills. Closely following, the application project ($\beta = 0.229$; $p < 0.05$) also had a large affect on teacher's confidence levels to teach carpentry skills. Furthermore, the student skill presentation teaching methods ($\beta = 0.023$; $p > 0.05$) had a smaller positive affect on confidence levels to teach carpentry skills. Whereas, the teacher demonstration teaching method ($\beta = 0.007$; $p > 0.05$) had close to no effect on confidence levels. While, the classroom learning teaching method ($\beta = -0.097$; $p > 0.05$) had a negative effect on teacher confidence levels to teach carpentry skills. In summary, the independent variables: laboratory practice and application project could explain the dependent variable, confidence level to teach carpentry skills. However, the independent variables: classroom learning, teacher demonstration, and student skill presentation could not explain the dependent variable, confidence level to teach carpentry skills.

Table 24

Relationship of instructional curriculum methods and confidence levels of teaching carpentry skill (n = 143)

Variable	*R*	*R²*	*b*	ß	*T*	*p*	VIF
Characteristics	.37	.13					
Classroom Learning			-.279	-.097	-.835	.405	2.14
Teacher Demonstration			.021	.007	.050	.960	2.84
Laboratory Practice			.717	.258	2.436	.016*	1.77
Real World Application Project			.670	.229	2.413	.017*	1.43
Student Skill Presentation			.084	.023	.201	.841	2.09
(Constant)			1.533		9.680	.000*	

Note. For the model: $F(5,137) = 4.233$, Adjusted $R^2 = 0.102$; $p < .05$; $*p < .05$)
Effect size = 0.15 (Small effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Fencing Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching fencing skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, real world application project, student skill presentation). Table 25 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teachers' confidence level to teach fencing skills. Results indicate that 12% of the variability in the participant's confidence levels can be explained by the model. Moreover, this means that 88% of the variability in the participant's confidence levels is explained by unknown variables that were not used in the model. Additionally, the model was found to have a small effect size (Cohen's f = .14; Soper, 2019). Moreover, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,136) = 3.817$; $p < .05$). This model indicates that the application project teaching method was the variable with the greatest affect ($\beta = 0.334$; $p < 0.001$) on teachers confidence to teach fencing skills. Followed by laboratory practice ($\beta = 0.033$; $p > 0.05$) and student skill presentation ($\beta = 0.031$; $p > 0.05$) teaching methods having a smaller positive affect on confidence levels to teach fencing skills. Whereas, the classroom learning teaching method ($\beta = 0.007$; $p > 0.05$) had close to no effect on confidence levels. While, the teacher demonstration method ($\beta = -0.028$; $p > 0.05$) had a negative effect on the participant's confidence levels to teach fencing skills. In summary, the independent variable, application project was the only independent variable that could explain the dependent variable, confidence level to teach fencing skills. However, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation could not explain the dependent variable, confidence level to teach fencing skills.

Table 25

Relationship of instructional curriculum methods and confidence levels of teaching fencing skill (n = 143)

Variable	*R*	*R²*	*B*	ß	*t*	*P*	VIF
Characteristics	.35	.12					
Classroom Learning			.027	.007	.068	.946	1.65
Teacher Demonstration			-.128	-.028	-.221	.826	2.49
Laboratory Practice			.129	.033	.286	.775	2.11
Real World Application Project			1.133	.334	3.574	.000*	1.35
Student Skill Presentation			.156	.031	.242	.809	2.56
(Constant)			1.869		14.054	.000*	

Note. For the model: F(5,136) = 3.817, Adjusted R^2 = 0.091; $p < .05$; *$p < .05$)
Effect size = 0.14 (Small effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Cold Metal Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching cold metal skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, real world application project, and student skill presentation). Table 26 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teachers' confidence level to teach cold metal skills. Results indicate that 20% of the variability in the participant's confidence levels can be explained by the model. Which tells the researcher that 80% of the variability in the participant's confidence levels is explained by unknown variables that were not used in the model. Additionally, the model was found to have a medium effect size (Cohen's $f = .25$; Soper, 2019). Moreover, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,135) = 6.549$; $p < .05$). This model indicates that the application project teaching method was the variable with the greatest affect ($\beta = 0.360$; $p < 0.01$) on teachers confidence to teach cold metal skills. Followed by laboratory practice ($\beta = 0.271$; $p > 0.05$), classroom learning ($\beta = 0.084$; $p > 0.05$), and student skill presentation ($\beta = 0.088$; $p > 0.05$) teaching methods having a smaller positive affect on confidence levels to teach cold metal skills. While, the teacher demonstration method ($\beta = -0.216$; $p > 0.05$) had a negative effect on the participant's confidence levels to teach cold metal skills. In summary, the independent variable, application project was the only independent variable that could explain the dependent variable, confidence level to teach cold metal skills. However, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation could not explain the dependent variable, confidence level to teach cold metal skills.

Table 26

Relationship of instructional curriculum Methods and Confidence Levels of Teaching Cold Metal Skill (n = 143)

Variable	*R*	*R²*	*b*	ß	*t*	*P*	VIF
Characteristics	.44	.20					
Classroom Learning			.239	.084	.812	.418	1.79
Teacher Demonstration			-.629	-.216	-1.540	.126	3.31
Laboratory Practice			.760	.271	2.278	.024	2.38
Real World Application Project			1.124	.360	3.514	.001*	1.76
Student Skill Presentation			.088	.025	.216	.829	2.20
(Constant)			1.056		6.713	.000*	

Note. For the model: F(5,135) = 6.549, Adjusted $R^2 = 0.165$; $p < .05$; *$p < .05$)
Effect size = 0.25 (Medium effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Oxygen Fuel Cutting Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching oxygen fuel cutting skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, application project, and student skill presentation). Table 27 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teacher's confidence level to teach oxygen fuel cutting skills. Results indicate that 23% of the variability in the participants' confidence levels can be explained by the model. Subsequently, 77% of the variability in the participant's confidence levels is explained by unknown variables that were not used in the model. Additionally, the model was found to have a medium effect size (Cohen's $f = .30$; Soper, 2019). Moreover, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,136) = 7.889$; $p < .05$). This model indicates that application project teaching method was the variable with the greatest affect ($\beta = 0.342$; $p < 0.01$) on teachers confidence to teach oxygen fuel cutting skills. Followed by laboratory practice ($\beta = 0.169$; $p > 0.05$), classroom learning ($\beta = 0.070$; $p > 0.05$), and student skill presentation ($\beta = 0.30$; $p > 0.05$), teaching methods having a smaller positive affect on confidence levels to teach oxygen fuel cutting skills. Whereas, the teacher demonstration method ($\beta = -0.026$; $p > 0.05$) had a negative effect on confidence levels to teach oxygen fuel cutting skills. In summary, the independent variable, application project was the only independent variable that could explain the dependent variable, confidence level to teach oxygen fuel cutting skills. However, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation could not explain the dependent variable, confidence level to teach oxygen fuel cutting skills.

Table 27

Relationship of instructional curriculum methods and confidence levels of teaching oxygen fuel cutting skill (n = 143)

Variable	*R*	*R²*	*b*	ß	*t*	*P*	VIF
Characteristics	.47	.23					
Classroom Learning			.208	.070	.684	.495	1.83
Teacher Demonstration			-.076	-.026	-.221	.826	2.36
Laboratory Practice			.509	.169	1.622	.107	1.90
Real World Application Project			1.077	.342	3.408	.001*	1.76
Student Skill Presentation			.100	.030	.290	.772	1.83
(Constant)			1.372		7.467	.000*	

Note. For the model: F(5,136) = 7.889, Adjusted R^2 = 0.196; $p < .05$; *$p < .05$)
Effect size = 0.30 (Medium effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Oxygen Fuel Welding Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching oxygen fuel welding skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, real world application project, and student skill presentation). Table 28 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teacher's confidence level to teach oxygen fuel welding skills. Results indicate that 19% of the variability in the participants' confidence levels can be explained by the model. Which tells the researcher that 81% of the variability in the participant's confidence levels is explained by unknown variables that were not used in the model. Additionally, the model was found to have a small effect size (Cohen's $f = .23$; Soper, 2019). Moreover, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,135) = 6.409$; $p < .05$). This model indicates that the application project teaching method was the variable with the greatest affect ($\beta = 0.425$; $p < 0.001$) on teachers confidence to teach oxygen fuel welding skills. Followed by laboratory practice teaching method ($\beta = 0.201$; $p > 0.05$) having a smaller positive affect on confidence levels to teach oxygen fuel welding skills. Whereas, teacher demonstration teaching method ($\beta = -0.007$; $p > 0.05$) had close to no effect on the dependent variable. While, the student skill presentation ($\beta = -0.103$; $p > 0.05$) and the classroom learning ($\beta = -0.030$; $p > 0.05$) teaching methods had negative effects on the participant's confidence levels to teach oxygen fuel welding skills. In summary, the independent variable, application project could explain the dependent variable, confidence level to teach oxygen fuel welding skills. However, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation could not explain the dependent variable, confidence level to teach oxygen fuel welding skills.

Table 28

Relationship of instructional curriculum methods and confidence levels of teaching oxygen fuel welding skill (n = 143)

Variable	*R*	*R²*	*b*	ß	*t*	*P*	VIF
Characteristics	.44	.19					
Classroom Learning			-.087	-.030	-.282	.778	1.92
Teacher Demonstration			-.019	-.007	-.051	.959	2.74
Laboratory Practice			.577	.201	1.814	.072	2.04
Real World Application Project			1.345	.425	4.139	.000*	1.76
Student Skill Presentation			-.370	-.103	-.929	.354	2.07
(Constant)			1.272		7.350	.000*	

Note. For the model: F(5,135) = 6.409, Adjusted $R^2 = 0.162$; $p < .05$; *$p < .05$)
Effect size = 0.23 (Small effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Oxygen Fuel Brazing Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching oxygen fuel brazing skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, application project, and student skill presentation). Table 29 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teacher's confidence level to teach oxygen fuel brazing skills. Results indicate that 14% of the variability in the participants' confidence levels can be explained by the model. Subsequently, 86% of the variability in the participant's confidence levels is explained by unknown variables that were not used in the model. Moreover, the model was found to have a small effect size (Cohen's $f = .16$; Soper, 2019). Additionally, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,137) = 4.291$; $p < .05$). This model indicates that the application project teaching method was the variable with the greatest affect ($\beta = 0.298$; $p < 0.05$) on teachers confidence to teach oxygen fuel brazing skills. Followed by the classroom learning ($\beta = 0.193$; $p > 0.05$), student skill presentation ($\beta = 0.112$; $p > 0.05$), and laboratory practice ($\beta = 0.064$; $p > 0.05$) teaching methods having a smaller positive affect on confidence levels to teach oxygen fuel brazing skills. Whereas, teacher demonstration teaching method ($\beta = 0.006$; $p > 0.05$) had close to no effect on the dependent variable. In summary, the independent variable, application project could explain the dependent variable, confidence level to teach oxygen fuel brazing skills. However, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation could not explain the dependent variable, confidence level to teach oxygen fuel brazing skills.

Table 29

Relationship of instructional curriculum methods and confidence levels of teaching oxygen fuel brazing skill (n = 143)

Variable	*R*	*R²*	*b*	ß	*t*	*P*	VIF
Characteristics	.37	.14					
Classroom Learning			.549	.193	1.791	.076	1.83
Teacher Demonstration			.017	.006	.046	.963	2.44
Laboratory Practice			.179	.064	.560	.577	2.08
Real World Application Project			1.039	.298	2.507	.013*	2.23
Student Skill Presentation			-.437	.112	.806	.422	3.06
(Constant)			1.064		7.710	.000*	

Note. For the model: F(5,137) = 4.291, Adjusted R^2 = 0.104; $p < .05$; *$p < .05$)
Effect size = 0.16 (Small effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Shielded Metal Arc Welding (SMAW) Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching Shielded Metal Arc Welding (SMAW) skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, application project, and student skill presentation). Table 30 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teacher's confidence level to teach SMAW skills. Results indicate that 29% of the variability in the participants' confidence levels can be explained by the model. Additionally, the model was found to have a large effect size (Cohen's $f = .41$; Soper, 2019). Furthermore, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,136) = 10.846$; $p < .05$). This model indicates that the application project teaching method was the variable with the greatest affect ($\beta = 0.415$; $p < 0.001$) on teachers confidence to teach SMAW skills. Followed by the classroom learning ($\beta = 0.176$; $p > 0.05$), laboratory practice ($\beta = 0.164$; $p > 0.05$), and student skill presentation ($\beta = 0.018$; $p > 0.05$) teaching methods having a smaller positive affect on confidence levels to teach SMAW skills. Whereas, the teacher demonstration method ($\beta = -0.096$; $p > 0.05$) had negative effects on the confidence levels to teach SMAW skills. In summary, the independent variable, application project was the only independent variable that could explain the dependent variable, confidence level to teach SMAW skills. While, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation could not explain the dependent variable, confidence level to teach SMAW skills.

Table 30

Relationship of instructional curriculum methods and confidence levels of teaching shielded metal arc welding (SMAW) skill (n = 143)

Variable	*R*	*R²*	*b*	ß	*t*	*P*	VIF
Characteristics	.53	.29					
Classroom Learning			.503	.176	1.830	.069	1.75
Teacher Demonstration			-.279	-.096	-.839	.403	2.47
Laboratory Practice			.473	.164	1.622	.107	1.96
Real World Application Project			1.302	.415	4.538	.000*	1.59
Student Skill Presentation			-.061	.018	-.178	.859	1.85
(Constant)			1.246		7.706	.000*	

Note. For the model: F(5,136) = 10.846, Adjusted R^2 = 0.259; $p < .05$; *$p < .05$)
Effect size = 0.41 (Large effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Gas Metal Arc Welding (GMAW) Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching gas metal arc welding (GMAW) skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, application project, and student skill presentation). Table 31 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teacher's confidence level to teach GMAW skills. Results indicate that 28% of the variability in the participants' confidence levels can be explained by the model. Additionally, the model was found to have a medium effect size (Cohen's $f = .39$; Soper, 2019). Moreover, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,133) = 10.521$; $p < .05$). This model indicates that the application project teaching method was the variable with the greatest affect ($\beta = 0.406$; $p < 0.001$) on teachers confidence to teach GMAW skills. Followed by laboratory practice ($\beta = 0.248$; $p < 0.05$) and classroom learning ($\beta = 0.134$; $p > 0.05$) teaching methods having a positive effect on confidence levels to teach GMAW skills. Whereas, the teacher demonstration method ($\beta = -0.038$; $p > 0.05$) and student skill presentation ($\beta = -0.129$; $p > 0.05$) teaching methods had a negative effect on the participant's confidence levels to teach GMAW skills. In summary, the independent variables application project and laboratory practice could explain the dependent variable, confidence level to teach GMAW skills. However, the independent variables:

classroom learning, teacher demonstration, and student skill presentation could not explain the dependent variable, confidence level to teach GMAW skills.

Table 31

Relationship of Instructional Curriculum Methods and Confidence Levels of Teaching Gas Metal Arc Welding (GMAW) Skill (n = 143)

Variable	*R*	R^2	*b*	ß	*t*	*p*	VIF
Characteristics	.53	.28					
Classroom Learning			.396	.134	1.381	.169	1.75
Teacher Demonstration			-.116	-.038	-.345	.730	2.30
Laboratory Practice			.731	.248	2.490	.014*	1.84
Real World Application Project			1.352	.406	4.220	.000*	1.72
Student Skill Presentation			-.495	-.129	-1.287	.200	1.87
(Constant)			1.151		6.971	.000*	

Note. For the model: $F(5,133) = 10.521$, Adjusted $R^2 = 0.256$; $p < .05$; $*p < .05$)
Effect size = 0.39 (Medium effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Gas Tungsten Arc Welding (GTAW) Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching gas tungsten arc welding (GTAW) skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, application project, and student skill presentation). Table 32 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teacher's confidence level to teach GTAW skills. Results indicate that 22% of the variability in the participants' confidence levels can be explained by the model. Moreover, the model was found to have a medium effect size (Cohen's f = .28; Soper, 2019). Furthermore, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,136) = 7.687$; $p < .05$). This model indicates that the application project teaching method was the variable with the greatest affect ($\beta = 0.375$; $p < 0.001$) on teachers confidence to teach GTAW skills. Followed by the laboratory practice ($\beta = 0.204$; $p > 0.05$) and teacher demonstration ($\beta = 0.066$; $p > 0.05$) teaching methods having a smaller positive affect on confidence levels to teach GTAW skills. Whereas, the classroom learning teaching method ($\beta = -0.003$; $p > 0.05$) had close to no effect on the dependent variable. While, the student skill presentation ($\beta = -0.080$; $p > 0.05$) teaching method had a negative effect on the participant's confidence levels to teach GTAW skills. In summary, the independent variable, application project could explain the dependent variable, confidence level to teach GTAW skills. However, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation could not explain the dependent variable, confidence level to teach GTAW skills.

Table 32

Relationship of instructional curriculum methods and confidence levels of teaching gas tungsten arc welding (GTAW) skill (n = 143)

Variable	*R*	R^2	*b*	ß	*t*	*p*	VIF
Characteristics	.47	.22					
Classroom Learning			-.008	-.003	-.028	.977	1.85
Teacher Demonstration			.189	.066	.619	.537	1.96
Laboratory Practice			.560	.204	1.914	.058	1.98
Real World Application Project			1.231	.375	3.866	.000*	1.64
Student Skill Presentation			-.313	-.080	-.728	.468	2.09
(Constant)			.833		6.441	.000*	

Note. For the model: F(5,136) = 7.687, Adjusted R^2 = 0.192; $p < .05$; *$p < .05$)
Effect size = 0.28 (Medium effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Plasma Arc Cutting (PAC) Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching plasma arc cutting (PAC) skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, application project, and student skill presentation). Table 33 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teacher's confidence level to teach PAC skills. Results indicate that 18% of the variability in the participants' confidence levels can be explained by the model. Subsequently, 82% of the variability in the participant's confidence levels is explained by unknown variables that were not used in the model. Moreover, the model was found to have a small effect size (Cohen's $f = .22$; Soper, 2019). Additionally, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,136) = 6.091$; $p < .05$). This model indicates that the independent variables with the greatest effect on teacher's confidence to teach PAC include the real world application project ($\beta = 0.211$; $p < 0.05$) and laboratory practice teaching methods ($\beta = 0.228$; $p < 0.05$). Followed by classroom learning ($\beta = 0.190$; $p > 0.05$) having a smaller positive affect on confidence levels to teach PAC skills. While, the student skill presentation ($\beta = -0.048$; $p > 0.05$) and teacher demonstration ($\beta = -0.068$; $p > 0.05$) teaching methods had a negative effect on the participant's confidence levels to teach PAC skills. In summary, the independent variables, application project and laboratory practice could explain the dependent variable, confidence level to teach PAC skills. However, the independent variables: classroom learning, teacher demonstration, and student skill presentation could not explain the dependent variable, confidence level to teach oxygen fuel brazing skills.

Table 33

Relationship of instructional curriculum methods and confidence levels of teaching plasma arc cutting (PAC) skill (n = 143)

Variable	*R*	*R²*	*B*	ß	*t*	*P*	VIF
Characteristics	.43	.18					
Classroom Learning			.593	.190	1.713	.089	2.06
Teacher Demonstration			-.216	-.068	-.610	.543	2.10
Laboratory Practice			.700	.228	2.029	.044*	2.11
Real World Application Project			.749	.211	2.270	.025*	1.44
Student Skill Presentation			-.203	-.048	-.483	.630	1.65
(Constant)			1.132		6.695	.000*	

Note. For the model: F(5,136) = 6.091, Adjusted R^2 = 0.183; $p < .05$; *$p < .05$)
Effect size = 0.22 (Small effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Construction Method Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching construction method skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, application project, and student skill presentation). Table 34 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teacher’s confidence level to teach construction method skills. Results indicate that 13% of the variability in the participants’ confidence levels can be explained by the model. Which means that 87% of the variability in the participant’s confidence levels is explained by unknown variables that were not used in the model. Additionally, the model was found to have a small effect size (Cohen’s $f = .15$; Soper, 2019). Moreover, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,134) = 3.836$; $p < .05$). This model indicates that the application project teaching method was the variable with the greatest affect ($\beta = 0.297$; $p < 0.01$) on teachers confidence to teach construction method skills. Followed by classroom learning ($\beta = 0.192$; $p > 0.05$) and laboratory practice ($\beta = 0.073$; $p > 0.05$) teaching methods having a positive effect on confidence levels to teach construction method skills. Whereas, the student skill presentation ($\beta = -0.043$; $p > 0.05$) and teacher demonstration ($\beta = -0.125$; $p > 0.05$) teaching methods had negative effects on the participant’s confidence levels to teach construction method skills. In summary, the independent variable, application project could explain the dependent variable, confidence level to teach construction method skills. However, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation could not explain the dependent variable, confidence level to teach construction method skills.

Table 34

Relationship of instructional curriculum methods and confidence levels of teaching construction methods skill (n = 143)

Variable	*R*	*R²*	*b*	ß	*t*	*p*	VIF
Characteristics	.35	.13					
Classroom Learning			.560	.192	1.705	.091	1.95
Teacher Demonstration			-.423	-.125	-.963	.337	2.59
Laboratory Practice			.220	.073	.627	.532	2.07
Real World Application Project			1.015	.297	3.136	.002*	1.38
Student Skill Presentation			-.171	-.043	-.404	.687	1.75
(Constant)			1.218		8.413	.000*	

Note. For the model: F(5,134) = 3.836 Adjusted R^2 = 0.093; $p < .05$; $*p < .05$)
Effect size = 0.15 (Small effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Small Gas Engines Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching small gas engines skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, application project, and student skill presentation). Table 35 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teacher's confidence level to teach small gas engines skills. Results indicate that 16% of the variability in the participants' confidence levels can be explained by the model. Subsequently, 84% of the variability in the participant's confidence levels is explained by unknown variables that were not used in the model. Furthermore, the model was found to have a small effect size (Cohen's $f = .19$; Soper, 2019). In addition, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,134) = 4.963$; $p < .05$). This model indicates that the application project teaching method was the variable with the greatest affect ($\beta = 0.334$; $p < 0.01$) on teachers confidence to teach small gas engines skills. Followed by classroom learning ($\beta = 0.129$; $p > 0.05$) and laboratory practice ($\beta = 0.115$; $p > 0.05$) teaching methods having a positive effect on confidence levels to teach small gas engines skills. Whereas, the teacher demonstration ($\beta = -0.084$; $p > 0.05$) and student skill presentation ($\beta = -0.028$; $p > 0.05$) teaching methods had negative effects on the participant's confidence levels to teach small gas engines skills. In summary, the independent variable, application project could explain the dependent variable, confidence level to teach small gas engines skills. However, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation could not explain the dependent variable, confidence level to teach small gas engines skills.

Table 35

Relationship of instructional curriculum methods and confidence levels of teaching small gas engines skill (n = 143)

Variable	*R*	R^2	*B*	ß	*T*	*p*	VIF
Characteristics	.40	.16					
Classroom Learning			.346	.129	1.061	.290	2.34
Teacher Demonstration			-.239	-.084	-.674	.502	2.49
Laboratory Practice			.307	.115	.933	.353	2.40
Real World Application Project			1.034	.334	3.412	.001*	1.52
Student Skill Presentation			-.102	-.028	-.290	.772	1.51
(Constant)			1.021		6.653	.000*	

Note. For the model: F(5,134) = 4.963, Adjusted R^2 = 0.125; $p < .05$; $*p < .05$)
Effect size = 0.19 (Small effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Multi- Cylinder Engines Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of teaching multi- cylinder engines skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, application project, and student skill presentation). Table 36 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teacher's confidence level to teach multi- cylinder engines skills. Results indicate that 27% of the variability in the participants' confidence levels can be explained by the model. Additionally, the model was found to have a medium effect size (Cohen's f = .37; Soper, 2019). Furthermore, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,135) = 9.713$; $p < .05$). This model indicates that the application project teaching method was the variable with the greatest affect ($\beta = 0.466$; $p < 0.001$) on teachers confidence to teach multi- cylinder engines skills. Followed by laboratory practice ($\beta = 0.154$; $p > 0.05$), classroom learning ($\beta = 0.066$; $p > 0.05$), and teacher demonstration ($\beta = 0.054$; $p > 0.05$) teaching methods having a positive effect on confidence levels to teach multi- cylinder engines skills. While the student skill presentation method ($\beta = -0.223$; $p < 0.05$) had a negative effect on the participant's confidence levels to teach multi- cylinder engines skills. In summary, the independent variables, application project and student skill presentation could explain the dependent variable, confidence level to teach multi- cylinder engines skills. However, the independent variables: classroom learning, teacher demonstration, and laboratory practice could not explain the dependent variable, confidence level to teach multi-cylinder engines skills.

Table 36

Relationship of instructional curriculum methods and confidence levels of teaching multi- cylinder engines skill (n = 143)

Variable	*R*	*R²*	*b*	ß	*T*	*p*	VIF
Characteristics	.514	.27					
Classroom Learning			.185	.066	.702	.484	1.64
Teacher Demonstration			.201	.054	.456	.649	2.60
Laboratory Practice			.483	.154	1.472	.143	2.01
Real World Application Project			1.862	.466	5.215	.000*	1.47
Student Skill Presentation			-1.054	-.223	-2.357	.020*	1.64
(Constant)			.868		7.612	.000*	

Note. For the model: $F(5,135) = 9.713$, Adjusted $R^2 = 0.237$; $p < .05$; $*p < .05$)

Effect size = 0.37 (Medium effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Modern Machinery Technology Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of modern machinery technology skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, application project, and student skill presentation). Table 37 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teacher's confidence level to teach modern machinery technology skills. Results indicate that 12% of the variability in the participants' confidence levels can be explained by the model. Subsequently, 88% of the variability in the participant's confidence levels is explained by unknown variables that were not used in the model. Furthermore, the model was found to have a small effect size (Cohen's f = .14; Soper, 2019). However, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,133) = 3.745$; $p < .05$). This model indicates that the application project teaching method was the variable with the greatest affect ($\beta = 0.291$; $p < 0.01$) on teachers confidence to teach modern machinery technology skills. Followed by classroom learning ($\beta = 0.132$; $p > 0.05$), laboratory practice ($\beta = 0.034$; $p > 0.05$), and student skill presentation ($\beta = 0.016$; $p > 0.05$) teaching methods having a positive effect on confidence levels to teach modern machinery technology skills. Whereas, the teacher demonstration method ($\beta = -0.020$; $p > 0.05$) had a negative effect on the participant's confidence levels to teach modern machinery technology skills. In summary, the independent variable, application project could explain the dependent variable, confidence level to teach modern machinery technology skills. However, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation teaching methods could not explain the dependent variable, confidence level to teach modern machinery technology skills.

Table 37

Relationship of instructional curriculum methods and confidence levels of teaching modern machinery technology skill (n = 143)

Variable	*R*	*R²*	*b*	ß	*t*	*p*	VIF
Characteristics	.35	.12					
Classroom Learning			.434	.132	1.382	.169	1.38
Teacher Demonstration			-.111	-.020	-.136	.892	3.30
Laboratory Practice			.151	.034	.309	.758	1.87
Real World Application Project			1.515	.291	3.244	.001*	1.22
Student Skill Presentation			.107	.016	.112	.911	2.92
(Constant)			.910		7.665	.000*	

Note. For the model: F(5,133) = 3.745, Adjusted R^2 = 0.090; $p < .05$; *$p < .05$)
Effect size = 0.14 (Small effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Hydraulics Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of hydraulics skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, application project, and student skill presentation). Table 38 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teacher's confidence level to teach hydraulics skills. Results indicate that 17% of the variability in the participants' confidence levels can be explained by the model. Therefore, 86% of the variability in the participant's confidence levels is explained by unknown variables that were not used in the model. Additionally, the model was found to have a small effect size (Cohen's $f = .20$; Soper, 2019). Furthermore, the regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,135) = 5.705$; $p < .05$). This model indicates that the application project teaching method was the variable with the greatest affect ($\beta = 0.313$; $p < 0.01$) on teachers confidence to teach hydraulics skills. Followed by laboratory practice ($\beta = 0.124$; $p > 0.05$), classroom learning ($\beta = 0.118$; $p > 0.05$), and teacher demonstration ($\beta = 0.073$; $p > 0.05$) teaching methods having a positive effect on confidence levels to teach hydraulics skills. Whereas, the student skill presentation method ($\beta = -.133$; $p > 0.05$) had a negative effect on the participant's confidence levels to teach hydraulics skills. In summary, the independent variable, application project could explain the dependent variable, confidence level to teach modern hydraulics skills. However, the independent variables: classroom learning, teacher demonstration, laboratory practice, and student skill presentation teaching methods could not explain the dependent variable, confidence level to teach hydraulics skills.

Table 38

Relationship of instructional curriculum methods and confidence levels of teaching hydraulics skill (n = 143)

Variable	*R*	*R²*	*b*	ß	*t*	*P*	VIF
Characteristics	.42	.17					
Classroom Learning			.383	.118	1.088	.279	1.94
Teacher Demonstration			.293	.073	.594	.553	2.47
Laboratory Practice			.390	.124	1.029	.305	2.37
Real World Application Project			1.331	.313	3.472	.001*	1.33
Student Skill Presentation			-.659	-.133	-1.262	.209	1.82
(Constant)			4.267		5.095	.000*	

Note. For the model: F(5,135) = 5.705, Adjusted R^2 = 0.144; $p < .05$; *$p < .05$)
Effect size = 0.20 (Small effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

Relationship of Confidence levels of Teaching Pneumatics Skills and Teaching Methods

Simultaneous multiple linear regressions were used to explain the relationship between the dependent variable, confidence level of pneumatics skills and the independent variables, teaching methods (classroom learning, teacher demonstration, laboratory practice, application project, and student skill presentation). Table 39 displays the regression model that depicts the teaching methods found to be significant in the regression equation for the participating teacher's confidence level to teach pneumatics skills. Results indicate that 29% of the variability in the participants' confidence levels can be explained by the model. Furthermore, the model was found to have a large effect size (Cohen's $f = .41$; Soper, 2019). The regression line predicted by these independent variables does explain a significant amount of the variance in the dependent variable ($F(5,134) = 10.678$; $p < .05$). This model indicates that the application project teaching method was the variable with the greatest positive affect ($\beta = 0.428$; $p < 0.001$) on teachers confidence to teach pneumatics skills. Followed by laboratory practice ($\beta = 0.322$; $p < 0.05$) and classroom learning ($\beta = 0.184$; $p > 0.05$) teaching methods having a positive effect on confidence levels to teach pneumatics skills. Whereas, the student skill presentation method ($\beta = -0.284$; $p < 0.05$) and teacher demonstration ($\beta = -0.026$; $p > 0.05$) teaching methods had a negative effect on the participant's confidence levels to teach pneumatics skills. In summary, the independent variables that could explain the dependent variable, confidence level to teach modern pneumatics skills include laboratory practice, application project, and student skill presentation. While, the independent variables: classroom learning and teacher demonstration teaching methods could not explain the dependent variable, confidence level to teach pneumatics skills.

Table 39

Relationship of instructional curriculum methods and confidence levels of teaching pneumatics skill (n= 143)

Variable	*R*	R^2	*B*	ß	*t*	*P*	VIF
Characteristics	.53	.29					
Classroom Learning			.746	.184	1.746	.083	2.073
Teacher Demonstration			-.143	-.026	-.161	.873	5.057
Laboratory Practice			1.444	.322	2.587	.011*	2.900
Real World Application Project			2.317	.428	4.612	.000*	1.615
Student Skill Presentation			-1.921	-.284	-2.160	.033*	3.232
(Constant)			.619		6.229	.000*	

Note. For the model: $F(5,134) = 10.678$, Adjusted $R^2 = 0.258$; $p < .05$; $*p < .05$)
Effect size = 0.41 (Medium effect; Koltrik & Williams, 2003).
Teaching Methods Coded: No = 0, Yes = 1.

CHAPTER X

Summary, Conclusions, Implications, and Recommendations

Summary

Chapter Five contains the summary, conclusions, implications, and recommendations for each research question analyzed during this study. Additionally, the researcher offers recommendations for future research.

Purpose of the Study

The purpose of this study was to examine the confidence levels of entry year, Texas Agriculture, Food, and Natural Resources teachers that attended the VATAT professional development conference new teacher workshop regarding the instruction of agricultural mechanics related Texas Essential Knowledge and Skills (TEKS) and determine their level of university preparation to teach these agricultural mechanics related TEKS.

Research Questions

1. What are the personal, professional, & program demographics of entry year Texas Agriculture, Food, and Natural Resources (AFNR) teachers in regards to agricultural mechanic related Texas Essential Knowledge and Skills (TEKS)?
2. What are the confidence levels of entry year, Texas AFNR teachers regarding the instruction of agricultural mechanics related TEKS?
3. What knowledge and skills did entry year, Texas AFNR teachers learn while a student in their agricultural mechanics university courses?

4. What teaching methods were used to teach entry year, Texas AFNR teachers agricultural mechanics related knowledge and skills in their university agricultural mechanics courses?
5. What professional development format would be the most beneficial in assisting entry year, Texas AFNR teachers regarding the instruction of agricultural mechanics related TEKS?
6. Can teaching methods used at the university level to instruct agricultural mechanics curriculum to entry year, Texas AFNR teachers explain their confidence levels to teach agricultural mechanics related skills?

Summary of Findings

Research Question One

Research question one was designed to describe the personal, professional, and program demographics of participating Texas, entry year AFNR teachers in attendance of the 2018 VATAT professional development conference's first year teacher workshop (*n* = 143). These teachers were predominantly white/ non- Hispanic (*n* = 120; 83.90%), not married (*n* = 87; 61%), female (*n* = 91; 64%), and on average were 26 years of age. The majority of participants were FFA members (*n* = 133; 93%) as a student in high school, while less than 50% were 4H members (*n* = 66; 46%). Additionally, 53% (*n* = 76) of participating teachers completed an agricultural mechanics course while in high school.

Participants indicated that they have a bachelor's degree (*n* = 126; 88%), with a major in Agriculture Education (*n* = 63; 44.10%), completed a traditional certification program (*n* = 96; 67%), no previous agricultural mechanics work experience (*n* = 98; 69%), and had completed nine university semester credit hours of agricultural mechanics courses (*M* = 9.40). When participants were asked about program demographics concerning their current teaching job they indicated that the majority do receive a stipend for FFA advisor duties (*n* = 92; 64%); however, many indicated that they do not receive a stipend in lieu of an extended contract (*n* = 90; 63%). Furthermore, the average contract length of participants was 222 days (*M* = 222.19). The majority of participating teachers further indicated that they teach in a rural community (*n* = 83; 58%). Lastly, there was a similar amount of participants teaching at all six of the UIL size schools, with the majority of participants teaching at 3A schools (*n* = 37; 26%).

Research Question Two

Research question two was designed to understand the confidence levels of entry year AFNR teachers regarding the instruction of agricultural mechanics related TEKS. The 24 curriculum areas utilized for this study included: Employability/Career Skills, Supervised Agricultural Experiences (SAE), Hand Tools, Handheld Power Tools, Stationary Power Tools, Electrical, Plumbing, Concrete, Carpentry, Fencing, Cold Metal, Oxygen/Fuel Cutting, Oxygen/Fuel Welding, Oxygen Fuel Brazing, Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW), Gas Tungsten Arc Welding (GTAW), Plasma Arc Cutting (PAC), Construction Methods, Small Gas Engines, Multi-Cylinder Engines, Modern Machinery Technology, Hydraulics, and Pneumatics. Participants (*n* = 143) were asked how confident they are in teaching agricultural related curriculum areas to their students based on the scale: 0 = No Confidence, 1 = Little Confidence, 2 = Some Confidence, 3 = Moderate Confidence, and 4 = High Confidence.

The skill areas that a large portion of participating teachers indicated that they have high confidence in teaching: *Employability/Career Skills* (*f* = 68; 47.60%), *Hand*

Tools Skills (*f* = 67; 46.90%), *Handheld Power Tools Skills* (*f* = 54; 37.80%), *Stationary Power Tools skills* (*f* = 50; 35.00%). At the other extreme, teachers indicated a high percentage of no confidence in teaching the following skills: *Pneumatics Skills* (*f* = 80; 55.90%), *Hydraulics Skills* (*f* = 66; 46.20%), and *Modern Machinery Technology Skills* (*f* = 65; 45.50%), *multi-cylinder engines skills* (*f* = 55; 38.50%). The other skill areas did not show extreme frequencies for individual confidence level scales.

Participants were asked to rate their personal confidence level in teaching agricultural related curriculum areas to their students based on the following scale: 0 = No Confidence, 1 = Little Confidence, 2 = Some Confidence, 3 = Moderate Confidence, and 4 = High Confidence. The mean confidence levels were broken up in the following categories: No Confidence = 0.00 – 0.50, Little Confidence = .51 – 1.50, Some Confidence = 1.51 – 2.50, Moderate Confidence = 2.51 – 3.50, High Confidence = 3.51 – 4.00. Participants indicated that the five skills with the highest confidence level means were: *Hand Tools Skill* (*M* = 3.12; *SD* = 1.05), *Employability/Career Skills* (*M* = 3.12; SD = 1.10), *Handheld Power Tools Skill* (*M* = 2.82; *SD* = 1.18), and *Stationary Power Tools Skill* (*M* = 2.63; *SD* = 1.28). While the five skill areas that were described with the lowest mean confidence levels included: *Multi- Cylinder Engines Skill* (*M* = 1.18; *SD* = 1.27), *Modern Machinery Skill* (*M* = 1.11; *SD* = 1.29), *Hydraulics Skill* (*M* = 1.06; *SD* = 1.28, and *Pneumatics Skill* (*M* = .89; *SD* = 1.26). It is important to note that the skill areas that were indicated by participants in having the highest confidence were only ranked as moderately confident.

Research Question Three

Research question three sought to analyze the knowledge and skill areas taught to entry year, Texas AFNR teachers while students in their agricultural mechanics university courses. The 24 curriculum areas that this question focused on included: Employability/Career Skills, Supervised Agricultural Experiences (SAE), Hand Tools, Handheld Power Tools, Stationary Power Tools, Electrical, Plumbing, Concrete, Carpentry, Fencing, Cold Metal, Oxygen/Fuel Cutting, Oxygen/Fuel Welding, Oxygen Fuel Brazing, Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW), Gas Tungsten Arc Welding (GTAW), Plasma Arc Cutting (PAC), Construction Methods, Small Gas Engines, Multi-Cylinder Engines, Modern Machinery Technology, Hydraulics, and Pneumatics. Participants (*n* = 143) were asked if they were taught each of these skills in their university agricultural mechanics courses.

Participants indicated that the top five skill areas that were taught the most in university agricultural mechanics courses included: *Employability/Career Skills* (*n* = 124; 86.70%), *Hand Tools Skill* (*n* = 116, 81.10%), *Handheld Power Tools Skill (n* = 116, 81.10%), *Stationary Power Tools Skill* (*n* = 114; % = 79.70), and *Oxygen/Fuel Cutting Skill* (*n* = 104; 72.70%). Whereas the five skill areas that were taught the least in university agricultural mechanics courses included: *Concrete Skill* (*n* =52; 36.40%), *Fencing Skill* (*n* = 52; 36.40%), *Hydraulics Skill* (*n* = 43; 30.10%), *Modern Machinery Technology Skill* (*n* = 38; 26.60%), and *Pneumatics Skill (n* = 24; 16.80%).

Research Question Four

Research question four was designed to identify the teaching methods used to teach entry year AFNR teachers agricultural mechanics knowledge and skills, in their university, undergraduate agricultural mechanics courses. The 24 curriculum areas that this question focused on included: Employability/Career Skills, Supervised Agricultural Experiences (SAE), Hand Tools, Handheld Power Tools, Stationary Power Tools, Electrical, Plumbing, Concrete, Carpentry, Fencing, Cold Metal, Oxygen/Fuel Cutting, Oxygen/Fuel Welding, Oxygen Fuel Brazing, Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW), Gas Tungsten Arc Welding (GTAW), Plasma Arc Cutting (PAC), Construction Methods, Small Gas Engines, Multi-Cylinder Engines, Modern Machinery Technology, Hydraulics, and Pneumatics. For each of these skills, participants were asked which teaching methods were used to teach them that skill during their university agricultural mechanics courses. The five teaching method options given to the participants were: classroom learning, teacher demonstration, laboratory practice, projects, and student presentation. The participants (*n* = 143) were instructed to mark all of the teaching methods used to teach them each of the given skills.

Participants indicated that the three skill areas that were taught to them using the classroom learning teaching method the most were: *Employability Career Skills* (*n* = 97; 67.80%), *Supervised Agricultural Experience Skill (n* = 79; % = 55.20), and *Oxygen/Fuel Cutting Skill* (*n* = 68; 47.60%). Regarding the teacher demonstration teaching method, the three skill areas that utilized this method the most were: *Oxygen/Fuel Cutting Skill* (*n* = 65; 45.50%), *Oxygen/Fuel Welding Skill* (*n* = 59; 41.30%), *Stationary Power Tools Skill* (*n* = 59; 41.30%). Furthermore, the three skill areas that were taught to participants using the laboratory practice method the most included: H*andheld Power Tools Skill* (*n* = 89; 62.20%), *Oxygen/Fuel Cutting Skill* (*n* = 86; 60.10%), and *Hand Tools Skill* (*n* = 85; 59.40%). Additionally, the three skill areas that were taught to participating teachers by using the application project teaching method the most were: *Employability/Career Skills* (*n* = 66; 46.20%), *Hand Tools Skills* (*n* = 57; 39.90%), and *Handheld Power Tools Skills* (*n* = 51; 35.70%). Lastly, participants noted that the three skill areas that were taught to them using the student skill presentation teaching method the most were *Oxygen/ Fuel Cutting Skills* (*n* = 36; 25.20%), *Employability/Career Skills* (*n* = 34; 23.80%), and *Handheld Power Tools Skill* (*n* = 34; 23.80%).

Research Question Five

Research question five focused on the professional development format that entry year, Texas AFNR teachers prefer regarding agricultural mechanics related curriculum. Participants (*n* = 143) were given 13 professional development formats and were instructed to choose all of the choices that they felt would be beneficial to them. The professional development formats provided included: a two-hour VATAT workshop; three week long summer workshops; informal online video workshops (i.e. YouTube); Monday, all day VATAT workshop; multi-day, during summer workshops; an online, university course; a single day, during the school year workshop; a single day, during the summer workshop; a formal, semester long university course; a week long, during the school year workshop; a week long, during the summer workshop; a winter break, during the school year workshop; and a workshop during stock shows. Respondents indicated that the top five professional development formats that would be the most beneficial were: *multi-day, during summer* (*n* = 75; % = 52.40), *two hour VATAT workshop* (*n* = 61;

% = 42.70), *Monday, all day VATAT workshop* (*n* = 53; % = 37.10), *single day, during summer* (*n* = 38; % = 26.60), and *week long, during summer* (*n* = 37; % = 25.90). Whereas, the bottom five professional development formats that respondents indicated as the least beneficial included: *single day, during school year* (*n* = 16; % = 11.20), *online, university course* (*n* = 15; % = 10.50), *winter break, during school year* (*n* = 10; % = 7.00), *workshop during stock shows* (*n* = 9; % = 6.30), and *week long, during school year* (*n* = 9; % = 6.30).

Research Question Six

Research question six sought to determine if teaching methods used at the university level to instruct agricultural mechanics curriculum to entry year, Texas AFNR teachers could explain their confidence levels to teach agricultural mechanics related skills. To address this question, a multiple linear regression was used. More specifically, the forced entry (enter) method was used to determine if the independent variables (teaching methods; i.e. classroom learning, teacher demonstration, laboratory practice, real world application project, student skill presentation) could explain the dependent variable (confidence levels; i.e. no confidence, little confidence, some confidence, moderate confidence, high confidence). A simultaneous Multiple Linear Regression was used to determine if the independent variables (Teaching methods) could describe the dependent variable (Confidence Levels) for each skill area addressed in this study.

The model indicated that for the confidence levels to teach employability and career skills, the independent variable, application project was found to be statistically significant in explaining the proportion of variance (R^2 = .12). For the confidence to teach the supervised agricultural experience (SAE) skills, no independent variables in the model were found to be significant in explaining the proportion of variance (R^2 = .07). Whereas, the confidence to teach hand tools skills could be explained by one of the independent variables, application project (R^2 = .10). In addition, the independent variable, application project was found to be significant in explaining the proportion of variance for the confidence levels of teaching handheld power tool skills (R^2 = .16). For the confidence to teach stationary power tools skills, only one independent variable, application project was found to be significant in explaining the proportion of variance (R^2 = .13). Furthermore, for the confidence to teach electrical skill only one independent variable, application project was found to be significant in explaining the dependent variable (R^2 = .07). Results indicated that the confidence to teach plumbing skills, the independent variable, application project was found to be significant in explaining the proportion of the variance (R^2 = .18). Additionally, the confidence level to teach concrete skills could be explained by the independent variable, application project (R^2 = .13). Whereas, for confidence to teach carpentry skills, the independent variables, laboratory practice and application project were found to be significant in explaining the proportion of variance (R^2 = .13).

Furthermore, for the confidence to teach fencing skills, only one independent variable, application project teaching method, was found to be significant in explaining the proportion of variance (R^2 = .12). In addition, for the confidence level to teach cold metal skills the independent variable, application project, was found to be significant in explaining the proportion of the variance (R^2 = .20). The variance found within the model for the confidence to teach oxygen fuel cutting skills, could be explained by the application project teaching method (R^2 = .23). The model indicated that for the confidence levels to teach oxygen fuel welding skills, the independent variable, application project, was found to be significant in explaining the variance in the dependent variable (R^2 = .19). Moreover, the application project teaching method was the only independent variable found to be significant in explaining the variance in the confidence levels to teach oxygen fuel brazing (R^2 = .14). In addition, for the confidence levels to teach shielded metal arc welding (SMAW) skills, the independent variable, application project was found to be significant in explaining the variance in the dependent variable (R^2 = .29). Whereas, the independent variables, laboratory practice and application project teaching methods were found to be significant in explaining the variance in the confidence levels to teach gas metal arc welding (GMAW) skills (R^2 = .28). While, for the confidence levels to teach gas tungsten arc welding (GTAW) skills, the independent variable, application project, was significant in explaining the proportion of the variance (R^2 = .22).

Results indicated that for the confidence levels to teach plasma arc welding (PAC), the independent variables, laboratory practice and application project, were found to be significant in explaining the variance found in the dependent variable (R^2 = .18). Furthermore, the independent variable, application project were found to be significant in explaining the variance in the confidence levels to teach construction method skills (R^2 = .13). In addition, the independent variable, application project was also found to be significant in explain the variance in the confidence levels to teach small gas engine skills (R^2 = .16). The model indicated that for the confidence levels to teach multi- cylinder engine skills, the independent variable, application project and student skill presentation was found to be significant in explaining the variance in the dependent variable (R^2 =

.27). Whereas, the application project teaching method was the only independent variable found to be significant in explaining the variance in the confidence levels to teach modern machinery technology skills (R^2 = .12). Moreover, the application project was found to be significant in explain the variance in confidence levels to teach hydraulics (R^2 = .17). Lastly, the variance found within the model for the confidence levels to teach pneumatics can be explained by the independent variables, laboratory practice, application project, and student skill presentation (R^2 = .29).

Conclusions and Implications

The following section is comprised of conclusions and implications that were made based on the results from each of the research questions within this study. Regarding research question one, an evaluation of the participant's personal, professional, and program demographics was conducted. Results from research question two were used to identify the confidence levels of entry year, Texas AFNR teachers regarding the instruction of agricultural mechanics related curriculum. Research question three determined the knowledge and skill areas taught to entry year, Texas AFNR teachers while a student in their university agricultural mechanics courses. Whereas, research question four identified the teaching methods used to teach agricultural mechanics knowledge and skills to Texas, entry year AFNR teachers during their university agricultural mechanics courses. Responses regarding research question five identified the professional development formats preferred by Texas, entry year AFNR teachers regarding agricultural mechanics. Lastly, research question six described if teaching methods used at the university level to instruct agricultural mechanics curriculum to entry year, Texas AFNR teachers could explain entry year AFNR teachers' confidence levels to teach agricultural mechanics skill areas. Conclusions and implications were developed based from the results of each research question.

Research Question One

Results concerning research question one described the personal, professional, and program demographics of participating Texas, entry year AFNR teachers. Based upon the results from this study, most entry year, Texas AFNR teachers were female, 26 years old, and not married. Additionally, the majority of participants were FFA members and completed an agricultural mechanics course as a high school student. These teachers possess a bachelor's degree, majored in agricultural education, were traditionally certified, completed nine university semester credit hours of agricultural mechanics course work, and have no agricultural mechanics work experience prior to teaching.

A review of literature indicated a drastic shift in the gender of agricultural science teachers over the last several decades. Literature reports that the majority of school based agricultural science teachers were predominantly male from the 1980s to the early 2000s, during the 2000s it became more common for women to become AFNR teachers (Cano & Garton, 1994; National Research Council (US), 1988; Saucier & McKim, 2011 ;Wigenbach, McIntosh, & Degenhart, Pannkuk, & Kujawski, 2007). Specifically, in Texas, K. Jones (personal communication, February 13, 2017) reported that the 2018-2019 VATAT membership consisted of 43% female and 57% male. Additionally, the results from this study indicated that 64% of the participating Texas, entry year AFNR teachers were female. Due to this shift in gender, major questions arose that need to be addressed. Is gender an influential factor that affects the confidence levels of teachers to teach agricultural mechanics knowledge and skills to high school students? Should gender be considered when university agricultural education educators prepare teachers to teach agricultural mechanics curriculum? Should university educators acknowledge gender when considering the teaching methods used to instruct agricultural mechanics skills to pre-service teachers? Lastly, should professional development providers consider designing workshops for a growing population of female AFNR teachers as opposed to their male counterparts? The results from this study indicated that 67% of the participating teachers were traditionally certified; however, literature states that hiring alternatively certified AFNR teachers is becoming more common due to a shortage of traditionally certified teachers (Bowling & Ball, 2018; Duncan & Rickets, 2008; Rocca & Washburn, 2006; Roberts & Dyer, 2004 Robinson & Edwards, 2012). It is commonly assumed that traditionally prepared teachers are better prepared in pedagogical techniques than those that are alternatively certified (Robinson & Edwards, 2012). However, some major questions that researchers have may include: Are alternatively certified teachers a solution to current teacher shortages or more of problem than a solution? Is there a difference in the curriculum that is being taught by traditionally and alternatively certified AFNR teachers to high school students? Is there a difference between the competency and mastery levels of students that are taught by traditionally certified teachers versus alternatively certified teachers in Texas? More specific questions regarding teacher efficacy to teach agricultural mechanics curriculum, that need to be addressed include: Do confidence levels to teach specific agricultural mechanics skills vary between traditionally and alternatively certified AFNR teachers? Furthermore, are there different professional development needs between traditionally and alternatively certified teachers in regards to teaching a large range of agricultural mechanics skills? What kind of educational backgrounds do alternatively certified teachers in Texas have? Do traditionally certified and alternatively certified AFNR teachers share the same amount of teacher efficacy in regards to teaching agricultural mechanics curriculum? Also, do these two groups of teachers have different opinions on professional expectations of an AFNR teacher?

Research Question Two

Research question two sought to identify the confidence levels of Texas, entry year AFNR teachers regarding the instruction of agricultural mechanics related curriculum. Participating teachers indicated moderate confidence in teaching the following skills: employability/career skills, hand tools skills, handheld power tools skills, and stationary power tools skills to their students. However, participants also indicated no confidence in teaching: pneumatics skills, hydraulics skills, modern machinery technology skills, and multi- cylinder engines. According to TEA (D, n.d.) the skills that should be taught in agricultural mechanic’s courses should include: electrical wiring, plumbing, concrete construction, carpentry, fencing, hot and cold metal techniques, and power systems. Since students are expected to learn a large range of skills, it is imperative that their teachers are confident in performing and teaching students these skills. If the teacher is not prepared properly to teach these skills, it is the student’s career future that could be impacted the most. Furthermore, in order to ensure an effective and safe learning environment while teaching agricultural mechanics skills, the teacher must be knowledgeable and competent in teaching the content and managing the laboratory (Saucier, Vincent, & Anderson, 2014).

Based on the results from our study, several questions arose that need to be addressed. Why are entry year teacher's moderately confident in teaching employability/career skills, hand tools skills, handheld power tools skills, and stationary power tools, while lacking confidence in teaching pneumatics skills, hydraulics skills, modern machinery technology skills, and multi-cylinder engines skills? Is there a way to better prepare future teachers with agricultural mechanics experiences prior to college? Is there anything university teacher preparation programs can do to remediate pre-service teachers confidence levels? What can be done to improve the confidence levels of existing teachers? Lastly, were participants taught these more technical skills, in which they had no confidence in teaching, during their university agricultural mechanics courses? Is a lack of confidence in teaching certain skill areas due to a lack of university preparation or a lack of perceived importance on that subject from the learner's perspective? What can teacher preparation programs, university agricultural mechanics course professors, and professional development providers do to increase the confidence levels of teachers to teach agricultural mechanics skills to high school students?

Research Question Three

Research question three sought to identify the knowledge and skill areas taught to entry year, Texas AFNR teachers while students in their university agricultural mechanics courses. A high percentage of participants indicated that they were taught employability/career skills, hand tools skills, handheld power tools skills, stationary power tools skills, and oxygen/fuel cutting skill during their university courses. Whereas, participants also indicated low percentages of being taught concrete skills, fencing skills, hydraulics skills, modern machinery technology skills, and pneumatics. According to

American Association for Agricultural Education National Research Agenda (Roberts, Harder, and Brashears, 2016), the range of subjects that pertain to agriculture has expanded and our agricultural education programs need to provide students with the skills needed to fill industry positions has increased. In order to adequately teach these students the skills needed for a wide array of industry jobs, our school-based teachers must be properly prepared to teach the associated curriculum. It is possible that AFNR teachers will not expose information and promote interest in a subject if they were never taught it in their university courses or professional development workshops. Several implicative questions can be created from the results of this study. Why did university agricultural mechanics instructors choose to instruct certain curriculum areas and not others? Is this because of a specific specialization of the professor? Could it be that the agricultural education preparation programs have a limited budget and small laboratory size that limits teaching certain skill areas? Are the skills that are taught limited due to a lack of experienced faculty? Are limitations on the skills that are taught in agricultural mechanics courses limited due to technology accessibility at the university level? Does the instructor simply not think that the certain curriculum is important enough to teach? Are certain skill areas not being taught simply because there is not enough time in scope of a students' degree plan? According to Texas Higher Education Coordinating Board (2009), the 120 Hour Statute, Texas Education Code Section 61.0515, states that students starting in the fall of 2008, completing a baccalaureate degree program in Texas, can no longer take more than 120 credit hours. With the decreased maximum credit hours that students can take, has the quality of a baccalaureate degree diminished? Moreover, is there a statistically significant relationship between confidence levels of entry year AFNR teachers to teach agricultural mechanics curriculum and the curriculum being taught in their university courses? These topics needs to be further researched.

Research Question Four

Research question four sought to identify the teaching methods that were used to teach participating Texas, entry year AFNR teacher's agricultural mechanics curriculum in their university agricultural mechanics courses. Participants indicated that only two skill areas (employability/career skills and Supervised Agricultural Experience) had higher than 50% of the teachers being taught by the classroom learning method. Additionally, the highest skill area that was taught using the teacher demonstration method was oxygen-fuel cutting, with only 46% of participants indicated that it was utilized to teach that skill. For the laboratory practice teaching method, participants noted percentages as high as 62% for handheld power tools and as low as 8% for pneumatics. In regards to the application project, participants did not indicate any skill area that was taught using this method more than 46% (employability/career skills). Lastly, oxygen/fuel cutting was the skill that was taught using the student skill presentation method the most, with only 25% of respondents being taught by this method. During this study, researchers evaluated the teaching methods used to teach these teachers, but what teaching methods are the most effective in preparing pre-service teachers? Are the methods currently being used beneficial in producing confident teachers who can teach agricultural mechanics curriculum skills? Why are these instructional methods being used to teach these skills at the university level? Are there other instructional methods that should be utilized when teaching agricultural mechanics curriculum to pre-service teachers?

Research Question Five

Research question five was designed to describe the professional development format that entry year, Texas AFNR teachers preferred regarding agricultural mechanics knowledge and skills. A review of literature has indicated a variety of research on what agricultural mechanics skills professional development should focus on; however, there is limited research on teacher preferences of professional development length, time of the year, or its effectiveness.

Results from other sections of this study indicated that participants have little to no confidence in several of the skill areas and the majority of participants were not taught some of these same skills in their university agricultural mechanics courses (i.e. gas tungsten arc welding, oxygen/fuel brazing, multi-cylinder engines, concrete, hydraulics, modern machinery technology, and pneumatics). Furthermore, ones confidence in their own abilities is extremely important when teaching students how to perform tasks that could be potentially dangerous to themselves as well as others (McKim & Saucier, 2013). Professional development can be a way to provide teachers with experiences and information that could in return improve their competence in regards to safely teaching specific curriculum and skills that should be taught in secondary agricultural mechanics courses (McKim & Saucier).

Out of the 13 professional development formats identified by this study, only the multi-day during summer workshop format resulted in more than 50% of respondents preferring that format. This indicates that entry year AFNR teachers do not prefer most of the professional development formats provided in this study. Why do entry year teachers not prefer any format of professional development? Is it because they do not yet realize that they need further training? Are they overwhelmed with their AFNR teacher duties so much that they do not feel like they have time for professional development? According to Huberman's Professional Life Cycle of Teachers (1989), the phase where teachers enter the profession (first three years) consist of two themes: the *survival* theme and *discovery* theme. The *survival* theme consists of struggling with reality-shock, balancing professional responsibilities and daily classroom tasks, as well as limited instructional materials (Huberman). Additionally, the *discovery* theme describes the enthusiasm of having a classroom, materials, and students. Individuals either experience both, one, or none of these themes (Huberman). Therefore, it is likely that the entry year teachers that participated in this study are still in the early stages of the *survival* and *discovery* themes of their teacher life cycle. There are further questions about this topic that need to be addressed. Are there any other professional development delivery methods not listed in this study that entry year AFNR teachers who instruct agricultural mechanics courses would prefer more? How can professional development providers deliver convenient, yet beneficial education, to entry year AFNR teachers in regards to agricultural mechanics curriculum?

Research Question Six

Research question six was designed to determine if teaching methods used at the university level to instruct agricultural mechanics curriculum to entry year, Texas AFNR teachers could explain their confidence levels to teach agricultural mechanics related skills. The results indicated that four of the twenty-four skill areas, confidence levels could be explained by the laboratory practice teaching method. These skill areas included: carpentry, GMAW, PAC, and pneumatics. Whereas, the student skill presentation teaching method had a significant negative affect when explaining the confidence levels to teach multi-cylinder engines skills and pneumatics. Is this because these skills are more technical and should be taught be using methods were the instructor is doing the majority of the teaching? Furthermore, the skill areas where the application project was statistically significant in explaining the confidence levels to teach 23 out of the 24 skill areas should continue to be evaluated. This teaching method significantly explained the confidence levels to teach all of the skill areas except supervised agricultural experiences skills. Why were the majority of the participants' in this study not taught these agricultural mechanics skills by the application project method? Is it feasible and/or possible to incorporate more application projects into the curriculum of university agricultural mechanics courses? What type of application projects should be used to teach agricultural mechanics curriculum (class projects, small group projects, or individual projects)? Furthermore, many of the models could only explain a small percentages of the variability in the participants' confidence levels for each of the agricultural mechanics skill areas. However, some models could explain more of the variability in the participant's confidence levels for teaching each of the agricultural mechanics skill areas. For example, the pneumatics and SMAW models both could explain 29% of the variability in the participants' confidence levels to teach these skill areas. For each of these skill areas what other variables could explain the remaining variance in the participants' confidence?

Recommendations

The following recommendations were formulated based on the results indicated by Texas, entry year AFNR teachers in regards to their confidence levels and university preparation to teach agricultural mechanics skills to high school students. Recommendations were offered to teacher educators, agricultural education faculty, student teacher mentors, state legislature, and state agriculture teachers professional organizations, and pre-service teachers.

Research Question One

Research question one sought to identify the personal, professional, and program demographics of participating Texas, entry year AFNR teachers. It is important that researchers, professional development providers, and university teacher education faculty are familiar with the demographics and backgrounds of Texas AFNR teachers. Teacher certification programs and gender trends are changing demographics that need to be addressed. Based on the demographics of this study and a review of literature, it is becoming more common for females to become AFNR teachers (Cano & Garton, 1994; National Research Council (US), 1988; Saucier & McKim, 2011; Wigenbach, McIntosh, Degenhart, Pannkuk, & Kujawski. 2007). With this emerging trend, further research needs to be conducted in order to determine if gender has a strong effect on confidence levels to teach agricultural mechanics skills to high school students. Furthermore, studies should be conducted by agricultural education instructors and education agencies to determine if various teaching methods should be used to instruct agricultural mechanics curriculum to women in university courses and in professional development during conferences, university workshops, or local school district workshops.

Are alternatively certified teachers a solution to current teacher shortages or more of a problem? Bowling and Ball (2018) reported that many alternatively certified teachers are knowledgeable in the technical skills within their specific field or training; however, are lacking the pedagogical training and program management skills. Furthermore, some evidence shows that both groups of teachers have similar professional development needs. However, it is difficult to distinguish if the participants were able to fully identify all of their professional development needs accurately (Bowling & Ball). Further research should be conducted to evaluate if there is a difference in the curriculum that is being taught by traditionally and alternatively certified AFNR teachers to high school students. Another topic that has not been addressed is the competency and mastery levels of students who are taught by traditionally certified teachers versus alternatively certified teachers in Texas. Furthermore, Robinson and Edwards (2012) conducted a study in which they sought to compare the self-efficacy of first year traditionally and alternatively certified Oklahoma AFNR teachers at the beginning and end of their first year of teaching. They concluded that both groups of teachers had increased levels of self-efficacy in student engagement, instructional practices, and classroom management throughout the school year (Robinson & Edwards, 2012). The traditionally certified teachers had higher beginning scores in two of the three constructs. Additionally, it was concluded that alternatively certified teachers experienced the most growth in perceived self-efficacy from the beginning to end of the school year. However, alternatively certified teachers did not receive the highest scores based on university supervisor's assessments. Furthermore, traditionally certified teachers were more likely to remain in the teaching profession than their alternatively certified counterparts (Robinson & Edwards). Duncan and Ricketts (2008) found that Georgia's traditionally certified agricultural teachers indicated more self-efficacy in technical content knowledge than alternatively certified teachers. However, the researcher recommended professional development for both groups of teachers. It is recommended by the researcher that additional research be conducted to determine if there is a difference in the professional development needs and teacher efficacy levels between traditionally and alternatively certified teachers in regards to teaching agricultural mechanics skills.

Research Question Two

Research question two sought to identify the confidence levels of Texas, entry year AFNR teachers regarding the instruction of agricultural mechanics related curriculum. Based upon the results of this study, recommendations for practical solutions and further research is offered by the researcher. Boone and Boone (2007) noted that many beginning teachers struggle with developing a course of instruction, self- confidence, time management, and class preparations. Therefore, these problems need to be addressed or they could build up and convince a teacher that they are not an adequate teacher, resulting in them switching profession.

Self-efficacy involves an individual's personal judgements of his or her own capabilities (Bandura, 1997). According to Bandura (1986), self-efficacy influences an individual's decisions, behaviors, amount of determination, reactions to obstacles and difficulties, as well as the overall level of achievement they accomplish. Furthermore, beliefs that an individual has about their own confidence and abilities to teach agricultural mechanics, can influence how well they teach the content to their students (Shultz, Anderson, Shultz, & Paulsen, 2014). Additionally, when identifying the confidence levels of teachers to teach agricultural mechanics skills, it is also important to remember Ericsson's Theory of Expertise, since *Expertise* refers to the characteristics, skills, and knowledge that differentiates experts and those with less experience (Ericsson, Charness, Feltovich, & Hoffman, 2006). In almost every domain, including agriculture education, methods of effective training and instruction run parallel with relevant knowledge and techniques (Ericson & Charness, 1994). Furthermore, in order to better teach a student, or Agriculture, Food, and Natural Resource (AFNR) teacher to master a skill, it is important to understand the requirements that first must be met. Moreover, when educating future AFNR teachers, it is crucial to understand that adults learn differently than children (Knowles, 2015). Knowles' Theory of Andragogy focuses on adult learners and is centered on the fact that most adults learn best when they are involved in the methods, content, timing, and reflection of their own learning. Additionally, adult learners are more motivated to learn if they know why that information or skill is important and how it benefits them. Concluding a review of literature, there is a lack of research that has been conducted on the confidence levels of AFNR teachers to teach specific agricultural mechanics skills. Wigenbach, White, Degengart, Pannkuk, & Kujawski (2007) identified the knowledge and teaching comfort levels of pre- service AFNR teachers to teach eight curriculum areas. Wigenbach et al, reported that their participants had adequate knowledge and comfort levels in regards to agricultural mechanics curriculum. Leiby, Robinson, and Key (2013), sought to determine the perceptions of pre-service AFNR teachers regarding their perceived importance and confidence to teach several welding skills and curriculum prior to and after a semester long metals and welding course. It was reported that the participant's knowledge score increased from an F at the beginning of the semester to a C at the end of the semester (Lieby et al.). Additionally, confidence to teach all of the welding constructs increased from below average and average confidence levels at the beginning of the semester to above average at the end of the semester (Lieby et al.). Lieby et al., further recommended that research be conducted on perceived importance and confidence levels to teach other agricultural mechanics skills other that welding curriculum.

Based on the results from this study, the researcher recommends that the university agricultural education faculty from all 11 of the agricultural education preparation programs in Texas should review and modify their curriculum based on the strengths and weaknesses of entry year AFNR teachers. According to Saucier, McKim, and Tummons (2012), it is important to identify and address the essential agricultural mechanics skill area needs of early career AFNR teachers. For the existing teachers, it is recommended that workshops and curriculum be developed and funded that focuses on the skill areas that teachers have indicated little to no confidence in teaching. It has been recognized that funding can be an issue and it is recommended that workshop developers utilize available grants to meet the needs of these entry year teachers. Possible grants could be provided by: USDEducation, region center services, community colleges, professional organizations, corporations, and private organizations. It could also be beneficial for all of the university preparation programs to provide local professional development to the teachers in their agricultural education areas. If the teacher preparation program is lacking expertise in that field, it is recommended that universities coordinate professional development opportunities that are presented by experts in that field or skill area. Moreover, is this lack of confidence in teaching certain agricultural mechanics skill areas due to limited university preparation or the learners' lack of motivation to put the effort into learning the skill? Due to a high demand and shortage of qualified teachers to teach agricultural mechanics courses is it possible to encourage teachers by offering a hiring bonus or stipend to teach these courses? Furthermore, is there a way to prepare future teachers with agricultural mechanics experiences prior to college? One way to do this, could be for agricultural education professional organizations or university agriculture education programs to develop a summer internship program or camp for future teachers that focuses on various skills and experiences. This program would be conducted during the summer and will provide junior and seniors in high school that strive to become future AFNR teachers with educational experiences in several subject areas prior to their college career. Summer programs such as this, could be funded by state or local government grants, a registration fee, or costs could be reduced due to corporation donations. It is also recommended that high school teachers encourage their students that want to be future AFNR teachers to familiarize themselves in educational experiences especially in the areas that they are weak in.

Research Question Three

Research question three sought to identify the knowledge and skill areas taught to entry year, Texas AFNR teachers while they were undergraduate students in their university agricultural mechanics courses. In order to provide students with the knowledge and skills required in industry careers, the teachers instructing these agricultural mechanics courses must be skilled and competent in teaching the curriculum (Saucier, Vincent, & Anderson, 2014). In order to remediate the lack of several agricultural mechanics skill areas being taught at the university level, it is recommended by the researcher that quality lesson plans, content specific guided readings, educational videos, and other curriculum be readily available to entry year teachers. Are these specific skill areas not being taught due to factors related to the individual universities or due to state wide limitations such as the 120 Hour Statute? One solution could be to revert back to a minimum of 120 credit hours instead of a maximum of 120 credit hours for a bachelor's degree. Another solution could be to return back to agriculture education majors having a minimum required hours in each curriculum areas. It is recommended that the legislation and university administrators allow agricultural education students to take additional coursework in specialty areas to create competent AFNR teachers that can teach a variety of courses. However, will all agriculture education preparation programs in the state be able to offer adequate classes in every curriculum area? The researcher also recommends that the VATAT professional development conference offers workshops for entry-level AFNR teachers that focuses on the skill areas that the majority of participating entry year teachers identified that they were not taught during their university agricultural mechanics courses. Furthermore, more research should be conducted in order to answer if confidence levels of entry year AFNR teachers to teach agricultural mechanics related skills can be explained by the curriculum being taught at the university level.

Research Question Four

Research question four sought to identify the teaching methods that were used to teach participating Texas, entry year AFNR teacher's agricultural mechanics curriculum in their university agricultural mechanics courses. According to the AAAE Nation Research Agenda, (Roberts, Harder, and Brashears, 2016), efforts must be made to ensure that all AFNR school based educators are competent and prepared to teach the technical and personal skills needed for students to obtain employment in their future careers. When teaching AFNR teachers how to teach different skills and curriculum, it could be helpful to remember Knowles' Theory of Andragogy (Knowles, Holton III, & Swanson, 2015). This theory addresses the fact that adults learn differently than children. For example, adults tend to learn better when they are involved in the methods used to teach them, content, timing, and reflection in their own learning. Additionally, adults learn better if they are motivated and believe that the content is important and relevant to them. Are there other methods that could be incorporated in university agricultural mechanics courses? Further research should be conducted on what methods pre-service teachers prefer to be taught by. Research studies should be conducted in order to explain the methods that are currently being used to teach these skills to pre-service teachers at the university level and if they are effective. Efforts should also be made by university faculty to evaluate which teaching methods yield the most valuable learning for their pre-service teachers in each of the agricultural mechanics skills.

Research Question Five

Research question five was designed to describe the professional development format that entry year, Texas AFNR teachers preferred regarding agricultural mechanics knowledge and skills. Results from this study indicated that out of the 13 professional development formats offered, only the two day workshop over the summer was identified to be preferred by more than 50% of the participants. It is recommended that professional development formats such as, multi-day during the summer workshops, two hour VATAT workshops, and VATAT all day Monday workshops all provide options that are specifically targeting entry year AFNR teachers in regards to teaching skill areas that were not taught in university agricultural mechanics courses and have low confidence levels in teaching. Furthermore, why do entry year AFNR teachers not prefer any format of professional development? Even though these participants indicated low confidence levels in teaching several of these agricultural mechanics areas, it is possible that they do not yet realized that they need continued education in certain areas.

Another explanation could be that they are overwhelmed with all of the duties that are expected of AFNR teachers and do not feel like they have time to spare for professional development. A current problem concerning high school AFNR teacher educators are teachers leaving the profession prematurely (McIntosh, 2017). Boone and Boone (2007), found that many of the problems that beginning teachers face, that the more experienced teachers do not, was developing a course of instruction, self-confidence, undergraduate preparation, and mentorship (Boone & Boone).

Additionally, Huberman's Professional Life Cycle of Teachers (1989), states that the first three years of a teacher's career consist of the *survival* and *discovery* themes. These themes include: struggling with reality-shock, balancing professional responsibilities and daily classroom tasks, as well as limited instructional materials (Huberman, 1989). Furthermore, it is likely that the participants of this study are still in these phases of their career, where they are having difficulty with balancing the duties and responsibilities of being an AFNR teacher and do not feel like they have enough time to complete every task. According to the Texas Administrative Code, Title 19, Part 7, Chapter 232, Subchapter A all holders of a classroom teachers certificate must complete 150 hours of continuing professional education every five years. Therefore, efforts should be made by local administrators, professional development providers, and university agricultural education faculty to entice entry year and early career teachers to participate in professional development, by offering hands-on, focused, timely, and convenient workshops.

Additionally, it is recommended that professional development presenters provide the participants with curriculum or reference handouts accessible through the professional organization or other websites or drives that teachers can access. Lastly, it is recommended by the researcher that entry year AFNR teachers take the initiative to attend professional development that they need rather than a subject that they are familiar with. They should attend relevant professional development as soon as they receive their teaching assignment. In addition to professional development opportunities, another way to help teachers get through the *discovery* and *survival* themes is to provide a local mentor that can offer advice, support, and curriculum. It is advised that this is done on a FFA district level and individual high school level, so that the mentor is local and can additionally help with local rules and expectations.

Research Question Six

Research question six sought to determine if teaching methods used at the university level to instruct agricultural mechanics curriculum to entry year, Texas AFNR teachers could explain their confidence levels to teach agricultural mechanics related skills. Results indicated that the application project teaching method was statistically significant in explaining the confidence levels to teach 23 out of the 24 skill areas evaluated. It is recommended that university agricultural mechanics faculty teach pre-service teachers by using various teaching methods; however, in order to incorporate all of the information together and produce the pre-service teacher's confidence, application projects should be utilized. Seaman Knapp, believed in teaching by using a demonstration method and encouraged agricultural educators to teach using practical and applicable instruction and believed in the philosophy of learning by doing (Bailey, 1945; Knobloch, 2003). Additionally, John Dewey, also strongly believed that education should be applied to real life experiences and noted that not all educational experiences are necessarily good ones (Knoblach, 2003). Furthermore, Dewey believed that education should be centered around the child or learner’s creativity, experiences, and interests (Howell, 1997). A review of literature illustrates that agricultural education was originated on the principle of learning by application. Therefore, why were the majority of the participants of this study not taught agricultural mechanics skills by the application project method? University agricultural mechanics faculty should make efforts to provide pre-service teachers with hands on, application project opportunities as often as possible. It is understood that sometimes this is not feasible; however, efforts should be made to provide these learning opportunities when possible. The models could only explain portions of the variability in the participants’ confidence level; therefore, research should be conducted in order to identify the other variables that can explain entry year AFNR teacher confidence to teach agricultural mechanics curriculum.

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APPENDIX A

AGRICULTURAL MECHANICS SKILLS ASSESSMENT

Agricultural Mechanics Skills Assessment

VATAT Conference 2018

Code:_________

<u>Instructions:</u>

Participation in this survey is voluntary and individual responses from this survey will be kept anonymous. IRB # 38352.

Part 1: This section contains 24 agricultural mechanics related skill areas. Please **identify your level of confidence to teach** each of these skill areas by bubbling the confidence level that you feel best describes your confidence.

Part 2: This section contains the same 24 agricultural mechanics related skill areas as mentioned above. Please identify: 1) **What agricultural mechanics skills did you learn at the undergraduate university you attended?** 2) If yes, what teaching methods where used to teach you those skill areas? Please answer these questions to the best of your ability.

Part 3: This section contains a single question concerning your **professional development format preference**. Please check all of the boxes that apply.

Part 4: This section contains 22 questions about your **professional, program, and personal demographics**. Please answer these questions to the best of your ability.

******* <u>Incentive</u> *******

All fully completed surveys will have a chance of winning one of two, randomly drawn, Miller auto-darkening welding hoods.

<u>Part 1:</u>
Personal Confidence Levels of Teaching Agricultural Mechanics Related Skills

Agricultural Mechanics Related Skill Areas	No Confidence	Little Confidence	Some Confidence	Moderate Confidence	High Confidence
Example: Using online record books	●	○	○	○	○
Employability/ Career Skills (e.g. resume building, interview skills, correct work habits, etc.)	○	○	○	○	○
Supervised Agricultural Experiences (SAE) (e.g. types of SAE, record books, program of activities, etc.)	○	○	○	○	○
Hand Tools (e.g. using hammers, wrenches, levels, etc.)	○	○	○	○	○
Handheld Power Tools (e.g. using drills, jig saws, grinders, etc.)	○	○	○	○	○
Stationary Power Tools (e.g. using drill presses, table saws, iron worker, etc.)	○	○	○	○	○
Electrical (e.g. wiring switches, bending conduit, repairing an extension cord, etc.)	○	○	○	○	○

Agricultural Mechanics Related Skill Areas (Continued)	**No Confidence**	**Little Confidence**	**Some Confidence**	**Moderate Confidence**	**High Confidence**
Plumbing (e.g. selecting plumbing tools, installing plumbing fixtures, maintaining water systems, etc.)	○	○	○	○	○
Concrete (e.g. estimating costs, mixing concrete, building forms, etc.)	○	○	○	○	○
Carpentry (e.g. identifying building materials, estimate building costs, basic carpentry skills, etc.)	○	○	○	○	○
Fencing (e.g. selecting fencing materials, planning fencing projects, installing fencing projects, etc.)	○	○	○	○	○
Cold Metal (e.g. identifying types of metal, cutting metal, shaping metal, etc.)	○	○	○	○	○
Oxygen/ Fuel Cutting (e.g. selecting fuel gases, safety, cutting steel, etc.)	○	○	○	○	○
Oxygen/ Fuel Welding (e.g. safety, welding steel, identifying weld joints etc.)	○	○	○	○	○
Oxygen/ Fuel Brazing (e.g. selecting brazing filler rod, safety, identifying brazing properties, etc.)	○	○	○	○	○
Shielded Metal Arc Welding- SMAW (e.g. selecting electrodes, safety, operating SMAW machine, etc.)	○	○	○	○	○
Gas Metal Arc Welding- GMAW (e.g. selecting shield gas, setting wire feed speed, safety, etc.)	○	○	○	○	○

Agricultural Mechanics Related Skill Areas (Continued)	**No Confidence**	**Little Confidence**	**Some Confidence**	**Moderate Confidence**	**High Confidence**
Gas Tungsten Arc Welding- GTAW (e.g. selecting electrodes, safety, identifying weld joints, etc.)	○	○	○	○	○
Plasma Arc Cutting- PAC (e.g. identifying types of metal, replacing worn consumables, cutting steel, etc.)	○	○	○	○	○
Construction Methods (e.g. site analysis, develop plans, structural building techniques, etc.)	○	○	○	○	○
Small Gas Engines (e.g. understanding engine cycles, lubrication, repair, etc.)	○	○	○	○	○
Multi-Cylinder Engines (e.g. engine timing, engine cycles, repair, etc.)	○	○	○	○	○
Modern Machinery Technology (e.g. power train, GPS, preventative maintenance, etc.)	○	○	○	○	○
Hydraulics (e.g. principles of hydraulics, actuators, repair, etc.)	○	○	○	○	○
Pneumatics (e.g. principles of pneumatics, actuators, safety, etc.)	○	○	○	○	○

Part 2:

Did you learn any of the agricultural mechanics related skills listed below while earning your undergraduate degree?

			If yes, check the method(s) that were used for instruction:				
Agricultural Mechanics Related Skill Areas	**Yes**	**No**	**Classroom Learning**	**Teacher Demonstration**	**Laboratory Practice**	**Real world application Project**	**Student Skill Presentation**
Example: Learning online record books	●	○	☐	☐	☑	☐	☐
Employability/ Career Skills (e.g. resume building, interview skills, correct work habits, etc.)	○	○	☐	☐	☐	☐	☐
Supervised Agricultural Experiences (SAE) (e.g. types of SAE, record books, program of activities, etc.)	○	○	☐	☐	☐	☐	☐

	If yes, check the method(s) that were used for instruction:						
Agricultural Mechanics Related Skill Areas	**Yes**	**No**	**546Classroom Learning**	**Teacher Demonstration**	**Laboratory Practice**	**Real world application Project**	**Student Skill Presentation**
Hand Tools (e.g. using hammers, wrenches, levels, etc.)	○	○	☐	☐	☐	☐	☐
Handheld Power Tools (e.g. using drills, jig saws, grinders, etc.)	○	○	☐	☐	☐	☐	☐
Stationary Power Tools (e.g. using drill presses, table saws, iron worker, etc.)	○	○	☐	☐	☐	☐	☐
Electrical (e.g. wiring switches, bending conduit, repairing an extension cord, etc.)	○	○	☐	☐	☐	☐	☐

	If yes, check the method(s) that were used for instruction:						
Agricultural Mechanics Related Skill Areas	**Yes**	**No**	**Classroom Learning**	**Teacher Demonstration**	**Laboratory Practice**	**Real world application Project**	**Student Skill Presentation**
56456Plumbing (e.g. selecting plumbing tools, installing plumbing fixtures, maintaining water systems etc.)	○	○	☐	☐	☐	☐	☐
Concrete (e.g. estimating costs, mixing concrete, building forms, etc.)	○	○	☐	☐	☐	☐	☐
Carpentry (e.g. identify building materials, estimating building costs, basic carpentry skills, etc.)	○	○	☐	☐	☐	☐	☐
Fencing (e.g. selecting fencing materials, planning fencing projects, install fencing projects, etc.)	○	○	☐	☐	☐	☐	☐
	If yes, check the method(s) that were used for instruction:						

Agricultural Mechanics Related Skill Areas	Yes	No	Classroom Learning	Teacher Demonstration	Laboratory Practice	Real world application Project	Student Skill Presentation
Cold Metal (e.g. identify types of metal, cutting metal, shaping metal, etc.)	○	○	☐	☐	☐	☐	☐
Oxygen/ Fuel Cutting (e.g. selecting fuel gases, safety, cutting steel, etc.)	○	○	☐	☐	☐	☐	☐
Oxygen/ Fuel Welding (e.g. safety, welding steel, identifying weld joints etc.)	○	○	☐	☐	☐	☐	☐
Oxygen/ Fuel Brazing (e.g. selecting brazing filler rod, safety, identifying, brazing properties, etc.)	○	○	☐	☐	☐	☐	☐

	If yes, check the method(s) that were used for instruction:						
Agricultural Mechanics Related Skill Areas	**Yes**	**No**	**Classroom Learning**	**Teacher Demonstration**	**Laboratory Practice**	**Real world application Project**	**Student Skill Presentation**
Shielded Metal Arc Welding- SMAW (e.g. selecting electrodes, safety, operating SMAW machine, etc.)	○	○	☐	☐	☐	☐	☐
Gas Metal Arc Welding- GMAW (e.g. selecting shield gas, setting wire feed speed, safety, etc.)	○	○	☐	☐	☐	☐	☐
Gas Tungsten Arc Welding- GTAW (e.g. selecting electrodes, safety, identifying weld joints, etc.)	○	○	☐	☐	☐	☐	☐

	If yes, check the method(s) that were used for instruction:						
Agricultural Mechanics Related Skill Areas	**Yes**	**No**	**Classroom Learning**	**Teacher Demonstration**	**Laboratory Practice**	**Real world application Project**	**Student Skill Presentation**
Plasma Arc Cutting- PAC (e.g. identifying types of metal, replacing worn consumables, cutting steel, etc.)	○	○	☐	☐	☐	☐	☐
Construction Methods (e.g. site analysis, developing plans, structural building techniques, etc.)	○	○	☐	☐	☐	☐	☐
Small Gas Engines (e.g. understanding engine cycles, lubrication, repair, etc.)	○	○	☐	☐	☐	☐	☐
Multi-Cylinder Engines (e.g. engine timing, engine cycles, repair, etc.)	○	○	☐	☐	☐	☐	☐
	If yes, check the method(s) that were used for instruction:						

Agricultural Mechanics Related Skill Areas	Yes	No	Classroom Learning	Teacher Demonstration	Laboratory Practice	Real world application Project	Student Skill Presentation
Modern Machinery Technology (e.g. power train, GPS, preventative maintenance, etc.)	○	○	☐	☐	☐	☐	☐
Hydraulics (e.g. principles of hydraulics, actuators, repair, etc.)	○	○	☐	☐	☐	☐	☐
Pneumatics (e.g. principles of pneumatics, actuators, safety, etc.)	○	○	☐	☐	☐	☐	☐

<u>Part 3: Professional Development</u>

Directions: Please answer the following questions concerning your professional development preferences.

1. Which **format of professional development workshops** do you believe would benefit you the most regarding agricultural mechanics skill development? Check all of the boxes that apply.

- [ ] 2 hour Professional Development Conference (VATAT) workshop
- [ ] Single day, during summer
- [ ] Monday, all day VATAT workshop
- [ ] Multi-day, during summer
- [ ] Single day, during school year
- [ ] Informal online video (i.e. You Tube)
- [ ] Week long, during school year
- [ ] Week long, during summer
- [ ] Winter break; during school year
- [ ] 3 weeks, during summer
- [ ] Online, university course
- [ ] University course
- [ ] Workshop during stock shows

Part 4: Personal, Program, and Professional Demographics

Directions: Please answer the following questions below about your personal, program, and professional demographics.

1. Check the box of your **highest degree earned**. (Please check one)

☐ Bachelor's Degree ☐ Doctorate Degree

☐ Master's Degree ☐ Other ___________

2. What **type of degree** did you earn? Ex: Animal Science

____

3. At your current school, **what size community** is it located within? (Please check one)

☐ Rural (0- 2,500 pop.) ☐ Urban (50,001+ pop.)

☐ Suburban (2,501- 50,000 pop.)

4. Do you have **previous agricultural mechanics work experience**? (Please check one)

☐ Yes ☐ No

5. If yes, please **describe the details of that work experience**.
Ex: Welder for 2 years

____

____

6. Were you in **Agriculture, Food, and Natural Resource classes/ FFA** as a student? (Please check one)

☐ Yes ☐ No

7. If yes, **how many years**? ____________________________**years**

8. Were you in **4H** as a student?

9. If yes, **how many years**? ____________________________ **years**

10. What is your **teaching contract length in days**? ____________ **days**

11. Do you receive a **stipend for FFA advisor duties**? (Please check one)

☐ Yes ☐ No

12. If yes, what is the amount? $_______________

13. Do you receive a **stipend in lieu of an extended contract**? (Please check one)

☐ Yes ☐ No

14. What is the **UIL size of your school**? (Please check one)

☐ 1A ☐ 2A ☐ 3A ☐ 4A ☐ 5A ☐ 6A

15. How many **total agriculture teachers** work in your program? _____

16. What is your **age**? __________**years**

17. What is your **sex**? (Please check one)

☐ Male ☐ Female

18. What is your **ethnicity**? (Please check one)

☐ African American ☐ Asian
☐ White/ Non- Hispanic ☐ Hispanic/ Latino
☐ American Indian ☐ Pacific Islander
☐ Multi-racial/ Bi-racial

19. What is your **marital status**? (Please check one)

☐ Married ☐ Not Married ☐ Engaged

☐ Divorced ☐ Widowed

20. What **type of teaching certification program** did you complete? (Please check one)

☐ Traditional ☐ Alternative

21. How many **university semester credit hours of agricultural mechanics coursework** have you completed? ____________**hours**

22. Did you complete any **agricultural mechanics courses in high school**? (Please check one)

☐ Yes ☐ No

Thank you for your assistance.

These results will be shared with other universities to improve teacher education in Texas.

APPENDIX B

PANEL OF EXPERTS MEMBERS

Name	University/ School	Specialty Area
Dr. Ryan Saucier	Sam Houston State University	Agricultural Engineering Technology
Dr. Dwayne Pavelock	Sam Houston State University	Agriculture Education
Dr. Doug Ullrich	Sam Houston State University	Agriculture Education
Mr. Josh Shafer	Hallsville ISD	High school agricultural mechanics teacher
Mr. Danny Reeves	Klein ISD	High school agricultural mechanics teacher

APPENDIX C

LETTER TO PANEL MEMBERS

Sam Houston State University
MEMBER THE TEXAS STATE UNIVERSITY SYSTEM™
DEPARTMENT OF AGRICULTURAL SCIENCES

April 6, 2018

Dear Panel Member,

Greetings, my name is Robyn Key. I am a graduate student at Sam Houston State University pursuing a master's degree in agricultural sciences. I am currently working on the research for my thesis that is designed to determine the confidence levels of Texas novice Agriculture, Food and Natural Resources (AFNR) teachers in regards to agricultural mechanics related skills.

I am formally requesting your assistance in determining my instrument's validity. I understand that this is a busy time for you; however, I am hoping that you will be able to assist me with this matter. I have selected you to serve on my "panel of experts" because of your knowledge in the field of agricultural education. I value your knowledge and time.

Specifically, I would appreciate your feedback concerning the validity of the instrument I have attached. Also attached is a copy of my study's purpose and research questions to guide you in the reviewing of my instrument. If there are any items that you do not think are addressed in this instrument, please feel free to add them.

Please write any comments or concerns on the comments page that I have also attached to this e-mail. When your review is complete, please email me the completed comments page. If you have any questions, please do not hesitate to contact me. I can be reached via e-mail at rlk013@shsu.edu or by phone at (903)-353-5466. I would appreciate any feedback that you can provide by Friday, April 13, 2018 or as soon as possible. I realize that this is a tight timeline, and if you are unable to assist me, I completely understand. However, your help will be greatly appreciated.

Thank you in advance for your help with this review. Hopefully with your feedback, and the feedback of others, this instrument will be useful in determining confidence levels of Texas novice AFNR teachers in regards to agricultural mechanics related skills.

Sincerely,

Robyn Key

Huntsville, Texas 77341-2088 • 936.294.1215 • Fax 936.294.1232 • shsu.edu/agr

APPENIX D

PURPOSE AND RESEARCH QUESTIONS PROVIDED TO THE PANEL OF EXPERTS

Thesis Purpose and Objectives

Purpose of the Study

The purpose of this study is to examine the confidence levels of novice Texas Agriculture, Food, and Natural Resources teachers regarding the instruction of agricultural mechanics related Texas Essential Knowledge and Skills (TEKS) and determine their level of university preparation to teach these agricultural mechanics related TEKS

Research Questions

The following research questions were developed to guide this study:

7. What are the personal, professional, & program demographics of entry year Texas Agriculture, Food, and Natural Resources (AFNR) teachers in regards to agricultural mechanic related Texas Essential Knowledge and Skills (TEKS)?
8. What are the confidence levels of entry year, Texas AFNR teachers regarding the instruction of agricultural mechanics related TEKS?
9. What knowledge and skills did entry year, Texas AFNR teachers learn while a student in their agricultural mechanics university courses?
10. What teaching methods were used to teach entry year, Texas AFNR teachers agricultural mechanics related knowledge and skills in their university agricultural mechanics courses?

11. What professional development format would be the most beneficial in assisting entry year, Texas AFNR teachers regarding the instruction of agricultural mechanics related TEKS?
12. Can teaching methods used at the university level to instruct agricultural mechanics curriculum to entry year, Texas AFNR teachers explain their confidence levels to teach agricultural mechanics related skills?
13. Do differences in confidence levels of teaching agricultural mechanics related skills exists between entry year, Texas AFNR teachers who attended the first year teacher VATAT workshop and teachers who did not?

APPENDIX E

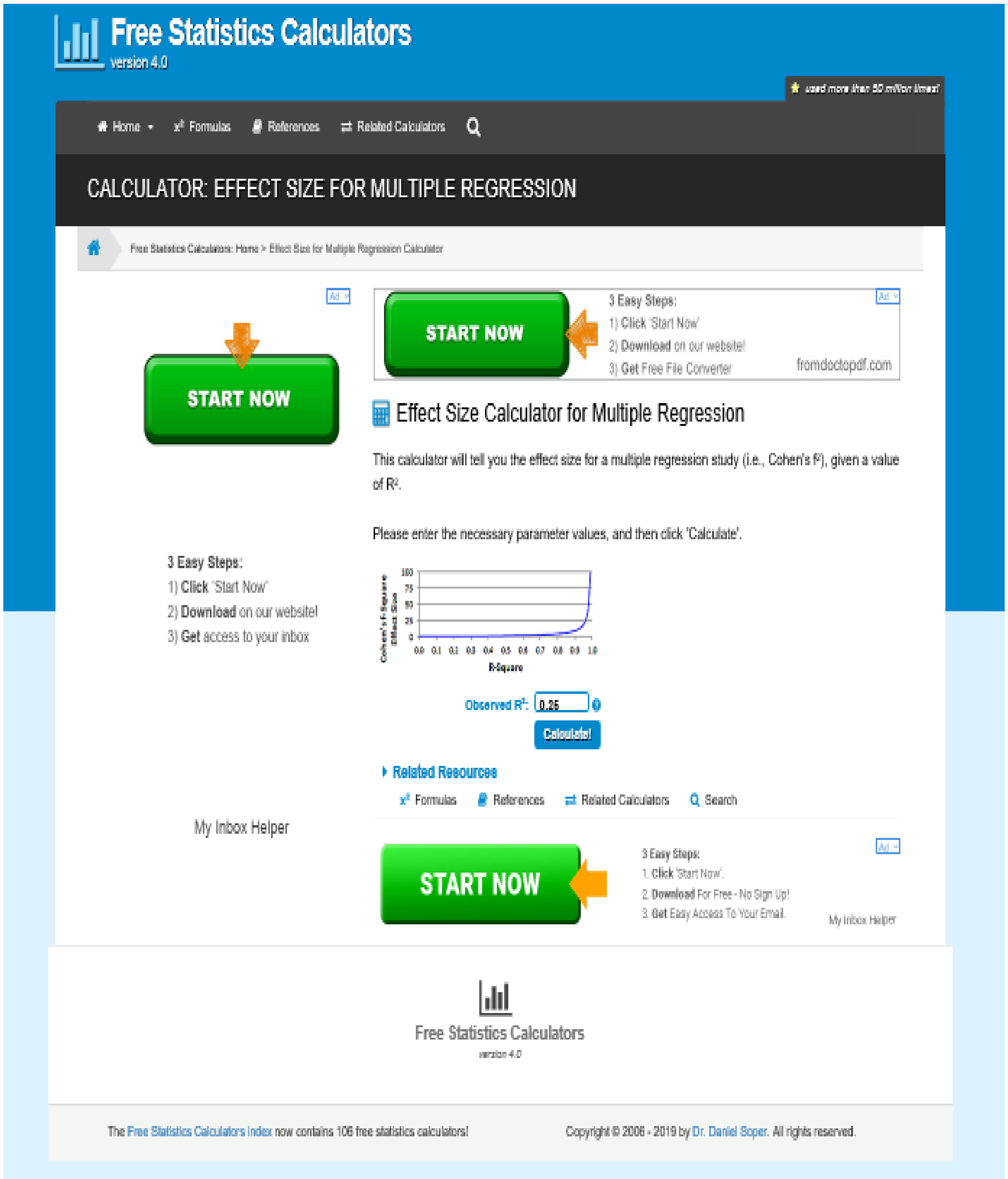
COMMENTS PAGE PROVIDED TO THE PANEL OF EXPERTS

Agricultural Mechanics Skills Assessment

Panel of Experts Comments:

APPENDIX F

SOPER'S EFFECT SIZE CALCULATOR FOR MULTIPLE REGRESSION



APPENDIX G

BIVARIATE INTERCORRELATION TABLES BETWEEN CONFIDENCE LEVELS AND TEACHING METHODS

Table 40

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Carpentry Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Carpentry Skills (Y_1)	1.00	0.15	0.21	0.29	0.29	0.23
Classroom Learning (X_1)		1.00	0.70	0.59	0.36	0.46
Teacher Demonstration (X_2)			1.00	0.61	0.42	0.66
Laboratory Practice (X_3)				1.00	0.32	0.48
Application Project (X_4)					1.00	0.53
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 41

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Concrete Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Concrete Skills (Y_1)	1.00	0.18	0.25	0.26	0.32	0.28
Classroom Learning (X_1)		1.00	0.62	0.56	0.30	0.48
Teacher Demonstration (X_2)			1.00	0.58	0.48	0.67
Laboratory Practice (X_3)				1.00	0.37	0.50
Application Project (X_4)					1.00	0.61
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 42

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Cold Metal Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Cold Metal Skills (Y_1)	1.00	0.26	0.23	0.28	0.38	0.28
Classroom Learning (X_1)		1.00	0.63	0.57	0.42	0.44
Teacher Demonstration (X_2)			1.00	0.74	0.49	0.65
Laboratory Practice (X_3)				1.00	0.31	0.48
Application Project (X_4)					1.00	0.63
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 43

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Construction Methods Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Construction Methods Skills (Y_1)	1.00	0.23	0.15	0.18	0.31	0.16
Classroom Learning (X_1)		1.00	0.65	0.61	0.34	0.48
Teacher Demonstration (X_2)			1.00	0.68	0.42	0.58
Laboratory Practice (X_3)				1.00	0.32	0.45
Application Project (X_4)					1.00	0.50
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 44

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Electrical Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Electrical Skills (Y_1)	1.00	0.05	0.05	0.02	0.22	0.15
Classroom Learning (X_1)		1.00	0.64	0.59	0.47	0.45
Teacher Demonstration (X_2)			1.00	0.62	0.46	0.58
Laboratory Practice (X_3)				1.00	0.38	0.36
Application Project (X_4)					1.00	0.58
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 45

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Employability/Career Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Employability/Career Skills (Y_1)	1.00	0.17	0.21	0.11	0.30	0.17
Classroom Learning (X_1)		1.00	0.34	0.20	0.16	0.31
Teacher Demonstration (X_2)			1.00	0.53	0.30	0.52
Laboratory Practice (X_3)				1.00	0.34	0.59
Application Project (X_4)					1.00	0.46
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 46

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Fencing Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Fencing Skills (Y_1)	1.00	0.15	0.16	0.14	0.35	0.19
Classroom Learning (X_1)		1.00	0.53	0.55	0.37	0.42
Teacher Demonstration (X_2)			1.00	0.61	0.43	0.72
Laboratory Practice (X_3)				1.00	0.29	0.64
Application Project (X_4)					1.00	0.45
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 47

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Gas Metal Arc Welding (GMAW) Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Gas Metal Arc Welding (GMAW) Skills (Y_1)	1.00	0.37	0.33	0.39	0.45	0.26
Classroom Learning (X_1)		1.00	0.59	0.57	0.41	0.41
Teacher Demonstration (X_2)			1.00	0.63	0.51	0.57
Laboratory Practice (X_3)				1.00	0.36	0.43
Application Project (X_4)					1.00	0.61
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 48

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Gas Tungsten Arc Welding (GTAW) Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Gas Tungsten Arc Welding (GTAW) Skills (Y_1)	1.00	0.27	0.29	0.33	0.42	0.29
Classroom Learning (X_1)		1.00	0.58	0.60	0.42	0.50
Teacher Demonstration (X_2)			1.00	0.62	0.39	0.55
Laboratory Practice (X_3)				1.00	0.35	0.53
Application Project (X_4)					1.00	0.61
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 49

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Hand Tools Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Hand Tools Skills (Y_1)	1.00	0.13	0.21	0.12	0.29	0.22
Classroom Learning (X_1)		1.00	0.45	0.43	0.29	0.36
Teacher Demonstration (X_2)			1.00	0.54	0.44	0.51
Laboratory Practice (X_3)				1.00	0.24	0.30
Application Project (X_4)					1.00	0.41
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 50

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Handheld Power Tools Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Handheld Power Tools Skills (Y_1)	1.00	0.01	0.06	0.02	0.37	0.22
Classroom Learning (X_1)		1.00	0.50	0.44	0.31	0.32
Teacher Demonstration (X_2)			1.00	0.50	0.47	0.54
Laboratory Practice (X_3)				1.00	0.25	0.28
Application Project (X_4)					1.00	0.51
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 51

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Hydraulics Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Hydraulics Skills (Y_1)	1.00	0.26	0.28	0.29	0.36	0.18
Classroom Learning (X_1)		1.00	0.62	0.64	0.26	0.50
Teacher Demonstration (X_2)			1.00	0.70	0.41	0.60
Laboratory Practice (X_3)				1.00	0.36	0.54
Application Project (X_4)					1.00	0.46
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 52

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Modern Machinery Technology Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Modern Machinery Technology Skills (Y_1)	1.00	0.19	0.17	0.15	0.32	0.20
Classroom Learning (X_1)		1.00	0.52	0.42	0.17	0.40
Teacher Demonstration (X_2)			1.00	0.66	0.31	0.78
Laboratory Practice (X_3)				1.00	0.22	0.60
Application Project (X_4)					1.00	0.42
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 53

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Multi-Cylinder Engine Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Multi-Cylinder Engine Skills (Y_1)	1.00	0.22	0.31	0.30	0.46	0.13
Classroom Learning (X_1)		1.00	0.57	0.56	0.26	0.40
Teacher Demonstration (X_2)			1.00	0.67	0.51	0.58
Laboratory Practice (X_3)				1.00	0.37	0.44
Application Project (X_4)					1.00	0.48
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 54

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Oxygen Fuel Brazing Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Oxygen Fuel Brazing Skills (Y_1)	1.00	0.28	0.23	0.24	0.31	0.25
Classroom Learning (X_1)		1.00	0.60	0.59	0.36	0.53
Teacher Demonstration (X_2)			1.00	0.68	0.44	0.62
Laboratory Practice (X_3)				1.00	0.37	0.50
Application Project (X_4)					1.00	0.74
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 55

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Oxygen Fuel Cutting Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Oxygen Fuel Cutting Skills (Y_1)	1.00	0.32	0.31	0.31	0.43	0.33
Classroom Learning (X_1)		1.00	0.62	0.54	0.48	0.45
Teacher Demonstration (X_2)			1.00	0.66	0.48	0.54
Laboratory Practice (X_3)				1.00	0.31	0.44
Application Project (X_4)					1.00	0.60
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 56

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Plasma Arc Cutting (PAC) Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Plasma Arc Cutting (PAC) Skills (Y_1)	1.00	0.35	0.26	0.35	0.30	0.22
Classroom Learning (X_1)		1.00	0.62	0.65	0.37	0.48
Teacher Demonstration (X_2)			1.00	0.65	0.40	0.47
Laboratory Practice (X_3)				1.00	0.32	0.42
Application Project (X_4)					1.00	0.52
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 57

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Plumbing Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Plumbing (Y_1)	1.00	0.27	0.28	0.24	0.40	0.28
Classroom Learning (X_1)		1.00	0.67	0.66	0.33	0.40
Teacher Demonstration (X_2)			1.00	0.67	0.44	0.58
Laboratory Practice (X_3)				1.00	0.37	0.45
Application Project (X_4)					1.00	0.55
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 58

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Pneumatics Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Pneumatics Skills (Y_1)	1.00	0.35	0.34	0.40	0.42	0.26
Classroom Learning (X_1)		1.00	0.71	0.64	0.31	0.56
Teacher Demonstration (X_2)			1.00	0.80	0.47	0.78
Laboratory Practice (X_3)				1.00	0.36	0.63
Application Project (X_4)					1.00	0.62
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 59

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Supervised Agricultural Experiences Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Supervised Agricultural Experiences Skills (Y_1)	1.00	0.15	0.13	0.20	0.24	0.13
Classroom Learning (X_1)		1.00	0.46	0.52	0.31	0.34
Teacher Demonstration (X_2)			1.00	0.54	0.42	0.37
Laboratory Practice (X_3)				1.00	0.57	0.56
Application Project (X_4)					1.00	0.46
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 60

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Small Gas Engines Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Small Gas Engines Skills (Y_1)	1.00	0.27	0.23	0.24	0.36	0.19
Classroom Learning (X_1)		1.00	0.65	0.65	0.36	0 .37
Teacher Demonstration (X_2)			1.00	0.71	0.50	0.50
Laboratory Practice (X_3)				1.00	0.28	0.35
Application Project (X_4)					1.00	0.50
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 61

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Shielded Metal Arc Welding (SMAW) Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Shielded Metal Arc Welding (SMAW) Skills (Y_1)	1.00	0.36	0.32	0.35	0.48	0.31
Classroom Learning (X_1)		1.00	0.60	0.60	0.37	0.44
Teacher Demonstration (X_2)			1.00	0.70	0.51	0.60
Laboratory Practice (X_3)				1.00	0.37	0.43
Application Project (X_4)					1.00	0.57
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 62

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Stationary Power Tools Skills

Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Stationary Power Tools Skills (Y_1)	1.00	0.05	.014	0.13	0.34	0.22
Classroom Learning (X_1)		1.00	0.50	0.44	0.34	0.46
Teacher Demonstration (X_2)			1.00	0.48	0.40	0.58
Laboratory Practice (X_3)				1.00	0.27	0.37
Application Project (X_4)					1.00	0.54
Student Skill Presentation (X_5)						1.00

Note: No = 0, Yes = 1

Table 63

Summary Table of Bivariate Intercorrelation between Teaching Methods Used to Teach Entry Year AFNR Teachers and Their Confidence Levels to Teach Oxygen Fuel Welding Skills

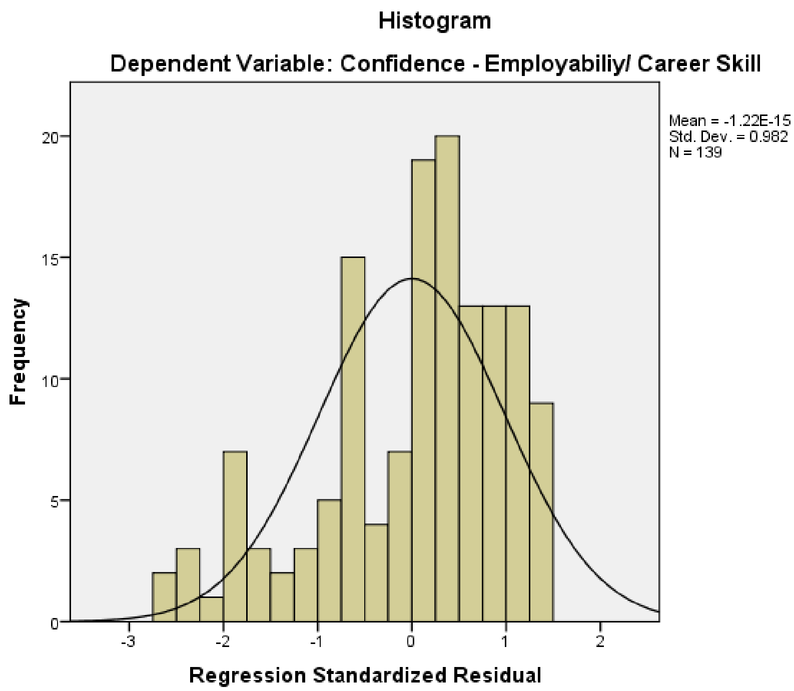
Variables	Y_1	X_1	X_2	X_3	X_4	X_5
Confidence of Teaching Oxygen Fuel Welding Skills (Y_1)	1.00	0.22	0.25	0.26	0.40	0.24
Classroom Learning (X_1)		1.00	0.65	0.57	0.44	0.46
Teacher Demonstration (X_2)			1.00	0.69	0.46	0.59
Laboratory Practice (X_3)				1.00	0.30	0.44
Application Project (X_4)					1.00	0.63
Student Skill Presentation (X_5)						1.00

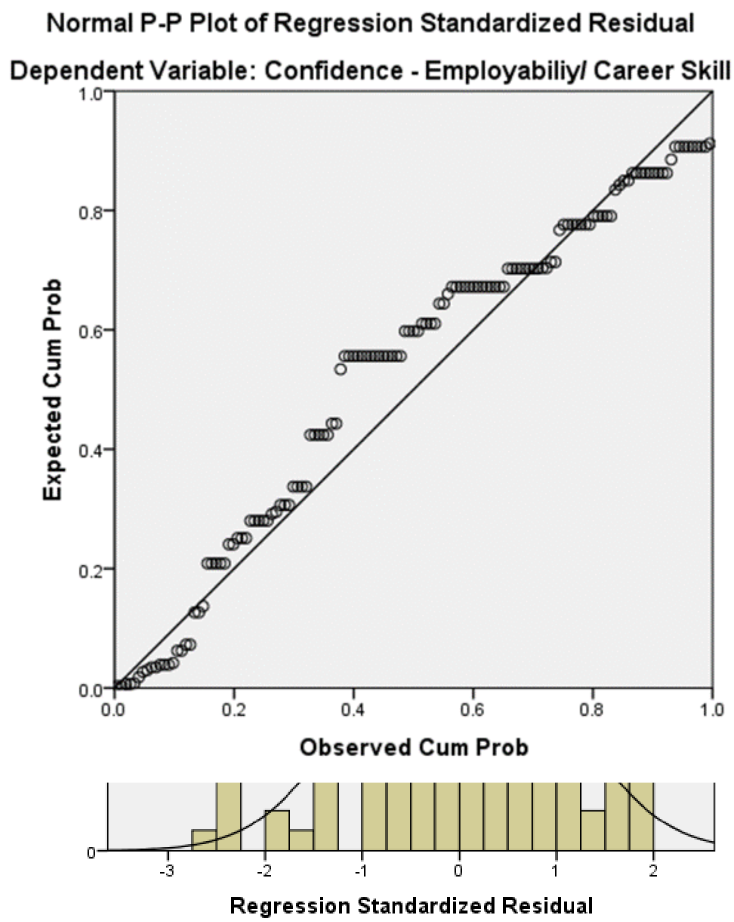
Note: No = 0, Yes = 1

APPENDIX H

HISTOGRAMS AND PP PLOTS

Relationship of Confidence Levels of Employability/Career Skills (Dependent Variables) and Teaching Methods (Independent Variables)





Relationship of

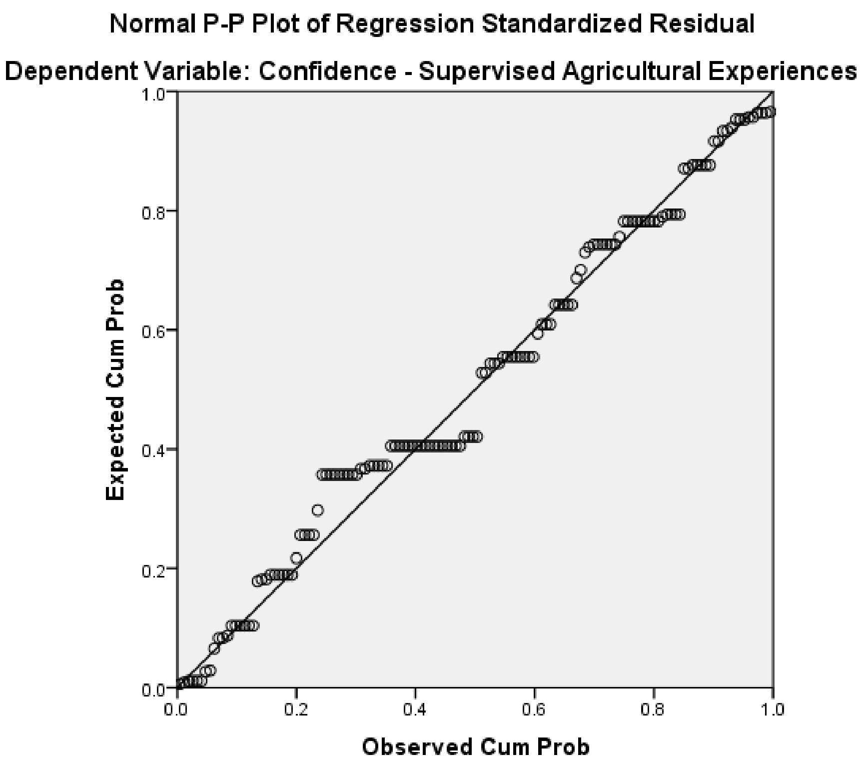
Confidence

Levels of

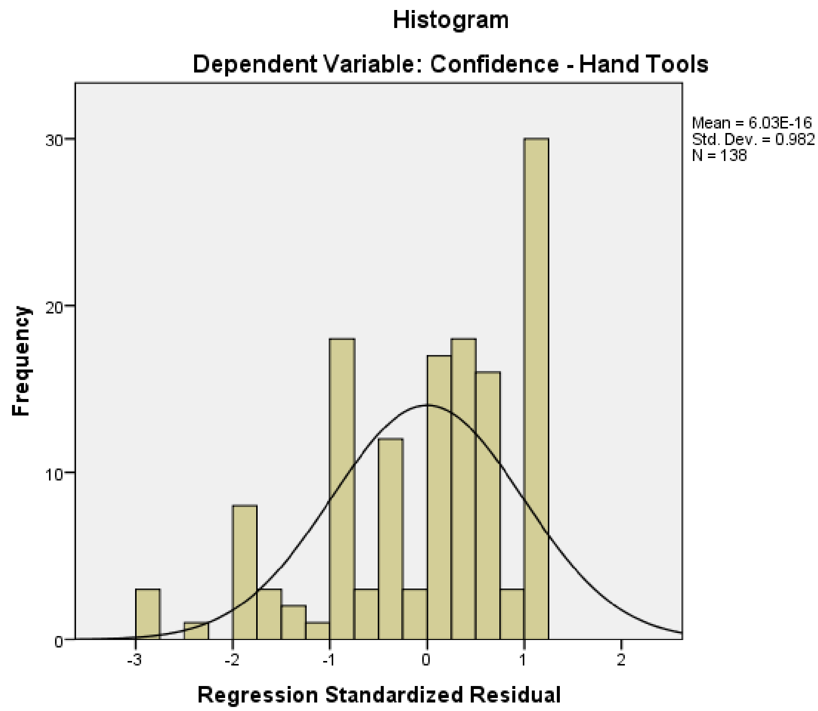
s

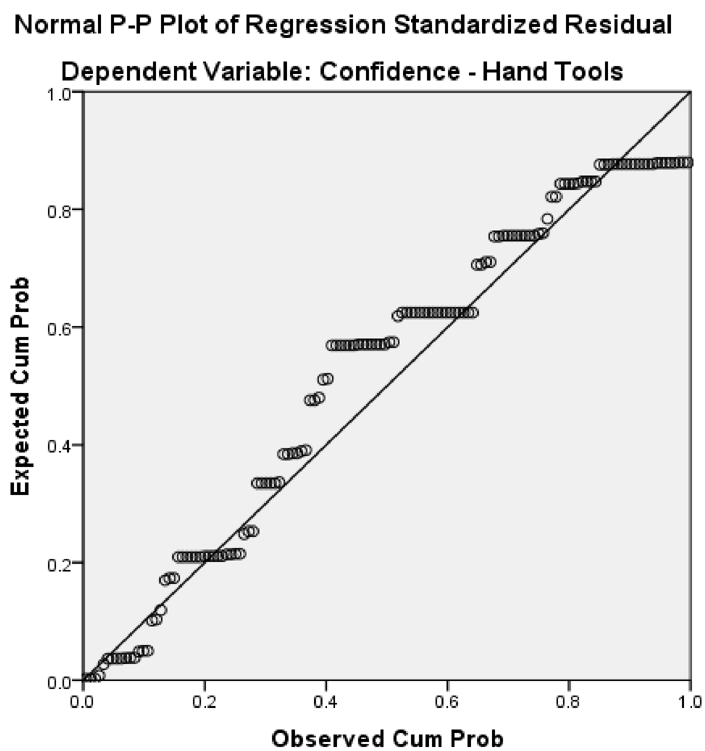
Supervised Agricultural Experiences Skills (Dependent Variables) and Teaching Methods

(Independent Variables)

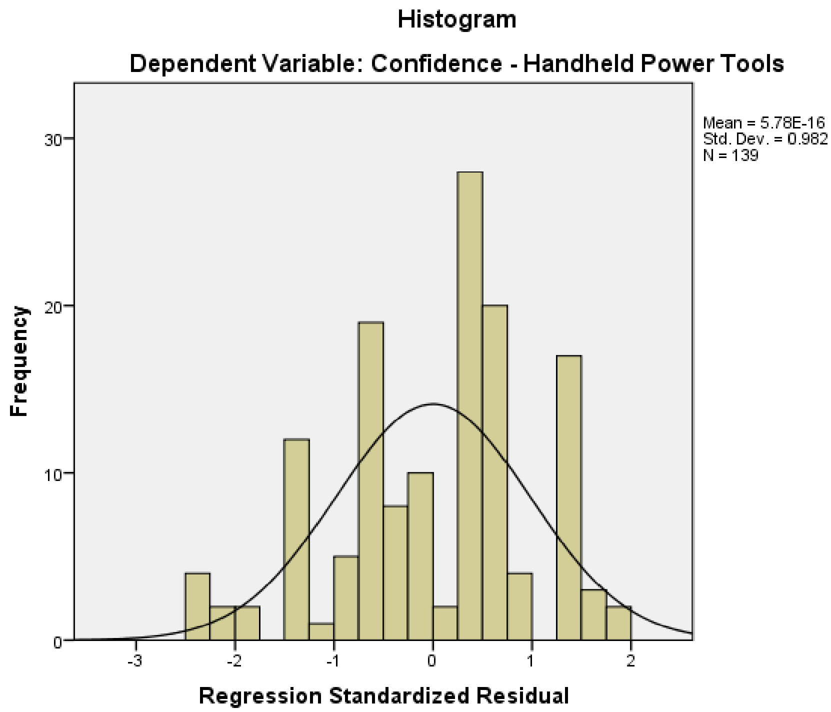

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: Confidence - Supervised Agricultural Experiences
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0

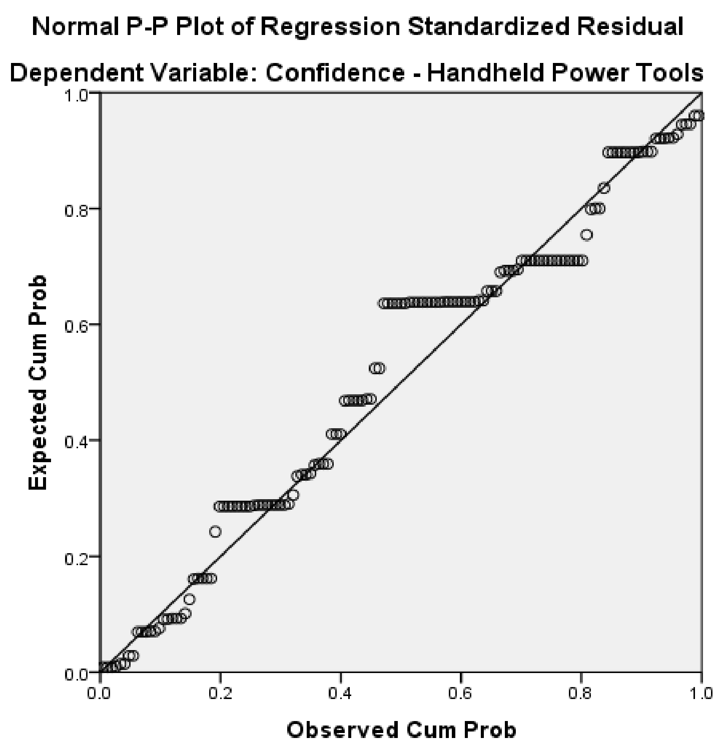
Relationship of Confidence Levels of Hand Tools Skills (Dependent Variables) and Teaching Methods (Independent Variables)



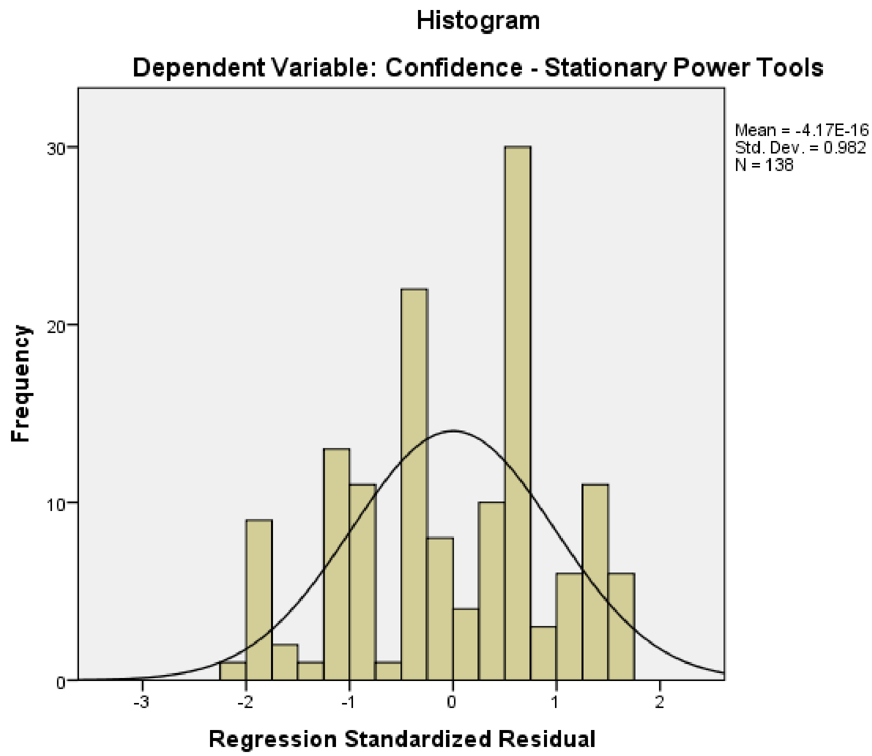


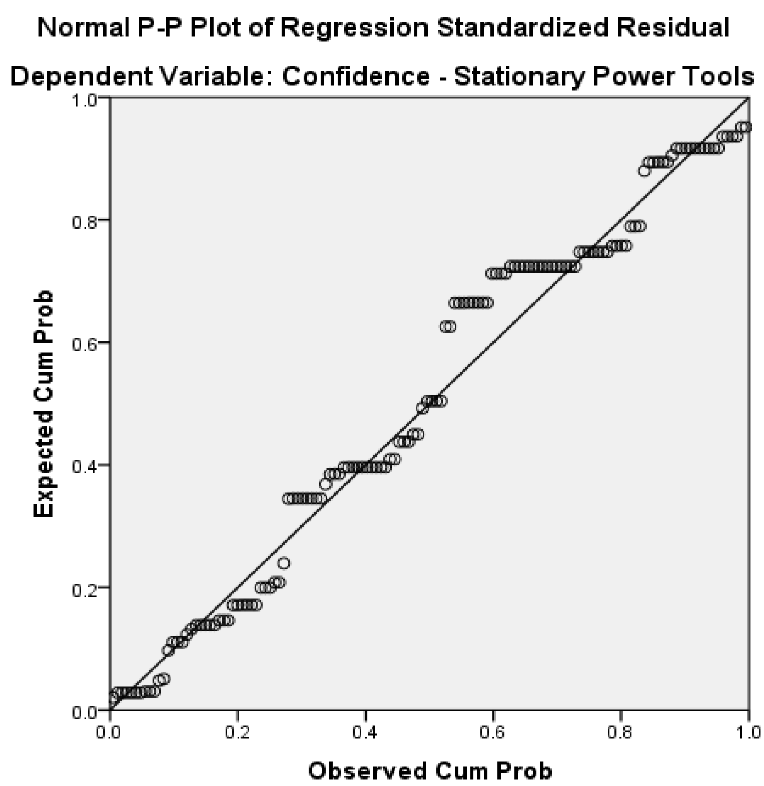
Relationship of Confidence Levels of Handheld Power Tools Skills (Dependent Variables) and Teaching Methods (Independent Variables)





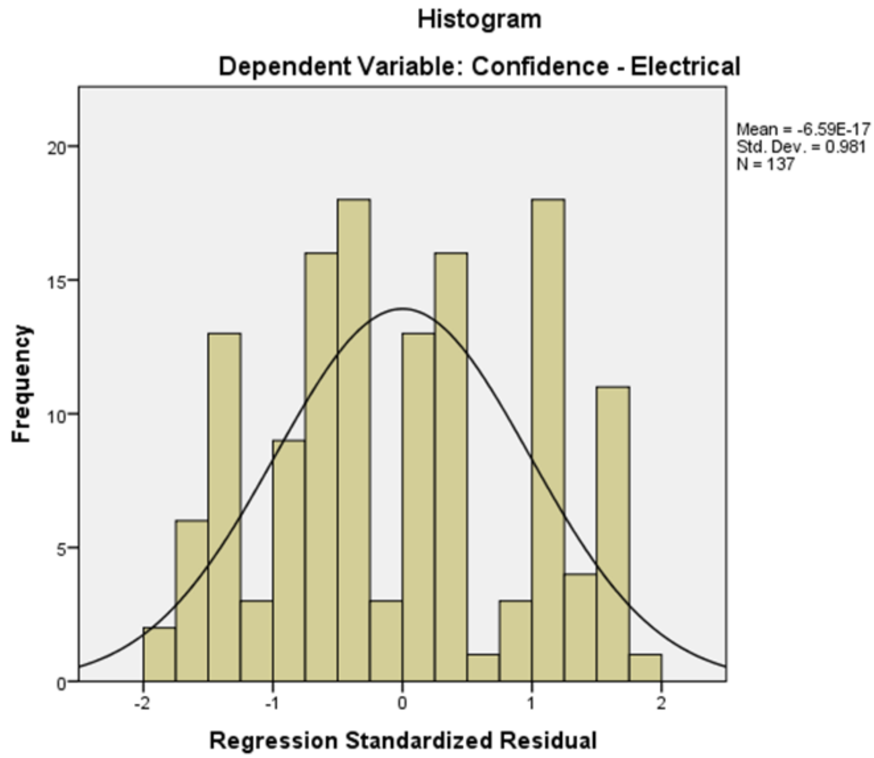
Relationship of Confidence Levels of Stationary Power Tools Skills (Dependent Variables) and Teaching Methods (Independent Variables)

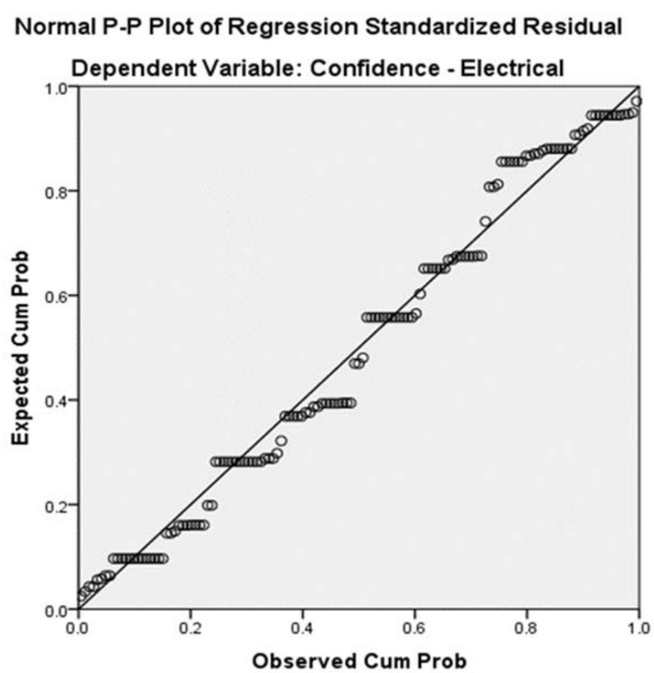




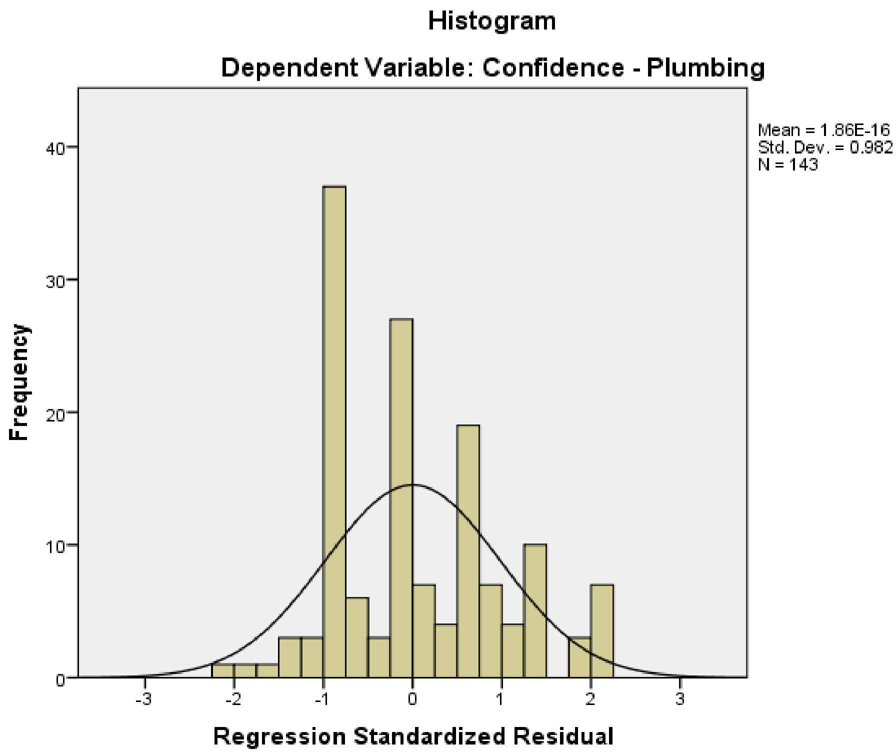
Relationship of Confidence Levels of Electrical Skills (Dependent Variables) and

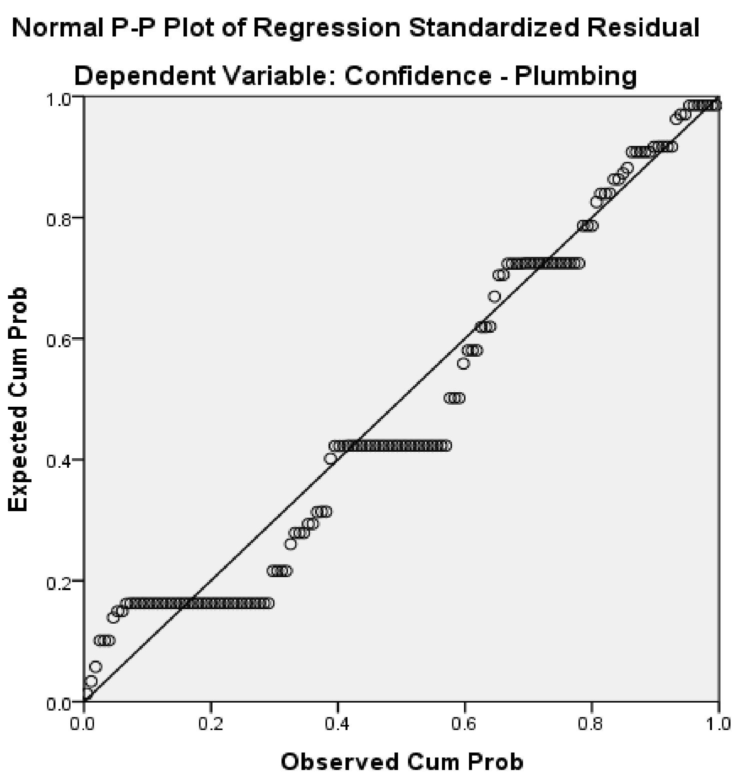
Teaching Methods (Independent Variables)



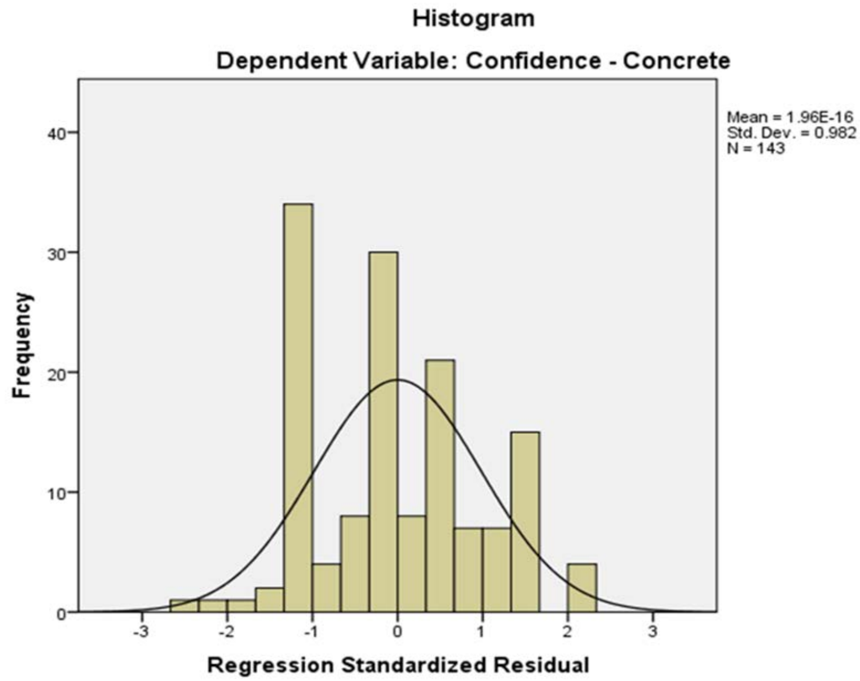


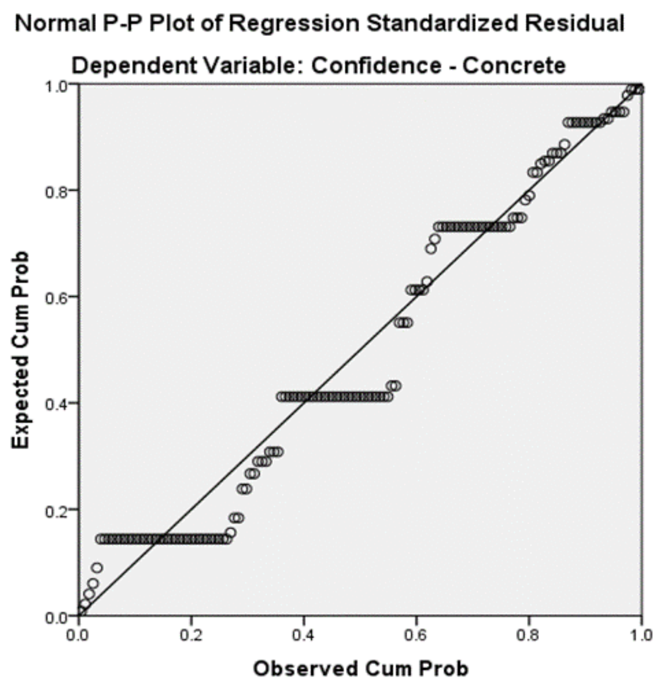
Relationship of Confidence Levels of Plumbing Skills (Dependent Variables) and Teaching Methods (Independent Variables)



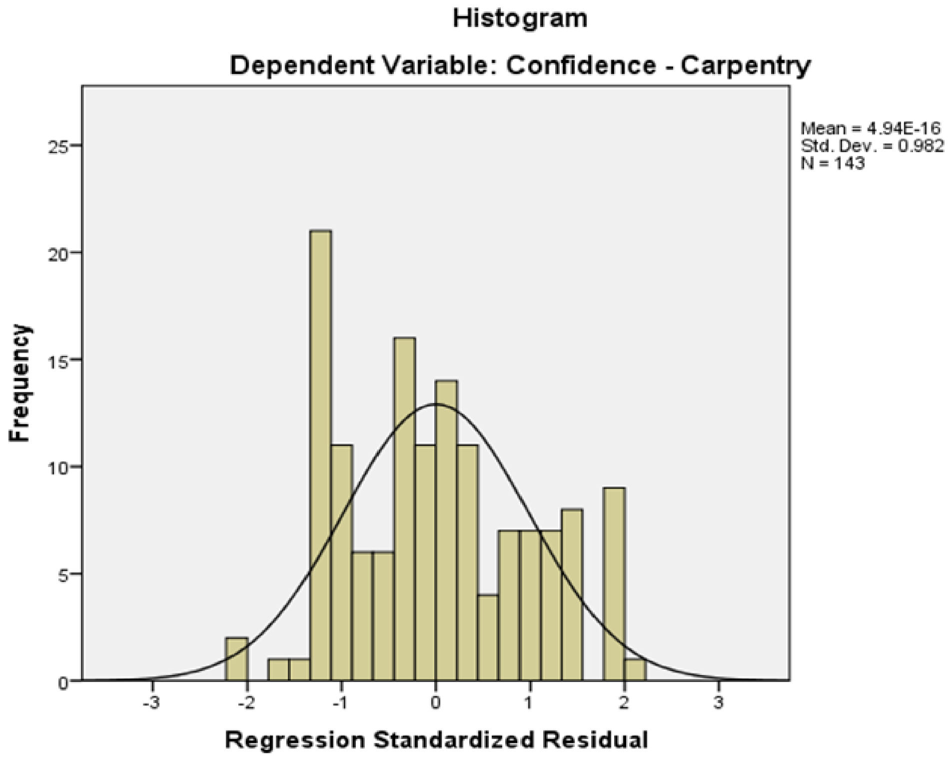


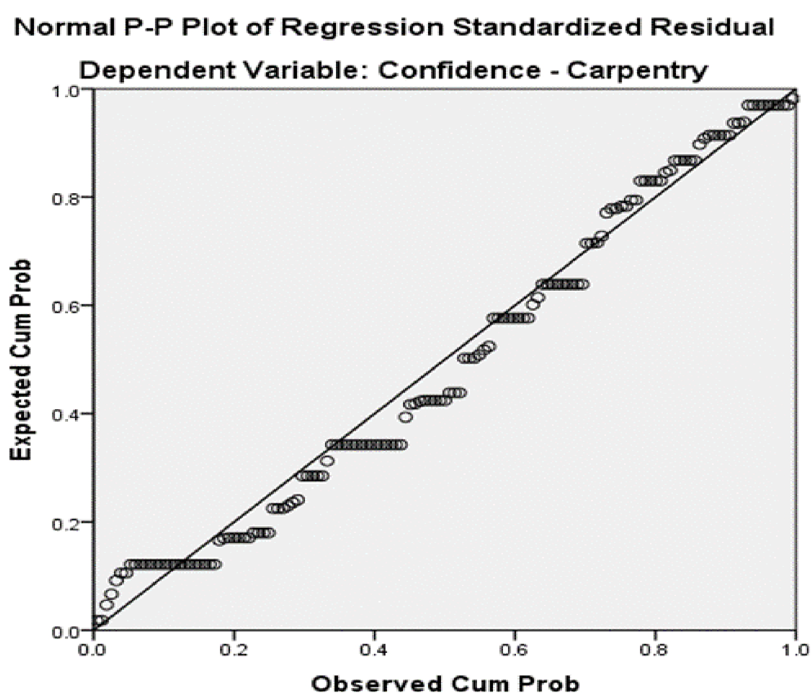
Relationship of Confidence Levels of Concrete Skills (Dependent Variables) and Teaching Methods (Independent Variables)



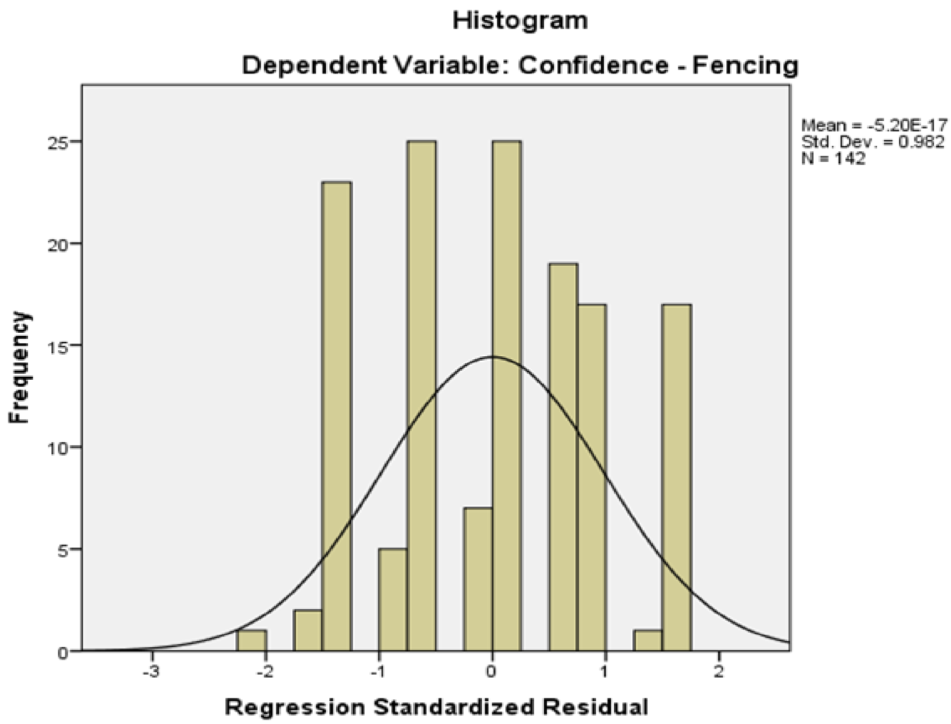


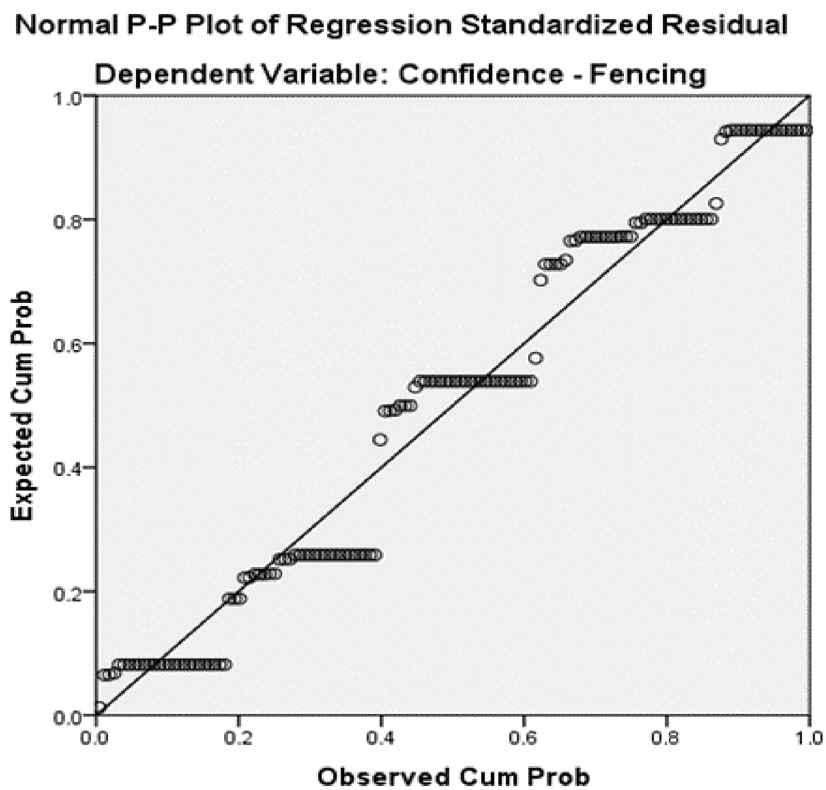
Relationship of Confidence Levels of Carpentry Skills (Dependent Variables) and Teaching Methods (Independent Variables)





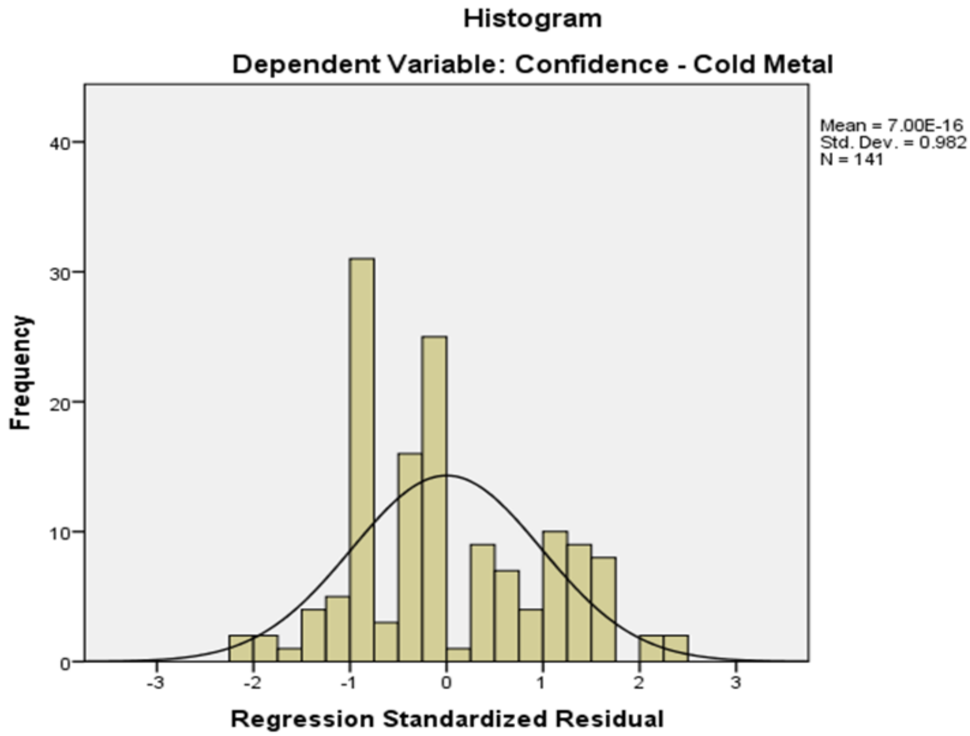
Relationship of Confidence Levels of Fencing Skills (Dependent Variables) and Teaching Methods (Independent Variables)

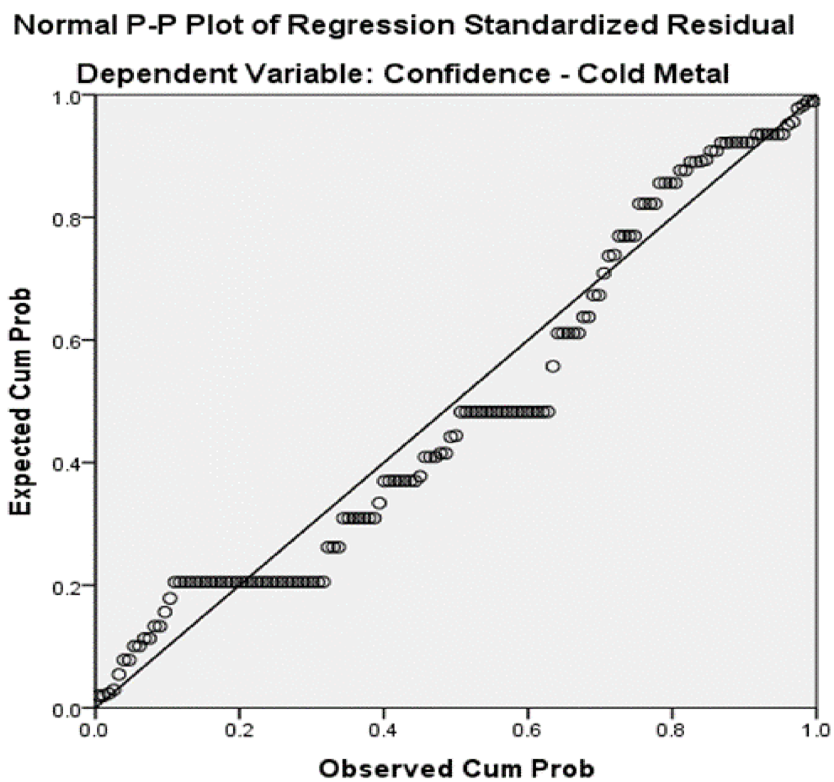




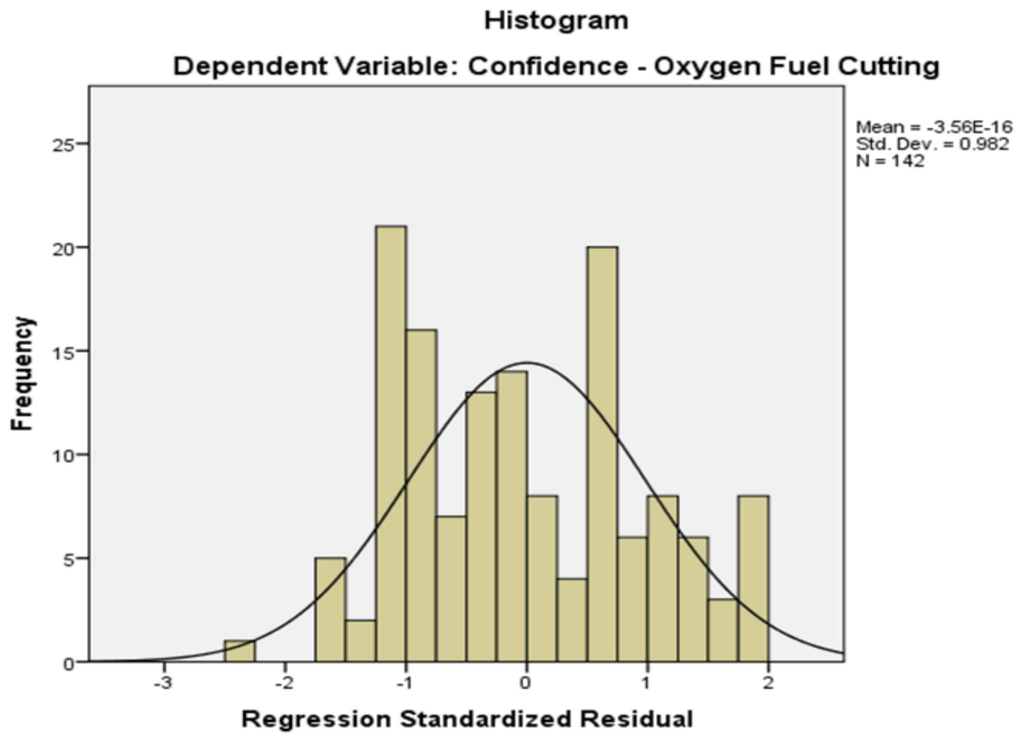
Relationship of Confidence Levels of Cold Metal Skills (Dependent Variables) and

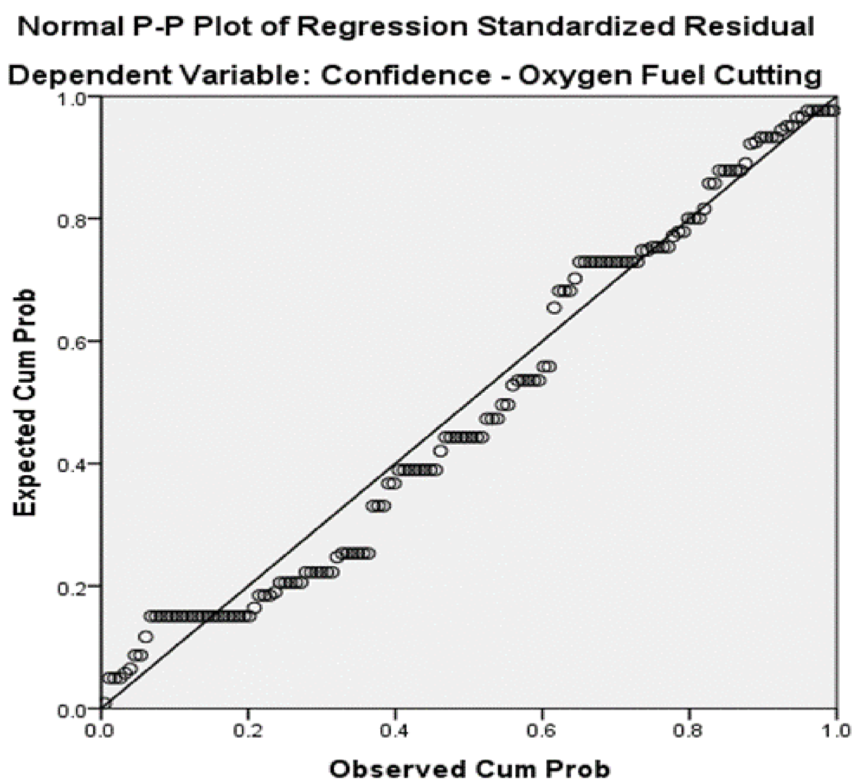
Teaching Methods (Independent Variables)



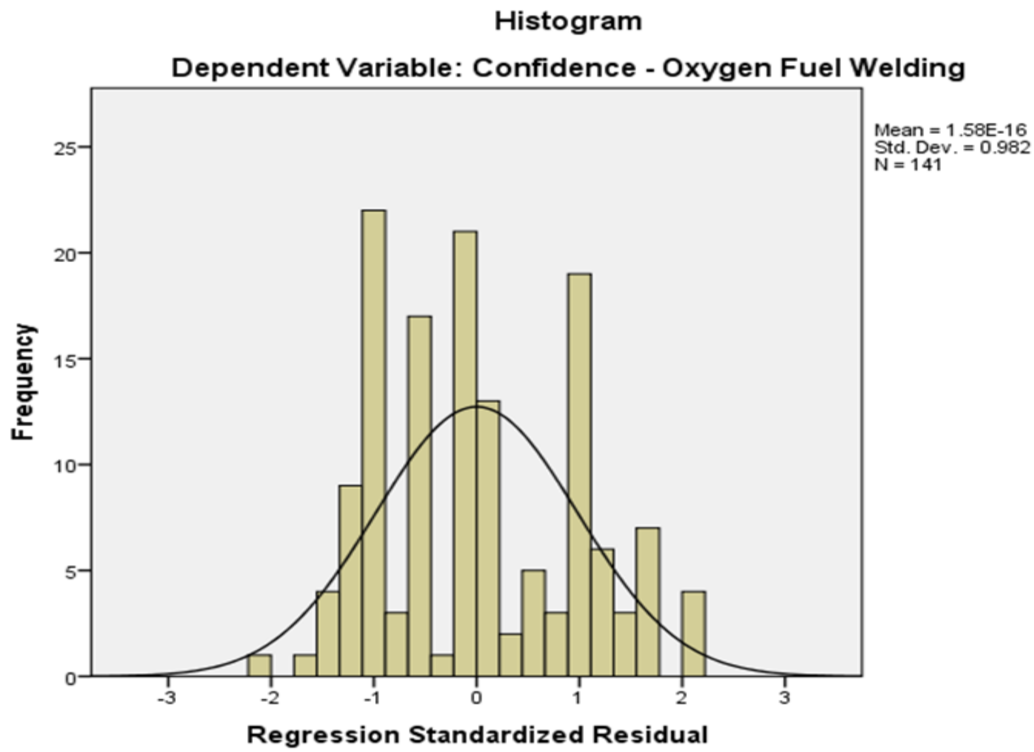


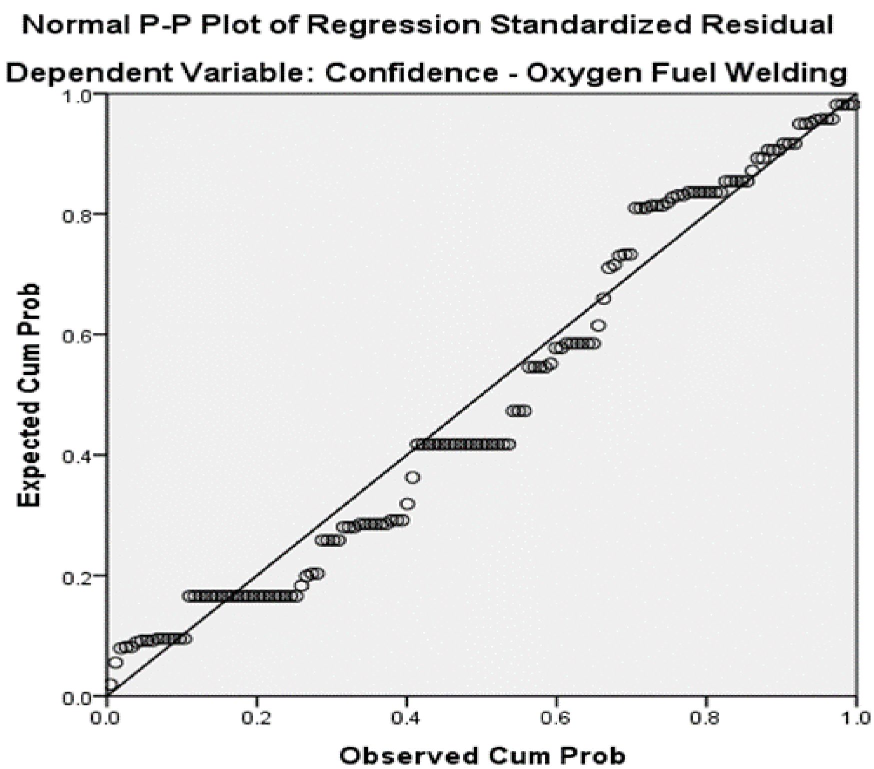
Relationship of Confidence Levels of Oxygen Fuel Cutting Skills (Dependent Variables) and Teaching Methods (Independent Variables)



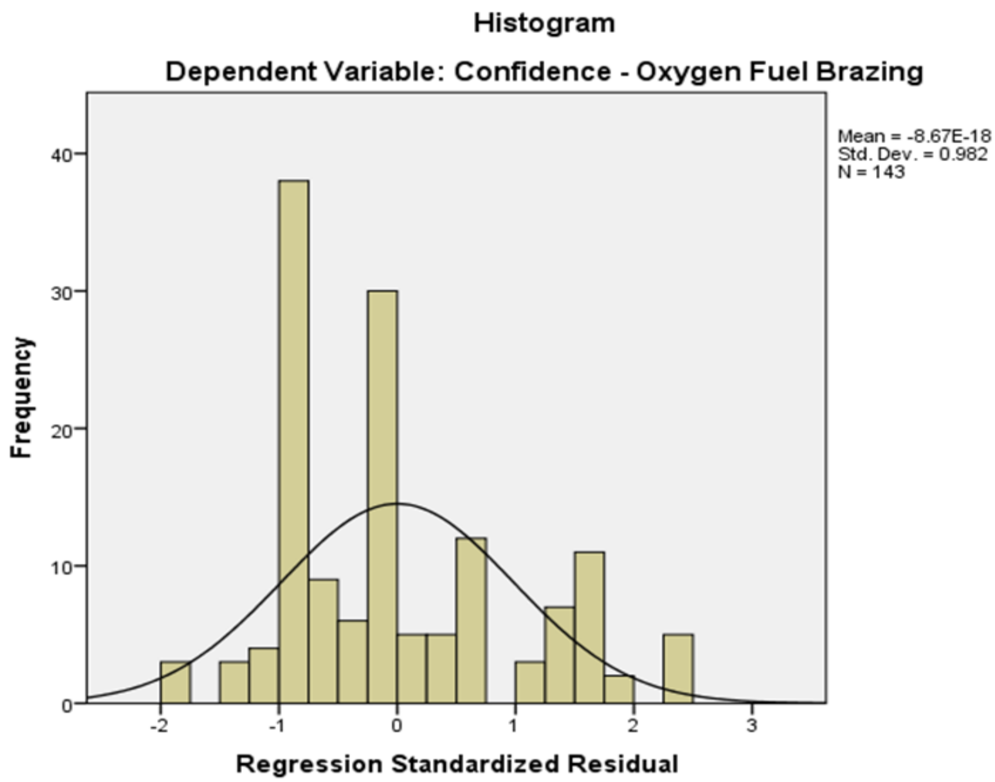


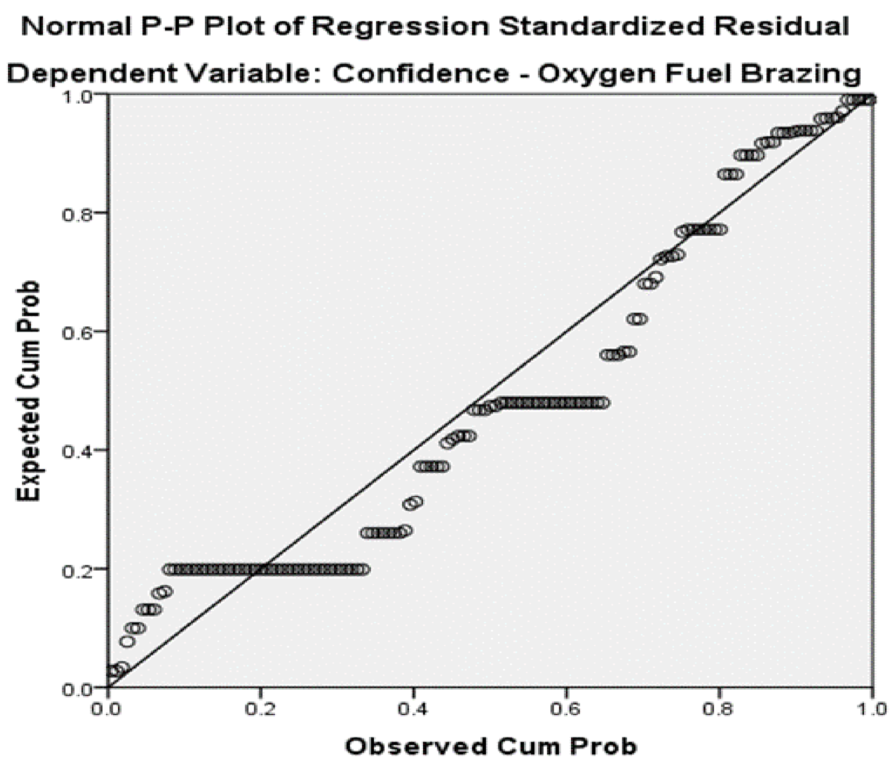
Relationship of Confidence Levels of Oxygen Fuel Welding Skills (Dependent Variables) and Teaching Methods (Independent Variables)



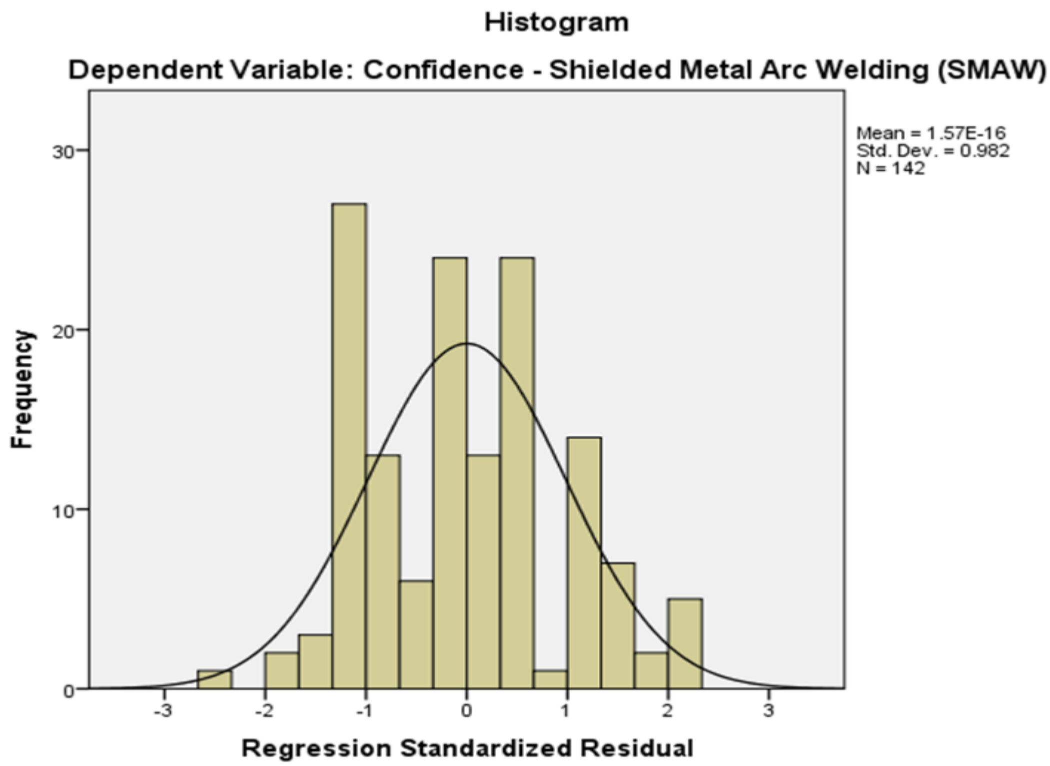


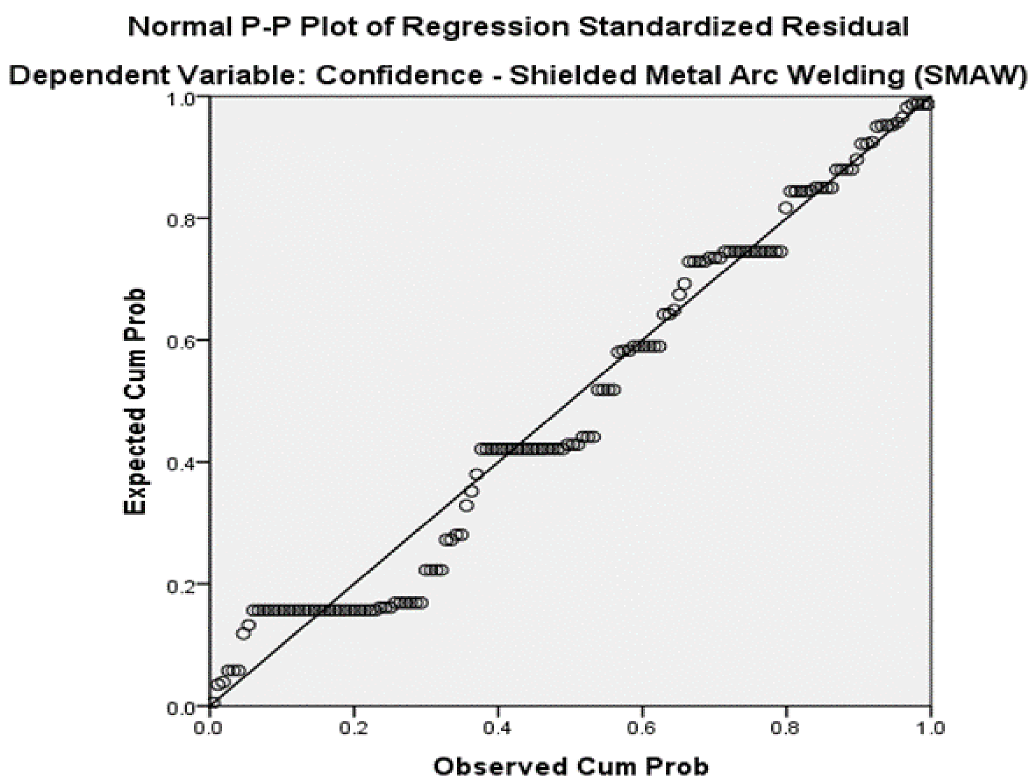
Relationship of Confidence Levels of Oxygen Fuel Brazing Skills (Dependent Variables) and Teaching Methods (Independent Variables)



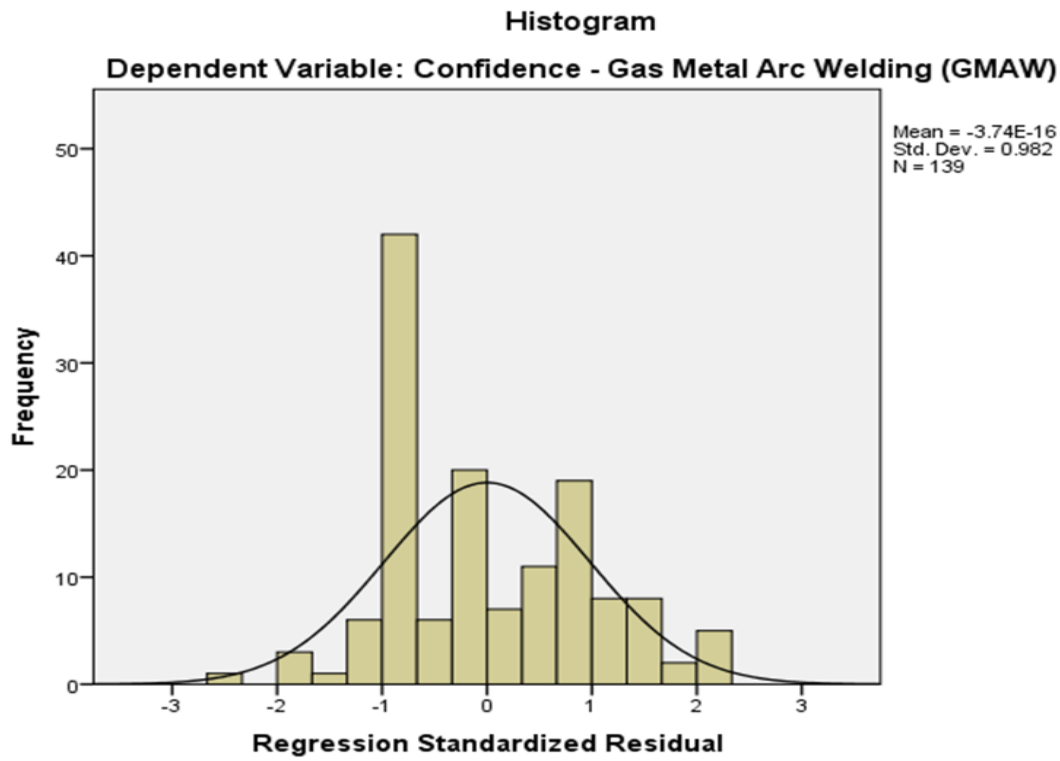


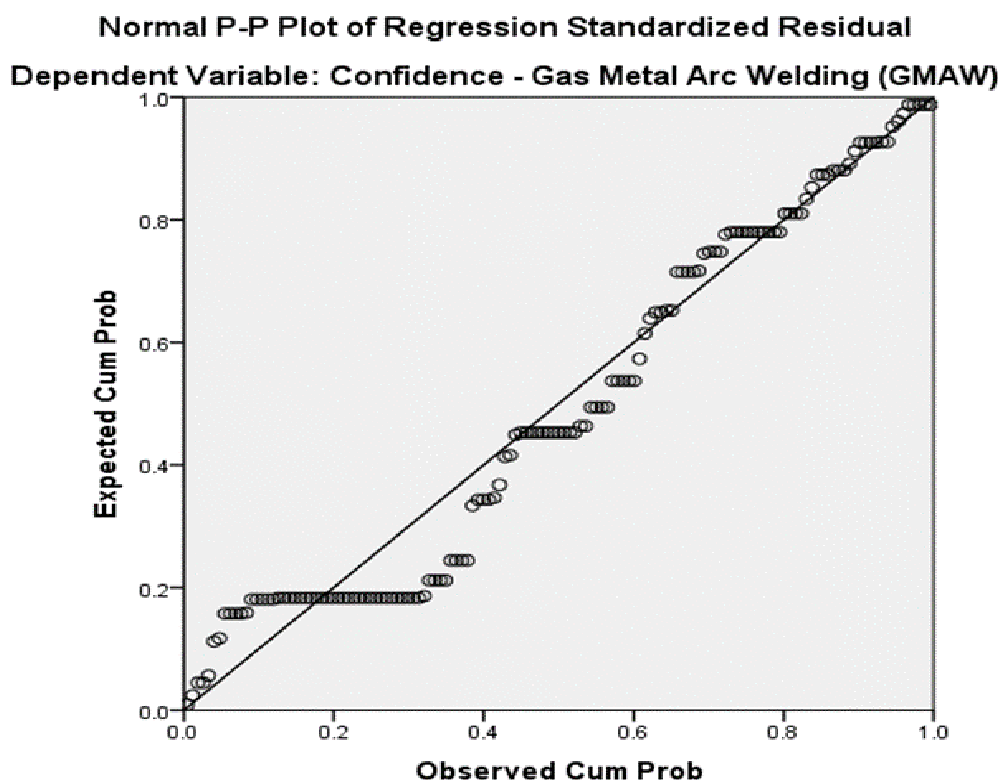
Relationship of Confidence Levels of Shielded Metal Arc Welding (SMAW) Skills (Dependent Variables) and Teaching Methods (Independent Variables)



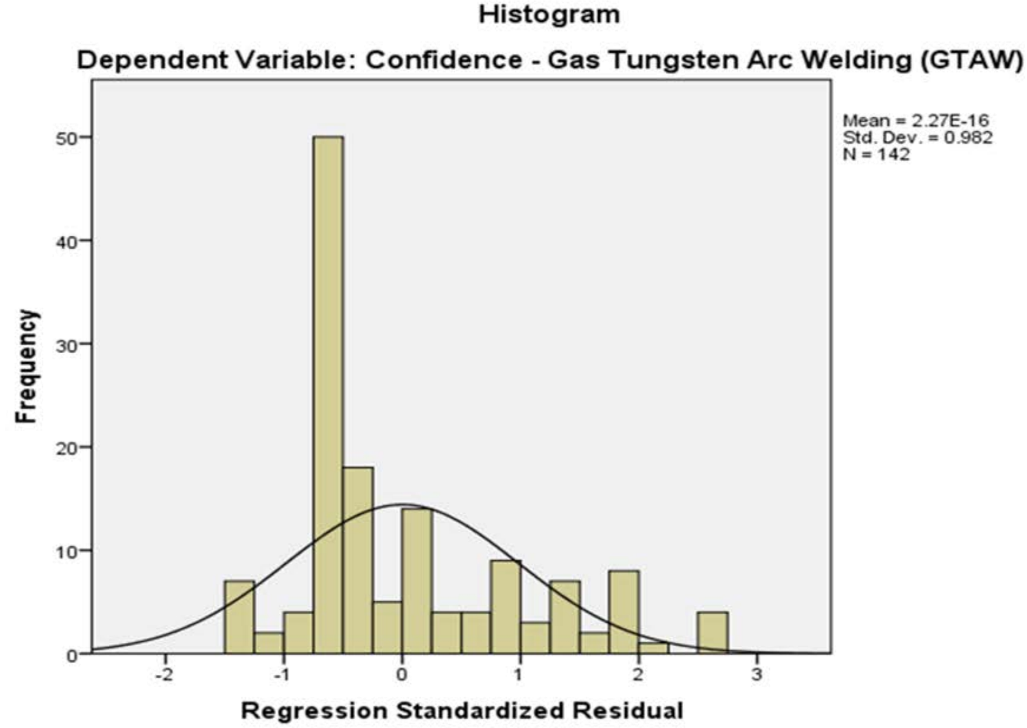


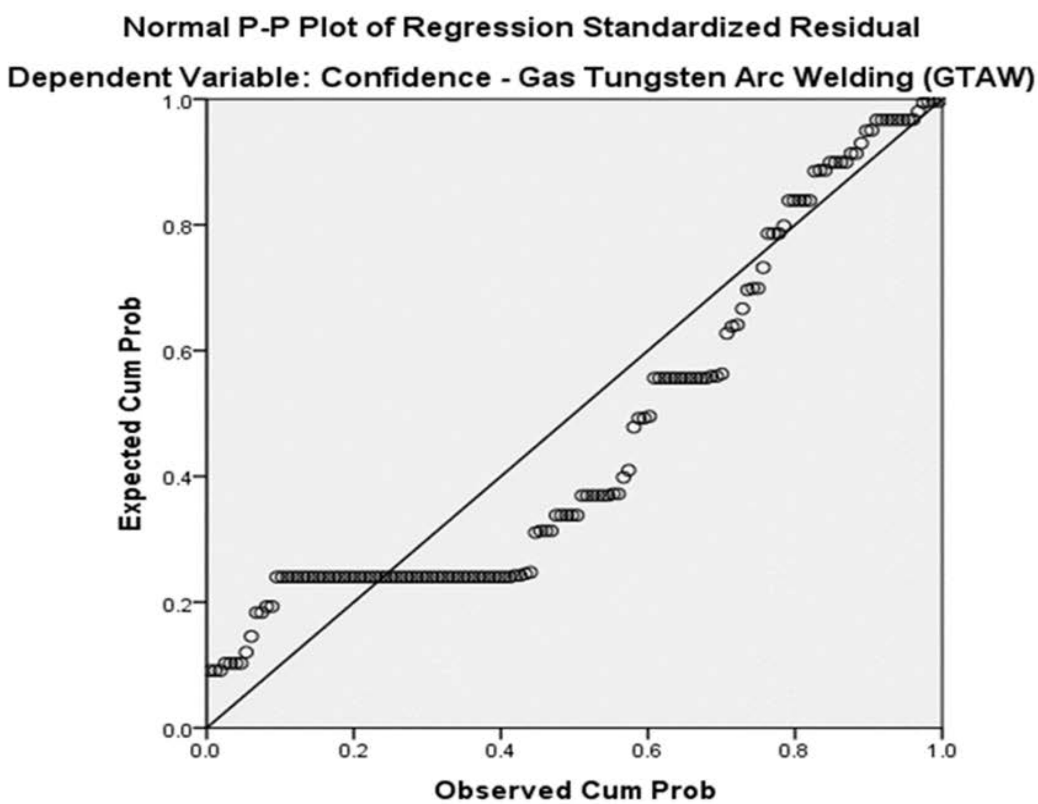
Relationship of Confidence Levels of Gas Metal Arc Welding (GMAW) Skills (Dependent Variables) and Teaching Methods (Independent Variables)



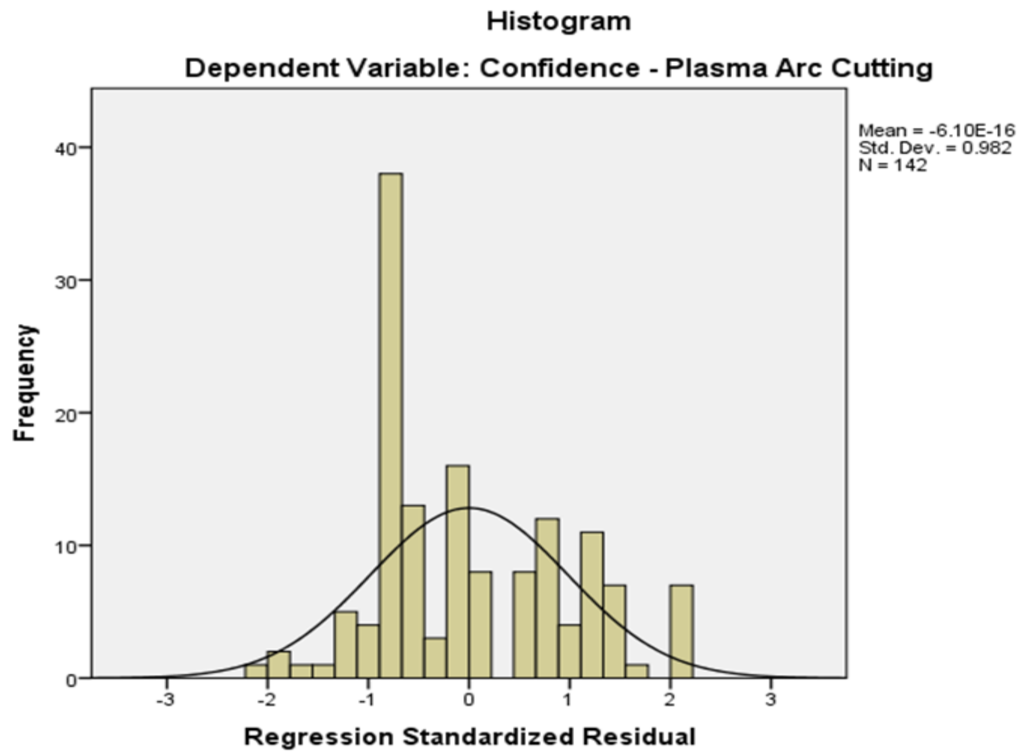


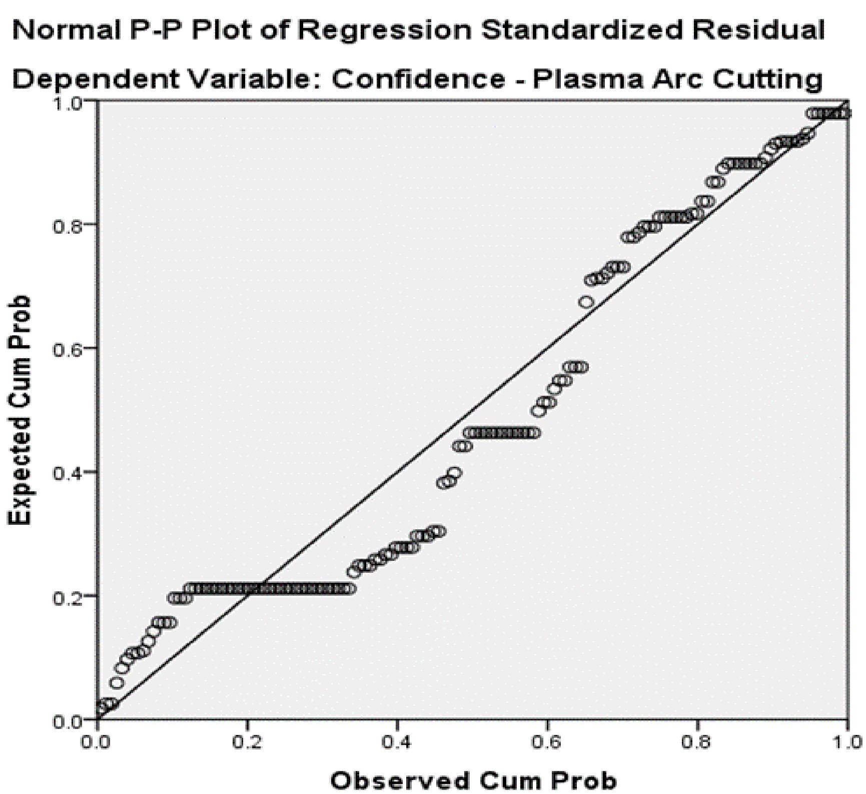
Relationship of Confidence Levels of Gas Tungsten Arc Welding (GTAW) Skills (Dependent Variables) and Teaching Methods (Independent Variables)



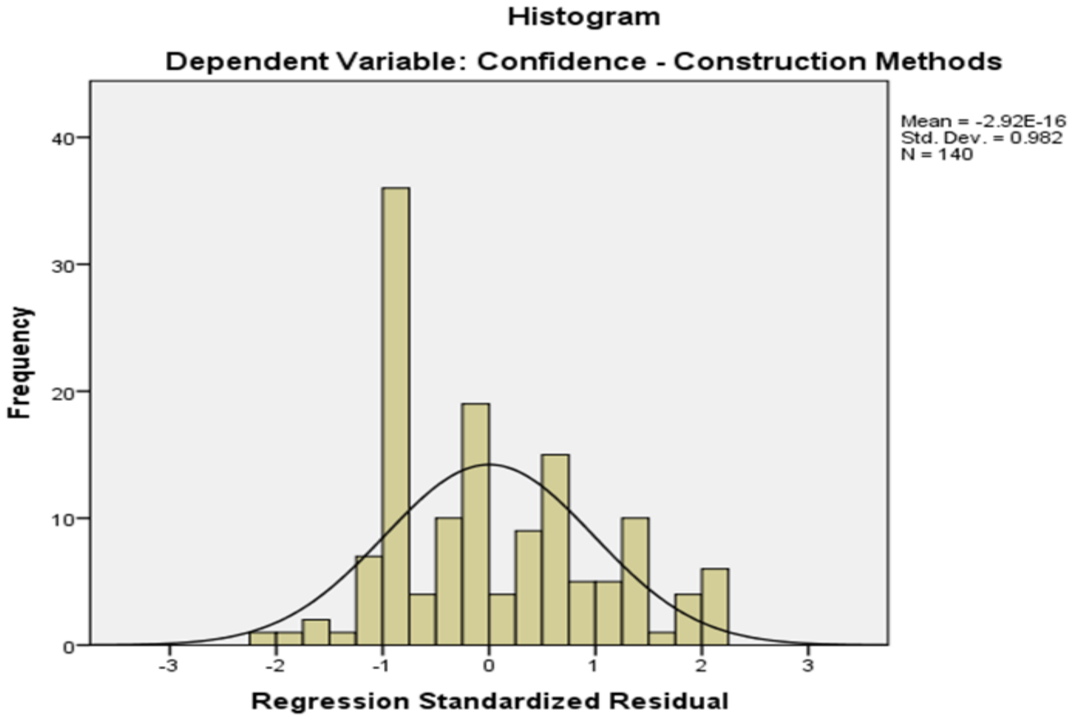


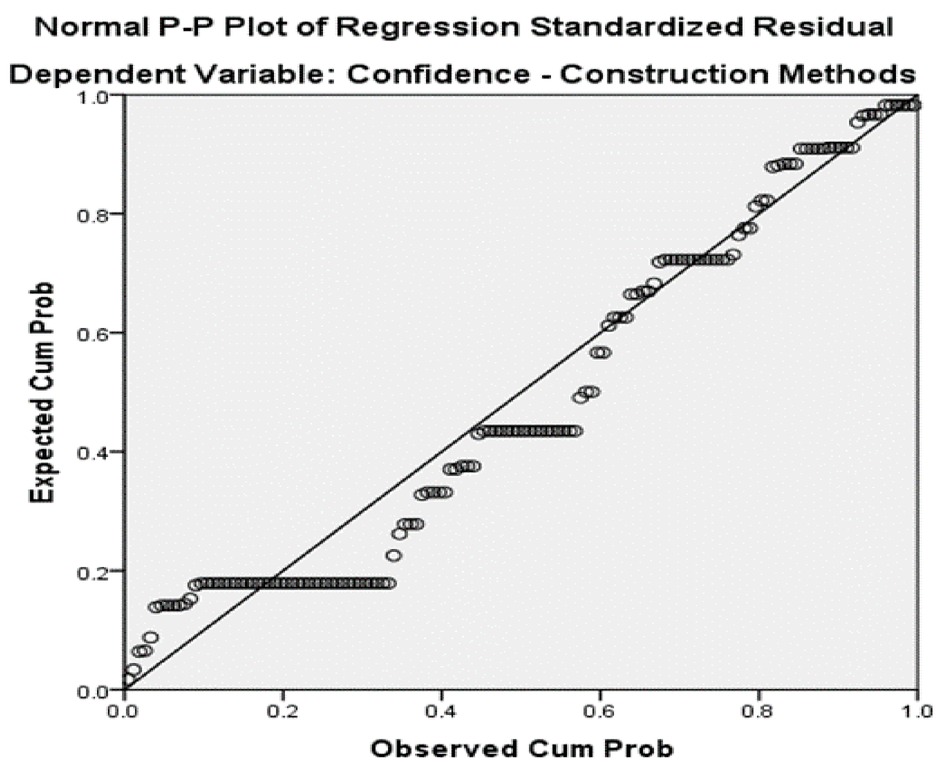
Relationship of Confidence Levels of Plasma Arc Cutting (PAC) Skills (Dependent Variables) and Teaching Methods (Independent Variables)



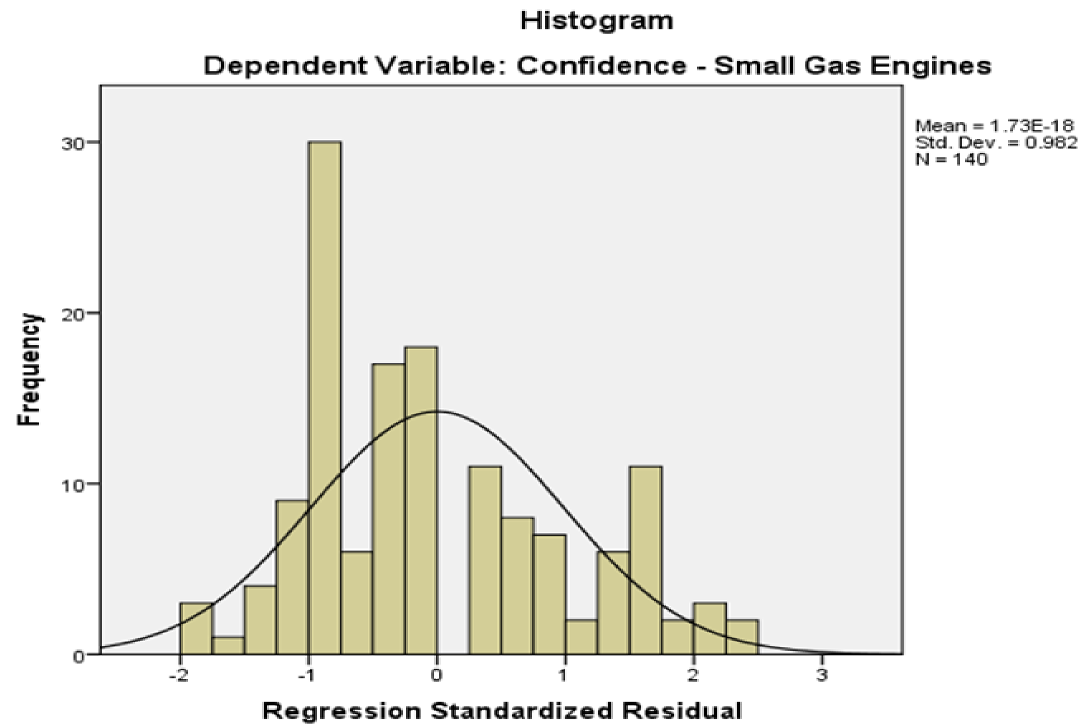


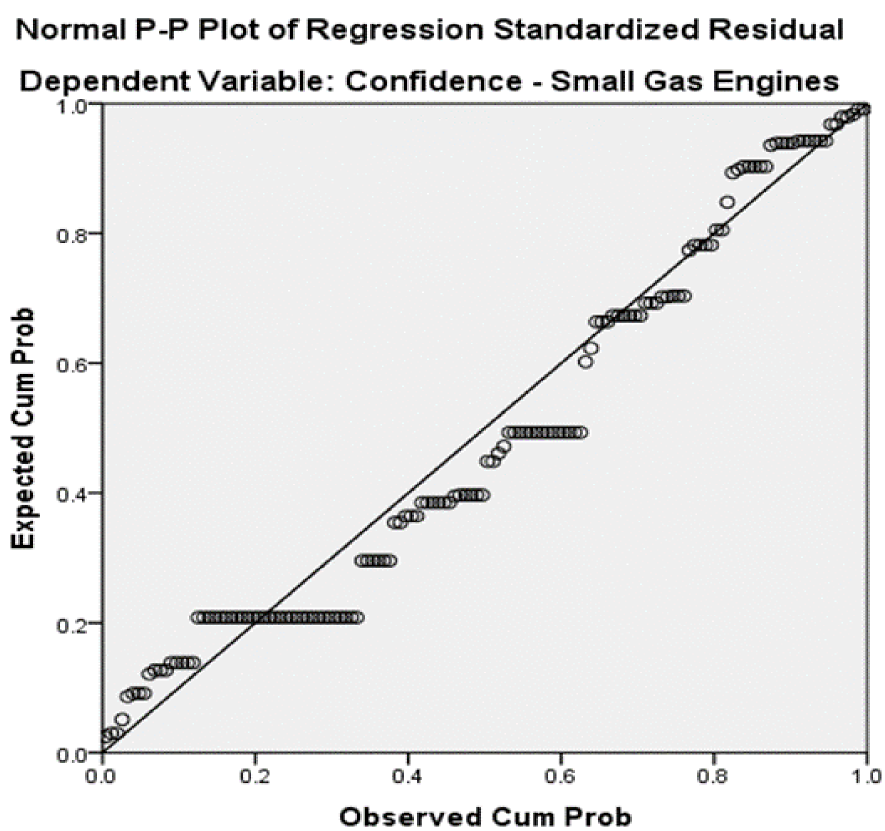
Relationship of Confidence Levels of Construction Methods Skills (Dependent Variables) and Teaching Methods (Independent Variables)



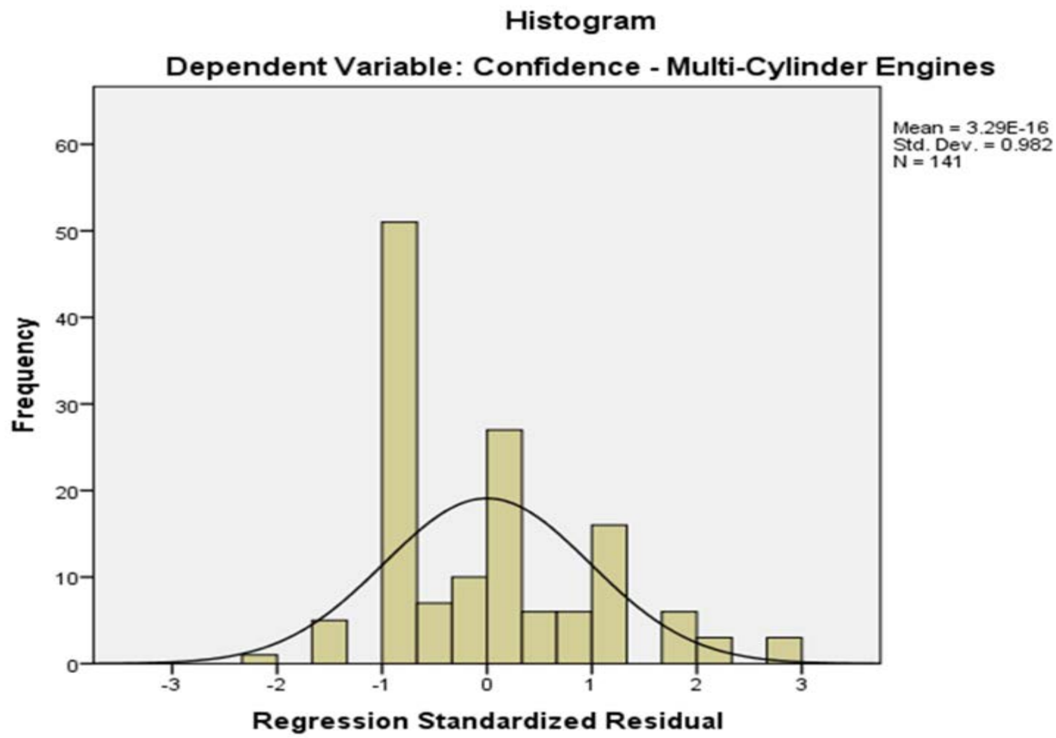


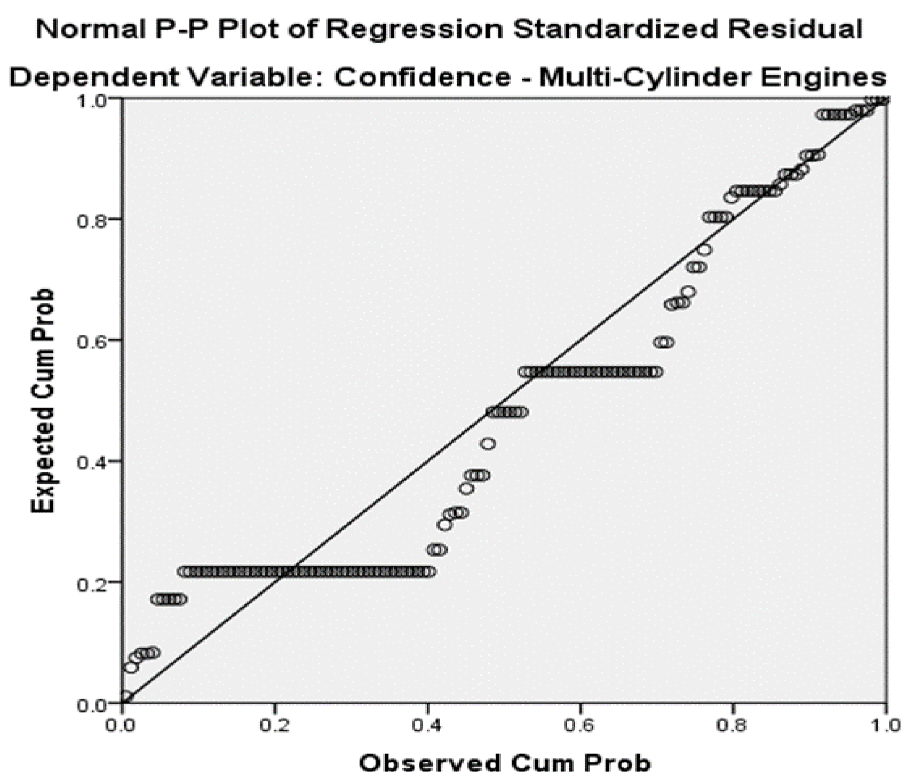
Relationship of Confidence Levels of Small Gas Engines Skills (Dependent Variables) and Teaching Methods (Independent Variables)



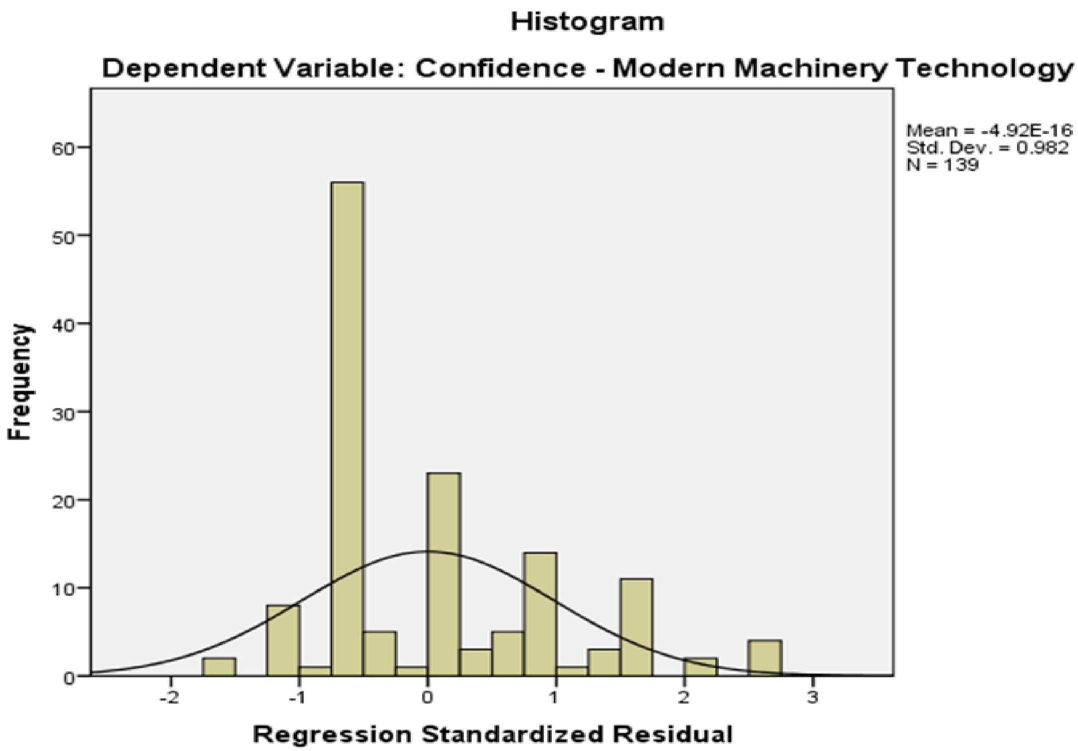


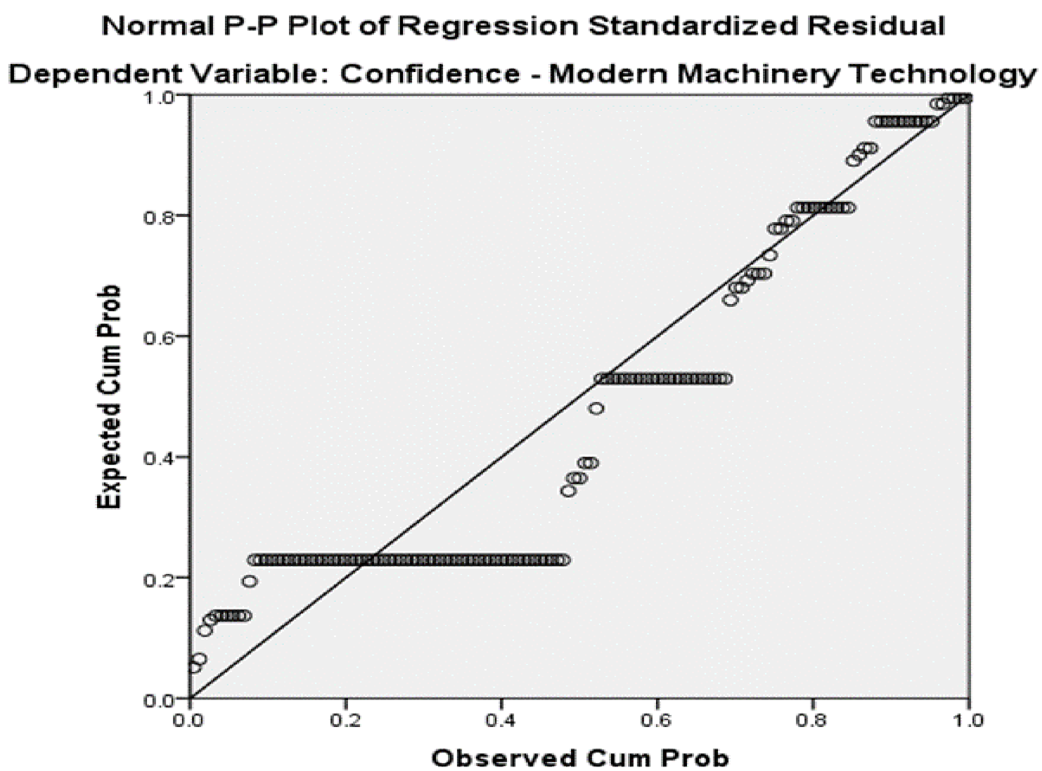
Relationship of Confidence Levels of Multi-Cylinder Engines Skills (Dependent Variables) and Teaching Methods (Independent Variables)



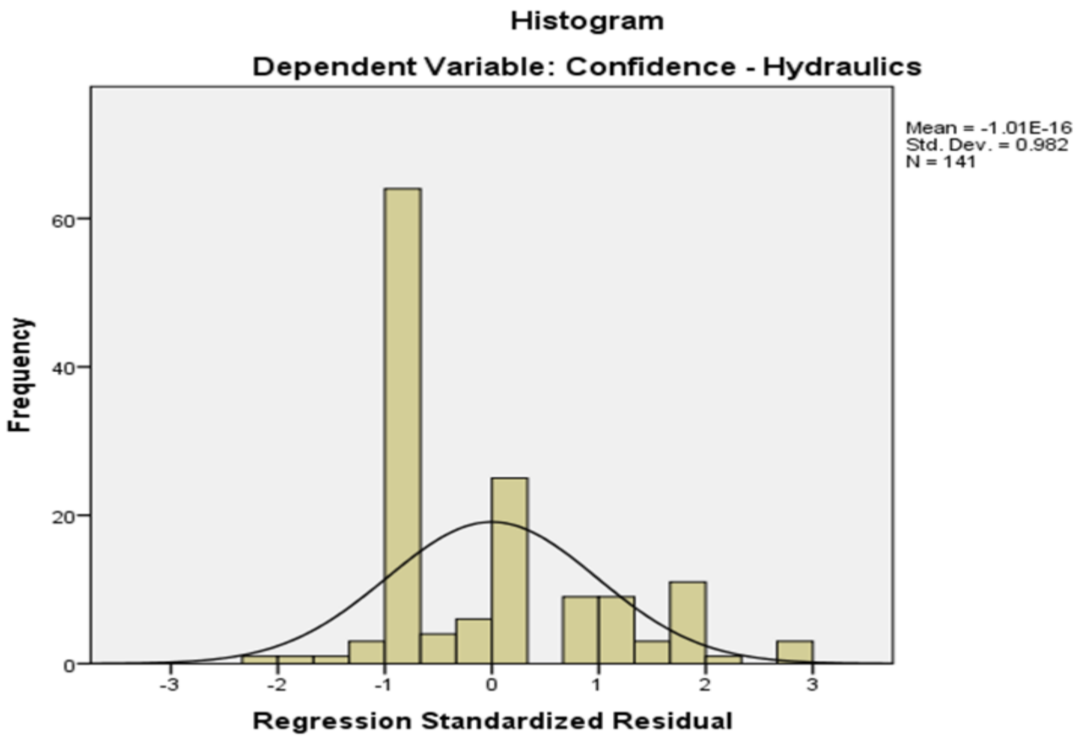


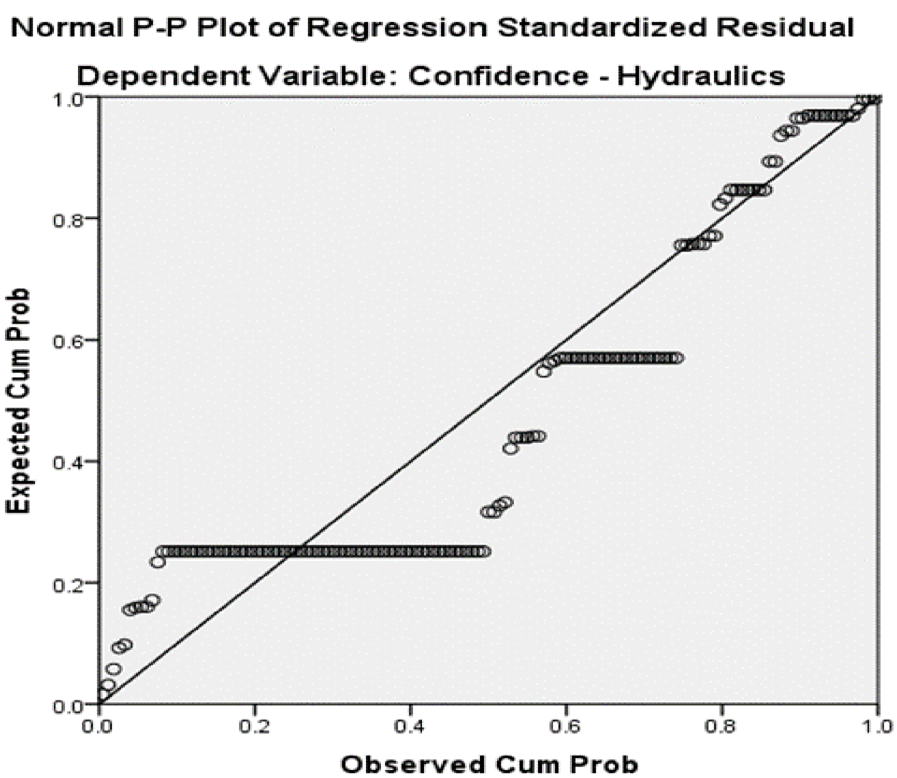
Relationship of Confidence Levels of Modern Machinery Technology Skills (Dependent Variables) and Teaching Methods (Independent Variables)



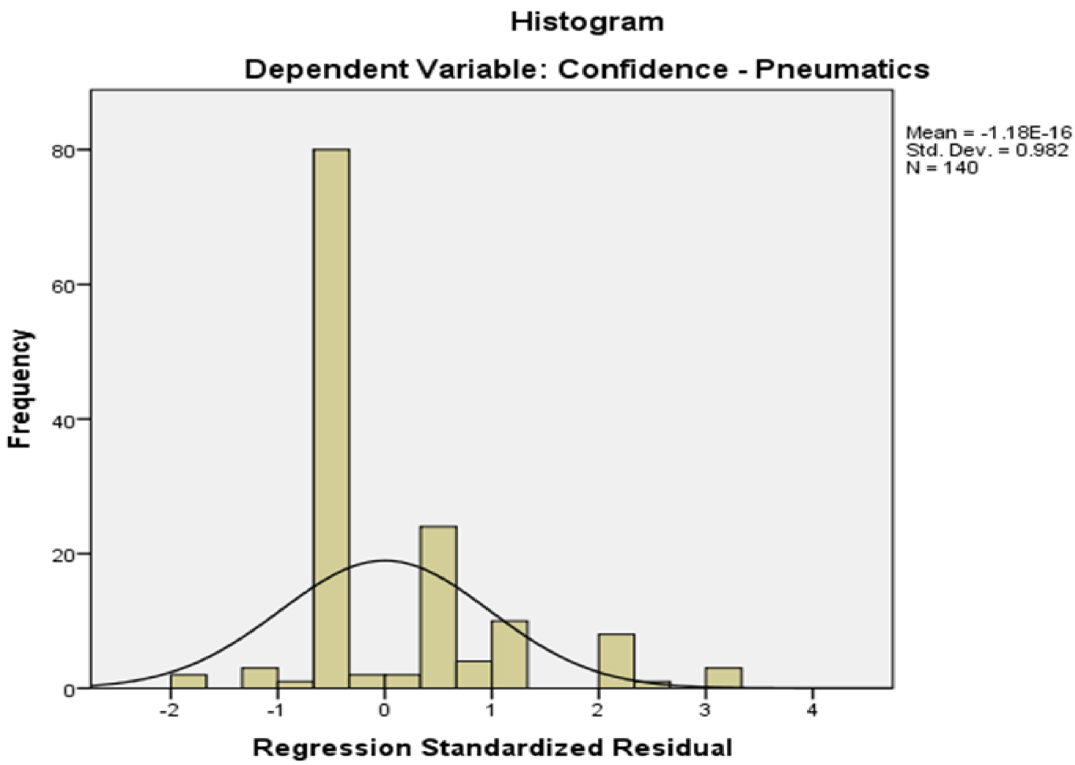


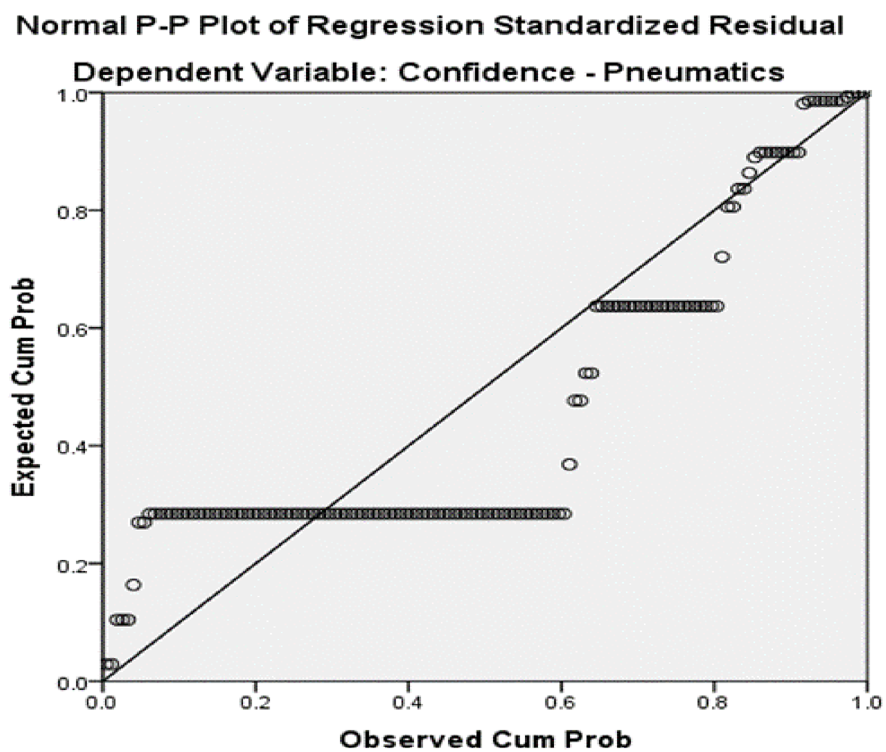
Relationship of Confidence Levels of Hydraulics Skills (Dependent Variables) and Teaching Methods (Independent Variables)





Relationship of Confidence Levels of Pneumatics Skills (Dependent Variables) and Teaching Methods (Independent Variables)





APPENDIX I

PI LOT TEST LETTER

Sam Houston State University
MEMBER THE TEXAS STATE UNIVERSITY SYSTEM™
DEPARTMENT OF AGRICULTURAL SCIENCES

2/22/2018

Dear Gaea Hoch:

Greetings, my name is Robyn Key and I am currently an Agricultural Sciences graduate student at Sam Houston State University. My thesis is focusing on confidence levels of Texas novice agricultural sciences teachers to teach agricultural mechanics related skills. I have developed a survey that is based on the research questions for my study. If you are willing, would you please administer the survey for my study to your student teaching block as a field test? In this envelope there is 20 blank copies of the survey. This survey will remain anonymous and confidential. The survey has instructions and an example of how to answer the questions. Also in this envelope is another envelope that is already addressed to Dr. Saucier and has pre-paid postage for you to return the completed surveys. Thank you so much for considering to help me precede with my study. If you have any question please do not hesitate to contact me.

Sincerely,

Robyn Key
Graduate Student
Agricultural Sciences
(903)353-5466
Rlk013@shsu.edu

Sam Houston State University is an Equal Opportunity/Affirmative Action Institution
Huntsville, Texas 77341-2088 • 936.294.1215 • Fax 936.294.1232 • shsu.edu/agr

VITA

Robyn L. Key

Education

Sam Houston State University
M.S Agriculture
Thesis concentration,
Graduation May 2019

Relevant Coursework:

- Advanced Biosecurity
- Advanced Principles of Livestock Management
- Statistics Methods for Agriculture
- Food Safety and Regulation
- Techniques and Interpretation in Research

Sam Houston State University
B.S. Ag Business
Minor in Secondary Education
Graduated May 2017

Relevant Coursework:

- Animal Feeds and Feeding
- Animal Nutrition
- Forage Crop and Pasture Management
- Sheep and Goat Production
- Advanced Agriculture Mechanics
- Agribusiness Marketing
- Agriculture Sales and Consulting
- Ag Structures and Environmental Control Systems

Research

Confidence Levels of Texas Novice Agricultural Science Teachers Teaching Agricultural Mechanics Related Curriculum.
M.S. Thesis, 2017-present

Work Experience

Graduate Teaching Assistant, Sam Houston State University August 2017- present
Taught plant and soil science laboratories and worked with other teaching assistants to update lessons. Prepared for area and state Floriculture CDE contests. Teach plant science, soil science, floral design, and plant propagation laboratories. Purchase supplies for laboratories.

Courses facilitated as Teaching Assistant

- PLSC 3440: Soil Science Lab
- PLSC 3395: Plant Propagation Lab
- PLSC 1107: Plant Science Lab

Student Teaching, Sam Houston State University Feb- May 2017
Taught five high school Agriculture, Food & Natural Resources course sections, coached several CDE judging teams, hosted show clinics, and advised Supervised Agricultural Experiences (SAE) projects and assisted with AET record books.

Courses facilitated as Student Teacher

- Principles of AFNR
- Professional Communications
- Principles of Floral Design
- Small Animal Management

Methods Observations, Sam Houston State University- Oct- Dec 2016
Completed 75 hours observing a high school agriculture science teacher. I also created and taught several lessons during this learning experience.

Cashier and Expeditor, McKenzie's BBQ, Huntsville TX- 2013 to 2016
Trained newly hired employees. Prepared and packaged orders accordingly. Responded to customer's complaints and resolved their issues.

Honors and Awards

- SHSU Raven Scholar, Spring 2018
- Presidents and Deans list, Spring 2017
- Presidents and Deans list, Fall 2016
- American FFA Degree Recipient, 2015
- Dean's list, Fall 2014

Certifications

- Agriculture, Food & Natural Resources Teacher Certificate- 2017
- EDEN Animal Agrosecurity and Emergency Management - 2017
- SHSU University vehicle operator- 2017
- SHSU Agricultural Sciences Department credit card authorized user-2017

Scholarships

- San Antonio Livestock Exposition Scholarship Recipient- 2017-2019
- Joe Glenn Burleson Agribusiness Scholarship Recipient- 2016
- Farm Credit Bank Scholarship Recipient- 2015-2016
- Pierce Scholarship Recipient- 2015
- Houston Livestock Show and Rodeo Scholarship Recipient- 2015

Extra-Curricular Activities

Agriculture and Engineering Technology Club- 2015 -2016

Served on the club t-shirt committee. Volunteered to be a judge's assistant at the Houston and San Antonio Ag Mechanic shows. Assisted with the State FFA Tractor Tech and Ag Mechanics CDE contests.

Delta Tau Alpha Honor Society- 2013 -2016
Served on the Haunted House Fundraiser committee. Volunteered to help with the Linus blanket project. Assisted with the corbus book that represented our DTA chapter at convention.

Collegiate FFA- 2013- 2016
Served as Reporter; took pictures at meetings, assisted with agendas and activities. Judged the State Sales contest. Helped host area and state LDE and CDE contests each year. Judged invitational LDE radio and skills contests, Co- chaired the Steer Saddling Fundraiser Committee. Was a voting delegate at the state CFFA convention. Competed on the quiz bowl team at the CFFA convention.

Block and Bridle 2013- 2015
Volunteered with the monthly trash pick up project. Presented an activity to school aged kids at the Children's Barn Yard. Helped clean up after the various fundraisers.

Workshops Instructed

ExCEL @ Sam- January 2018
Taught students about the differences of aquaponics and hydroponic systems

4H Floral Workshop- August 2017
Assisted with teaching 4H students how to make two different types of floral designs

4H Horticulture and Floral Workshop- November 2017
Taught 4H students about the differences of aquaponics and hydroponic systems. Also taught the 4H students how to make a floral arrangement