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A PROFILE OF CREDENTIALING PROGRAMS OFFERED IN PENNSYLVANIA

SECONDARY SCHOOL-BASED AGRISCIENCE PROGRAMS

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By

Jonathan Tyler Seaman

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The thesis of Jonathan Seaman was reviewed and approved* by the following:

John Ewing
Associate Professor
College of Agricultural Sciences
Department of Agricultural Economics, Sociology, & Education

Daniel Foster
Associate Professor
College of Agricultural Sciences
Department of Agricultural Economics, Sociology, & Education

Mark Threton
Assistant Professor
College of Education
Penn State Workforce Education and Development Program

Daniel Azzara
College of Agricultural Sciences
Department of Agricultural Economics, Sociology, & Education
Head of the Department

*Signatures are on file in the Graduate School

ABSTRACT

As part of career and technical education, school-based agriscience education plays a vital role in preparing youth for future vocations and careers within the agricultural sector. Preparing students for future education and careers within agriculture has become increasingly important as the global agricultural industry prepares to meet the predicted demands of a continuously growing population.

Known for utilizing hands-on learning, school-based agricultural education has historically included industry-recognized certifications to validate students' knowledge and skills achievements. These industry-recognized certifications can and do serve as important credentials for students as they seek employment and/or future educational opportunities. Furthermore, agribusinesses are searching for credentialed candidates to fill the voids left by a retiring workforce coupled with an increased demand for agricultural commodities and services.

The Pennsylvania Department of Education, Bureau of Career and Technical Education is aware of the industry certifications being offered by a portion of school-based agricultural education programs in the State of Pennsylvania; however, only those programs that have been approved by the Pennsylvania Department of Education are included in this census of data. This study intended to identify certifications offered by schools that may not be included in the existing body of data. Furthermore, this study intended to identify which industry certifications are offered most frequently and determine whether or not those certifications were among those also desired by Pennsylvania's agricultural industries. Upon making this comparison, future opportunities for research on the matter, as well as professional development opportunities for school-based agriscience educators related to industry-recognized certifications were also identified.

TABLE OF CONTENTS

LIST OF FIGURES	vi
LIST OF TABLES	vii
ACKNOWLEDGEMENTS	viii
Chapter 1 Introduction.....	10
Career and Technical Education.....	11
Agricultural Education.....	12
School-based Agriscience Education in Pennsylvania.....	13
Meeting a Global Challenge.....	15
Purpose and Objectives	16
Operational Definitions	17
Summary.....	18
Chapter 2 Review of Literature	19
Introduction	19
The Role of Career and Technical Education.....	19
The Role of Secondary Agriscience Education in Workforce Development.....	21
The Role of Hands-on Learning in Career and Technical/Agricultural Education.....	22
CTE and Agricultural Industry Certifications	23
Summary.....	26
Chapter 3 Research Methods.....	27
Purpose of Study.....	27
Conceptual Framework.....	29
Study Population.....	30
Data Collection	31
Limitations of Study	38
Description of Industry Certifications Surveyed.....	39
Summary.....	43
Chapter 4 Findings	44
Summary.....	53
Chapter 5 Conclusions, Recommendations, and Implications	54
Objective 1: Create an inventory of certification opportunities in Pennsylvania	55
Objective 2: Identify gaps between available certifications and industry needs.....	57

Objective 3: Identify potential opportunities for future research.....59

Objective 4: Identify professional development opportunities for educators.....60

Appendix A Penn State IRB Approval65

Appendix B Educator Data Collection Instrument.....75

LIST OF FIGURES

Figure 3-1: Conceptual Framework of Study.....28

LIST OF TABLES

Table 4-1: Certifications offered by Pennsylvania school-based agriscience programs.....	45
Table 4-2: Order of certification offering frequencies from greatest to least.....	46
Table 4-3: Certifications identified as beneficial to students by PA agribusiness.	48
Table 4-4: Comparison of certifications listed by agriscience educators and industry.....	49
Table 4-5: Costs of each industry certification and benefits to completers for obtaining.....	50

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Chapter 1

Introduction

Since the passage of the Smith-Hughes Act in 1917, there has been an evolving commitment to career and technical education in the United States. Career and technical education (CTE) is represented by 16 career clusters, “Agriculture, Food, and Natural Resources” being one of those career clusters (ACTE, 2016). As the educational community continues to improve the means by which secondary students are prepared for future careers and post-secondary education, it becomes increasingly imperative for educational outcomes to also prepare students to be competitive in a global economy (O’Lawrence & Martinez, 2010). Integrating industry-education relationships into secondary career and technical education will continue to be critical to the fulfillment of career and technical education’s mission of preparing students for career- and college-readiness. Effective, high quality CTE programs are aligned not only with college- and career-readiness standards, but also with the needs of employers, industry, and labor (USDE, 2012). In 2012, President Barack Obama set a new goal for the United States that by the year 2020, America would once again have the highest proportion of graduates in the world. President Obama challenged every American to attend at least one year of higher education or postsecondary training (USDE, 2012). Given the fact that the United States is currently ranked 9th in the world for young adults pursuing college or post-secondary education, this initiative alone creates an urgent need for improved college preparedness among secondary students (USDE, 2012). According to the United States Department of Education (2012):

Transforming career and technical education (CTE) is essential to this process. CTE represents an investment in our future. It offers students opportunities for career awareness and

preparation by providing them with the academic and technical knowledge and work-related skills necessary to be successful in postsecondary education, training, and employment. Employers turn to CTE as an important source of talent that they need to fill skilled positions within their companies. (para 11).

Employment data compared with projected employment opportunities in the United States show a distinct gap between industry needs and national education readiness (STEM 2014). As the world prepares for the largest human population growth ever seen, it will become increasingly imperative for career and technical education, specifically agricultural education, to prepare the United States workforce to lead the global initiative of preparing for sustaining 9 billion people (STEM, 2014). The basis for this study is to identify specific industry certification programs being offered in Pennsylvania secondary school-based agriscience programs that contribute to the overall goal of preparing for the global challenge.

Career and Technical Education

In the words of Dr. P.M. Munuyofu (2008), educational research associate at the Pennsylvania Department of Education, the history of career and technical education in Pennsylvania and the nation is a long one. By the mid-1880s, career and technical education in the form of industrial education was synonymous with institutional programs for youths (Munuyofu, 2008). One of the most fundamental obligations of any society is to prepare its adolescents and young adults to lead productive and prosperous lives as adults. This means preparing all young people with a solid enough foundation of literacy, numeracy, and thinking skills for responsible citizenship, career development, and lifelong learning (Symonds, Schwartz, & Ferguson, 2011). This is the very mission of career and technical education.

Currently, 94 percent of high school students in the United States are involved in career and technical education classes, programs, and extra-curricular activities (CTE Today, 2015). Career and technical education integrates with traditional academics in a rigorous and relevant curriculum. While CTE fulfills the needs of employers in high-demand areas, CTE also prepares students to be college- and career-ready by providing core academic, employability, and technical, job-specific skills. (CTE Today, 2015). The discipline of career and technical education is comprised of 16 career clusters. One of these 16 career clusters is “Agriculture, Food, and Natural Resources” (ACTE, 2016). Therefore, school-based agricultural education is a subset-category within the CTE domain.

Agricultural Education

The passage of the Hatch Act in 1887 brought with it a scientific revolution in American agriculture (Rose, 2014). For the first time in American history, funding was made available specifically for the purpose of agricultural scientific research (Jenkins, 2008). The United States Department of Agriculture (USDA) was the primary monitor of agricultural education from the time of the Hatch Act of in 1887, until the passage of the Smith-Hughes Act in 1917. It was at this point in history when sole governance of agricultural education by the USDA shifted to federal oversight by the Federal Board for Vocational Education, as mandated by the Smith-Hughes Act (Hillison, 1996). The evolution of these events eventually resulted in what we know today as school-based agricultural education.

In Pennsylvania, agricultural education was introduced by Waterford High School, Erie County, PA, in 1905. In 1911, the Pennsylvania School Code made it compulsory to teach one year of agriculture in every rural high school within the Commonwealth of Pennsylvania. By the early 1940’s, agricultural education had expanded from primarily rural vocational schools to also

secondary schools. At that time, there were approximately 235 active FFA chapters in the state of Pennsylvania (Osborne, 2010). During the 1990's the agricultural industry had become an integral part of the economy of Pennsylvania. Pennsylvania's policy makers were concerned about the public's ability to make informed choices regarding the food and fiber industry (Osborne, 2010). It was at this point when agricultural education became a very prominent component in Pennsylvania's educational system (PDE, 2009).

In 1995, Act 26, passed by the general assembly, required the Department of Education to develop and disseminate agricultural educational materials that incorporate agricultural concepts into the basic education or K-12 curricula and are designed to educate the general student population about the importance of the agricultural industry and the role of agriculture in the students' lives. (PDE, 2009, p.7)

School-based Agriscience Education in Pennsylvania

According to the National FFA Organization, 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, 2015). This is the guiding mission for agricultural education in Pennsylvania. The philosophical model for the implementation of agricultural education in Pennsylvania, as well as the majority of the United States, is what is referred to commonly as the "conceptual three-circle model for agricultural education" (Croom, 2008).

The "conceptual three-circle model for agricultural education" is comprised of three separate yet interrelated components that are credited as essential components to an effective and well-rounded school-based agricultural education program. These three essential components are

Classroom/Laboratory Instruction, Supervised Agricultural Experience (SAE), and Student Leadership Organization (FFA) (NAAE, 2016).

“Classroom and laboratory instruction include activities that provide learning experiences within the confines of a school facility. These classroom activities are characterized by learning activities designed by an agriculture teacher and presented to students using formal instruction methods such as lecture, demonstration, guided and independent practice, review, and assessment”
(Croom, 2008, p.110).

Supervised agricultural experience describes student-learning opportunities that traditionally involve an educational plan that takes students out of the confines of traditional instruction methods. This could include, but is not limited to keeping records on an agricultural project as well as keeping records on a work-experience in the agricultural industry.

Supervised agricultural experience (SAE) is an independent learning program for students enrolled in agricultural education courses. It is designed to provide learning experiences for students in the agricultural career pathway of their choice. Supervised agricultural experience requires an educational plan cooperatively developed by the student, the agriculture teacher, the student’s parents, and an employer if necessary
(Croom, 2008, p. 110).

The National FFA Organization, the student youth leadership organization formally known as the Future Farmers of America, provides opportunities for agricultural students to develop their leadership skills and abilities to apply in their chosen career pathways. Agricultural students can also improve their career skills by participating in various competitive events.

The FFA is an instructional tool that compliments both instruction and supervised agricultural experience (SAE). FFA programs are designed to

encourage students to perform well academically. In addition, the FFA assists in the development of students' interest in agricultural careers through the support of the supervised agricultural experience program (Croom, 2008, p. 110).

Meeting a Global Challenge

As humanity prepares for what will be a truly global challenge to feed, clothe, and house a projected 9 billion people by the year 2050, agricultural education partnered with career and technical education will be required to aid in increasing agricultural production by 70 percent (STEM, 2014). Not only must this increase in production meet the growing demands of the global population, but also address the malnourishment plaguing nearly 1 billion people already worldwide (STEM, 2014).

According to the STEM, Food, and Agriculture Council the solution to the global challenge is to build sustainable agricultural systems that employ the best minds from a variety of scientific and engineering disciplines. Developing practices that ensure environmental sustainability will also be essential to meeting the projected global demand for food, fiber, and natural resources. This initiative will require innovation in business, science, and agriculture collectively. Additionally, there is a distinct need to increase the scope and the skills of the agricultural workforce. The STEM, Food, and Agriculture Council states that the size of the need will require that agriculture's future workforce come from a population that, unlike previous generations, has no natural connection to agriculture. Research shows that not nearly enough of agricultural professionals are being produced to meet the industry demand, which continues to grow on an annual basis (STEM, 2014).

Pennsylvania's workforce supply/demand ratio is consistent with that of the national trend. In order to remain competitive in the global economy, Pennsylvania must overcome the challenge of meeting the increased employment demands of the agricultural industry coupled with an aging workforce as Baby Boomers retire, resulting in a significant manpower shortage. (Crabbe, 2015). This manpower shortage could undoubtedly affect Pennsylvania's agriculture and food-processing industries. According to the Pennsylvania Department of Agriculture, the human capital pipeline in all industries will be severely impacted. Companies will not only run out of skilled people to operate technology, but there will be more general labor shortages of workers just to get basic tasks done. The variety of agricultural jobs demanding skilled workers now and in the future include, but is not limited to, farm equipment service technicians, heavy-duty truck drivers, large-animal veterinarians, sales representatives, food packers, mechanics, landscapers, and entry-level farm workers. Over the next 10 years, approximately 75,000 workers will be needed to satisfy the workforce demand in Pennsylvania (Crabbe, 2015). Additionally, a demand for a predicted 57,900 bachelor of science and higher degree graduates every year through the year 2020 in the areas of food, agriculture, renewable natural resources, and the environment demonstrates a need for individuals with agricultural industry credentials. The actual supply of graduates from colleges of agriculture is approximately 35,400 annually, leaving a gap of approximately 39%. While this gap alone is cause for investigation and action, it is estimated that the United States gains one new person every 16 seconds, and the world gains a new person approximately every half a second. The gap between agricultural graduate supply and demand coupled with a continuously growing global demand for food, fiber, and fuel means that an agriculturally credentialed workforce must be a focal point for research and educator professional development (Akridge, 2017).

Agricultural education needs to be a significant part of the solution to closing the gap between workforce demands and the supply of skilled employees in Pennsylvania, as well as

contribute to the achievement of the global challenge goal. The aforementioned mission and structure of agricultural education is already established to prepare students to enter the agricultural workforce, however, in order to completely meet industry demands, secondary agriscience programs must bridge the gap between students and industry via credentialing programs.

Purpose and Objectives

The purpose of this study was to create a profile of certification opportunities in secondary school-based agriscience education programs in Pennsylvania. Additionally, a major focus of this study was to identify gaps that exist between those certifications available and those that were being implemented in school-based agriscience programs in Pennsylvania. As career and technical education has continued to be a vital part of preparing the workforce to meet the demand for skilled and credentialed workers, this study focused on the following research objectives in order to gain valuable insight into the state of industry certifications in secondary school-based agriscience education:

- 1.) Identify the industry-recognized certifications offered in Pennsylvania secondary school-based agricultural education programs as of 2016.
- 2.) Identify gaps that exist between industry-recognized certification programs available and those that are being offered in Pennsylvania secondary school-based agricultural education programs as of 2016.
- 3.) Identify potential opportunities for future research on industry certification opportunities offered in secondary school-based agricultural education.
- 4.) Identify professional development opportunities for Pennsylvania agriscience educators to aid them in offering industry-recognized certifications to their students.

Operational Definitions

The following shall serve as the intended definition for each term throughout this thesis.

Credential – a qualification and/or certification of achievement, obtained post-training, indicating that an individual is competent or has satisfactorily demonstrated application of knowledge and/or process within a specific category of vocation.

Credentialing Program – a single training event or series of trainings, both formal and/or informal, resulting in a credentialing certificate being awarded to completers successfully demonstrating achievement of program criteria.

Industry Certification – a credential awarded to successful completers of a credentialing program for a specific trade, vocation, or field of study.

Secondary School-based Agriscience Program - A collection of formal classes, youth leadership development, and independent application of curricula intended to prepare students in grades 7-12 for future careers in agriculture, natural resources, and land management

CIP – Classification of Instructional Program, provides a taxonomic scheme that supports the accurate tracking and reporting of fields of study and program completion activity.

Industry Certification – a credential awarded to successful completers of a credentialing program for a specific trade, vocation, or field of study.

Career & Technical Education – a field of concentration in education that focuses on preparing students for future vocations and education in areas such as agriculture, carpentry, welding, electronics, etc.

Vocational Education – an educational concentration that focuses on teaching students practical skills and theory to prepare for direct entry into the workforce.

Supervised Agricultural Experience – One of three main components to a complete agricultural education program that allows students to apply knowledge and skills learned in the classroom, coupled with leadership developed through FFA in a real-world, often independent-project, completed outside of regular instructional time.

FFA – One of three main components to a complete agricultural education program that focuses on developing leadership skills in agricultural education students for application in their future careers, businesses, and vocations.

Summary

Career and technical education has been a part of the American education system for 100 years, preparing students to meet the needs of a competitive global economy (O'Lawrence & Martinez, 2010). Making industry certifications available for career and technical education students not only aids in fulfilling the mission of CTE in preparing students for gainful employment, it also ensures a supply of career-ready employees to replace a retiring workforce in Pennsylvania (Crale, 2015). Aside from meeting the challenge of replacing an aging workforce, a growing global population also requires increasing productivity from the agricultural sector. A prepared and credentialed agricultural workforce will play a vital role in meeting the projected agricultural demands (STEM, 2014). In Pennsylvania, little is known about the extent to which agricultural industry certifications offered in secondary school-based agriscience programs match the workforce demands of agribusiness for the future.

Chapter 2

Review of Literature

The following review of literature examines the existing body of knowledge describing the role of career and technical education, as well as school-based agricultural education in preparing students for the 21st century workforce. Defining career and technical education, school-based agricultural education, and the needs of the agricultural industry in Pennsylvania are areas of interest that are included in this literature review. Literature examining the philosophies of hands-on learning as well as industry certifications in secondary education will also be described.

The Role of Career and Technical Education

The introduction of career and technical education to American high schools began around the beginning of the twentieth century. During this time the children of working-class parents began widely attending high school in increasing numbers. Prior to this time period, high school was traditionally attended by children of the elite, with a sole focus of preparing for college. However, with this new diversified population attending high school, a new dilemma arose in which educators were tasked with preparing traditional students for college, at the same time preparing the new population of students for the workplace (Asunda, 2012). The solution

was to differentiate high school curriculum into academic programs of study and vocational programs of study (Gray, 2002). Gray (2002) compiled longitudinal data from the 1980s to the year 2000 and concluded that contrary to traditional rhetoric, CTE students are in need of academic as well as work preparation. Gray (2002) also concludes the report by categorizing CTE students into three groups. The first and largest of these groups are students that are CTE concentrators who graduate having completed an integrated program of both CTE and academic curricula. The second group is comprised of CTE concentrators who complete only traditional CTE concentrated curricula. The third and final group composed of students who take CTE not as a program of study but as a source of elective courses. Gray (2002) concludes by recommending continued support by federal policy to ensure a seamless system between secondary technical education, academic preparation, and post-secondary education.

Since the beginning of the twentieth century, the exact manner in which career and technical education fits into the American educational system has been a topic of research focus. In a 2010 study of curriculum integration in career and technical education, Pearson et al. (2010) included a thorough discussion of the historical role of career and technical education in American academics.

As part of this historical background analysis, Kliebard (2004) summarized:

By 1917, the main direction of vocational education was sealed-job skill training in the public school supported generously by federal government... With money, powerful lobbying groups, energetic leadership in high places, and a sympathetic public, vocational education was well on its way to becoming the most successful curricular movement of the twentieth century (p. 123).

The widely adopted means by which vocational education was to be implemented resembled a system of distinctly differentiated curricula as Kliebard (2004) explained:

At that time, they advocated for a separate system of schools in which training programs prepared graduates for specific occupations.

Vocational education was designed to make an efficient producer and liberal education was intended to train the efficient consumer (p. 158).

As part of the argument that career and technical education has evolved into a seemingly parallel educational system Pearson et al. (2010) claims that career and technical education requires direct curriculum integration with traditional academics. The authors framed their study by asserting that the career and technical education field needs to not only integrate curriculum, but to re-connect with traditional educational systems that have been historically funded and legislated to operate separately. Grubb et al. (1991) is cited with the following statement:

Vocational and academic education have been growing apart at least since 1890; the split between the two is a deep one – one which affects the content and purpose, teaching methods, teacher training and philosophy, the kinds of students in vocational and academic programs, and status. Healing this division is a difficult and time-consuming process (p. 2).

The Role of Secondary Agriscience Education in Workforce Development

School-based agriscience education continues to serve as a portal between high school students and employment in the agricultural industry. As described by Wells et al. (2015), in a study analyzing the incorporation of inquiry-based instruction in secondary agricultural curricula, secondary school-based agriscience programs have been challenged to meet the demands of a changing world of education and workplace skills. In the review of the literature, Wells et al. (2015) found that secondary school-based agricultural programs nationwide are utilizing inquiry-

based approaches to learning in all three components of the 3-circle model of agricultural education (classroom/laboratory instruction, FFA, and Supervised Agricultural Experience). Wells (2015) did not include industry certifications in the study, however, the theoretical framework for the study was that school-based agricultural education continues to adapt to meet the needs of industry and society.

School-based agricultural education programs continue to require innovative and improved means of preparing students for their future education and careers. Doerfert (2017) explains that in order to prepare agricultural education programs to meet the changing needs of industry and society (as cited in Rayfield, Murphy, Briars, & Lewis, 2012), that we must define characteristics of effective agricultural education programs, teachers, and the means to correctly assess the current state of these characteristics. As the role of secondary school-based agricultural education shifts from solely preparing students for future vocational careers, to expanding agricultural literacy among all consumers, agricultural education will need to continue implementing innovative ideas and practices. In a report entitled, *Reinventing Agricultural Education for the Year 2020*, the authors state that “agricultural education envisions a world where all people value and understand the vital role of agriculture, food, fiber, and natural resources industries in advancing personal and global well-being” (NCAE, 1999, p.2). As the need for global agricultural literacy causes the role of agricultural education to evolve, certifications within the agribusiness industry can serve to validate an individual’s body of knowledge within a specific sector of agriculture.

Hands-on Learning in Career & Technical/Agricultural Education

John Dewey’s most concise definition of experiential learning, also referenced, as hands on learning is that, “our experience is simply what we do” (Berding, 1997). Dewey emphasized experience as the combination of trying and undergoing. With this as his working definition of

experience, Dewey's philosophy on educational pedagogy was based in the theory that education is the continuous reconstruction of experience (Berding, 1997).

Dewey wrote that as educators provide industrial and vocational training, educators must constantly maintain the primacy of educational values rather than industrial values of such training. Dewey asserted that industrial education should provide workers with the opportunity to learn the social and cultural background of their vocation as well as the skills necessary for said vocation (Dewey, 1931). Many vocational students engage in cooperative education, which places them in the adult workplace for varying periods of time. During these cooperative educational experiences, the student becomes accountable to adult supervisors, which immerses them in the daily realities of the workplace. Cooperative educational experiences allow students to learn which personal skills need improvement, as well as which skills can be improved in the context of the instruction offered through their vocational/career education program (Herr, 1987).

This context of hands-on learning coupled with learning in the workplace is the very foundational model by which agricultural education operates. Classroom/laboratory instruction, FFA, and Supervised Agricultural Experience are the three components attributed to a complete agricultural education program. Classroom/laboratory instruction provides the theory and formalized instruction for students. FFA activities develop leadership skills in agricultural education students, while Supervised Agricultural Experience provides a platform for real-world application of classroom/laboratory instruction and FFA leadership skills outside of formalized instructional time.

CTE & Agricultural Industry Certifications

In an analysis of career and vocational education as preparation for work, (Herr, 1987) quoted founding father Benjamin Franklin as stating:

It would be well if they (students) could be taught every thing that is useful and every thing that is ornamental: But Art is long, and their time is short. It is therefore proposed that they learn those things that are likely to be most useful and most ornamental (p.133).

This excerpt demonstrates that the discussion of vocational training and education has been ongoing from the time of the founding fathers of the United States. The conversation continued throughout history as the global economy became increasingly interconnected. As early as the 1980s the question of whether U.S. schools are adequately preparing the national workforce to be competitive with that of other nations in international economic competition has been asked (Herr, 1987). Given the level of competitiveness and the rate of change in the workplace, it is essential that students become as prepared as possible to enhance their chances of success in a globally competitive career market (Hughey & Hughey, 1999). Vocational education teaches students the problem-solving and analytic skills inherent to each trade, including agricultural emphases (Herr, 1987).

The workplace has changed, warranting a close examination of how career and technical education can change to meet new demands. Hughey & Hughey (1999) compared the traditional workplace versus the workplace of the early 21st century. The traditional workplace was categorized by centralized control governing individual worker tasks. Quality control traditionally examined at “end of the line” stage of the process with little regard for workers and labor as part of the decision-making process, mostly because workers were thought of as a cost (Gaal, 2011). The modern workplace tends to operate based on decentralized control, with multi-skilled workers functioning in teams. Production is thought of as more flexible than in the past utilizing “in-line” quality control in the process. The workforce is viewed as an investment that will be expected to continuously learn and improve (Barnett, 2011). Contrary to the past, workers are valued by a degree of core skills tied to the company’s mission. These changes include an

accompanying requirement that the modern workforce be internationally competitive as it is no longer possible to be isolated from global competition (Hughey & Hughey, 1999).

Worker credentialing and certification have become increasingly important issues in the delivery of secondary and postsecondary career and technical education (Bartlett, Sujin, Minu, & Yuwen, 2005). Since the early 1990s, industry credentials and certifications have increased in both the number of credentials available as well as the number of workers seeking them. Federal projections showed that employees holding industry-recognized certifications would be in increasing demand (Carter, 2005). The increase in the number of certifications offered and their growing attraction to both employers and employees have created a “parallel universe of secondary and post-secondary credentials” (Bartlett, Sujin, Minu, & Yuwen, 2005).

Summary

Since the beginning of the twentieth century, career and technical education has been preparing youth for both academic and vocational futures. As a part of career and technical education, agricultural education has more specifically been preparing students for future careers in agricultural science, production, and technology. Traditionally implemented in public school programs, the more contemporary model of agricultural education, known as school-based agriscience education, mostly taught at the secondary level, has been tasked with meeting the demands of an aging and changing global workforce. Using hands-on learning as a standard method of preparing students with the skills and knowledge needed to fill agricultural jobs in a globalized economy, secondary school-based agriscience education has evolved to incorporate industry-recognized certifications into the curriculum so graduates that are more career and college-ready than ever before. Additionally, the demands of a continuously growing population of human beings across the globe require secondary school-based agriscience programs to educate students that must be ready to step right out of the classroom and into higher education or

immediately into the workplace. As the number of industry-recognized certifications has increased, this study was intended to further understand what industry-recognized certification exist, which are being utilized, and what further research/professional development is needed to help educators use industry certifications to better prepare their students for the growing demand for credentialed graduates.

Chapter 3

Research Methods

This chapter describes the research methods and processes utilized throughout this study. Research objectives, purpose of study, target population, and theoretical/conceptual framework are also included in this chapter. Additionally, the validity and reliability of data collection instrumentation are outlined.

Purpose of Study

The purpose of this research was to create a profile of certification opportunities in secondary school-based agriscience education programs in Pennsylvania. In addition to inventorying the certification programs offered throughout the state of Pennsylvania, a major focus of this study was to identify gaps that exist between the certification programs available and those that were being implemented in school-based agriscience education programs at the time of this research. The following research objectives served as a guide for this study:

- 1.) Identify the industry-recognized certifications offered in Pennsylvania secondary school-based agricultural education programs as of 2016.

- 2.) Identify gaps that exist between industry-recognized certification programs available and those that are being offered in Pennsylvania secondary school-based agricultural education programs as of 2016.
- 3.) Identify potential opportunities for future research on industry certification opportunities offered in secondary school-based agricultural education.
- 4.) Identify professional development opportunities for Pennsylvania agriscience educators to aid them in offering industry-recognized certifications to their students.

Conceptual Framework

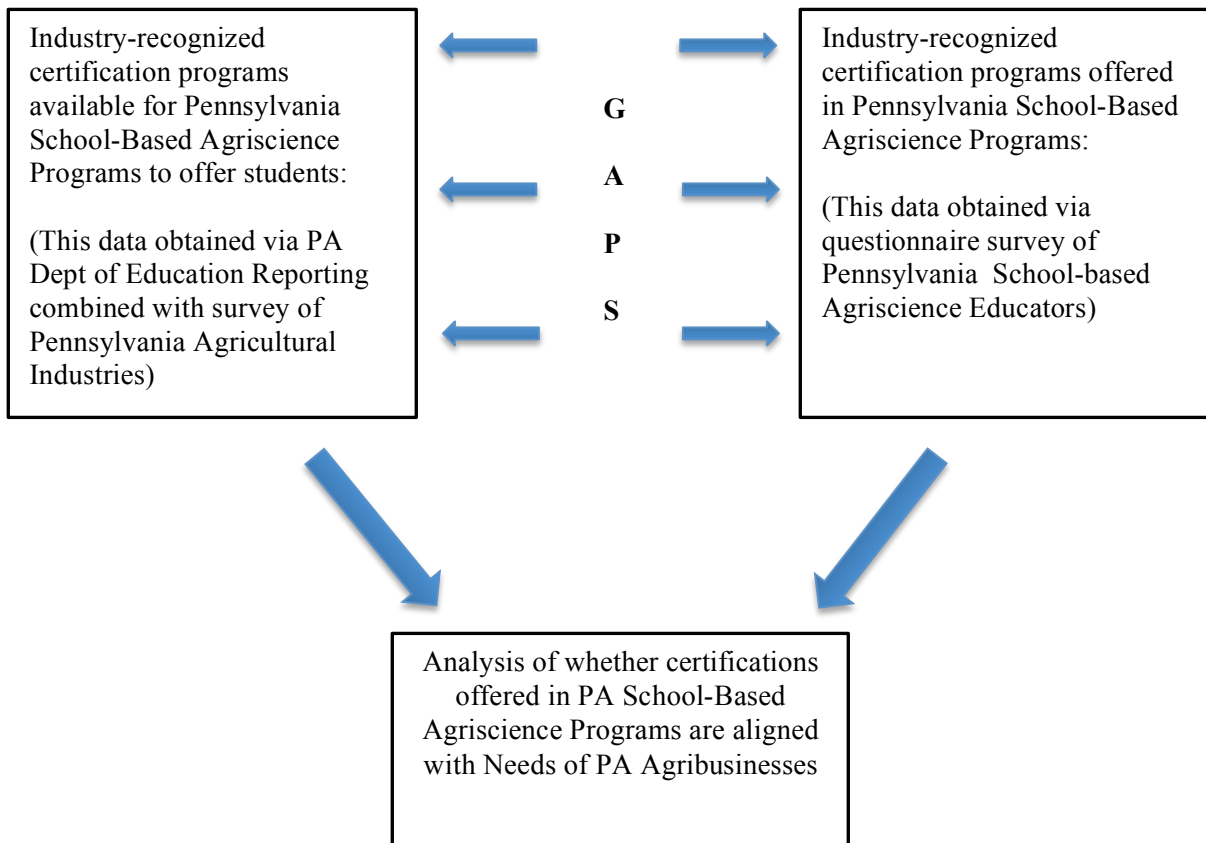


Figure 3.1 Conceptual Framework of Study

As illustrated in Figure 3.1, the conceptual framework of this study shows a comparison between two groups of data that could be similar but are not certain to be the same. One being the certification programs available for Pennsylvania secondary school-based agriscience educators to offer students in their programs, the other being the certification programs Pennsylvania secondary school-based agriscience educators actually were offering to their students at the time of this study. By comparing these two sets of data, gaps and disconnects between the certifications available to offer and the certifications actually being offered can be identified. As Figure 3.1 shows, the analysis of the aforementioned comparison can be utilized to see if both the certifications available and the certifications actually being offered are aligned with the needs of the agribusiness industry in Pennsylvania.

This study more narrowly focused on providing data on industry-recognized certifications being offered at the secondary level (grades 7-12). This data will be shared with the Pennsylvania Department of Agriculture to be combined in their larger-scope initiative. This data, however, was not representative of all secondary-level agriscience education programs because the data was only collected from secondary schools with an approved career and technical education program. This existing data represented only a portion of the secondary-level school-based agriscience programs in the state. The Bureau of Career and Technical Education's data was not representative of all secondary-level school-based agriscience programs in Pennsylvania, and the existing Pennsylvania Department of Education report on Chapter 339 approved programs did little to identify gaps or under-utilized industry-recognized certification programs available for teachers to offer.

Study Population

This study surveyed secondary-level agriscience instructors at school-based agricultural education programs in Pennsylvania. One research objective of this study was to create an inventory of certifications being offered in Pennsylvania school-based agricultural education programs. The most direct means of collecting the required data for this study was to survey the agriscience educators that ultimately decide which certifications to offer within their program. These same educators sometimes also serve as the instructors to facilitate the certification process for students in their program.

The survey was administered via an online survey platform to utilize its ability to quickly disseminate the data collection instrument as well as collect responses in a very user-friendly manner. Out of the 231 teachers invited to participate in this survey 93 provided responses. The 231 invited participants of this survey were secondary-level agriscience instructors that frequently utilize computers in their careers. These 231 agriscience instructors represent a census population of all active agriscience teachers in the state of Pennsylvania as listed by the Center for Professional Personnel Development in Agricultural Education at The Pennsylvania State University. The technological capabilities of the survey population was believed to be adequate to administer the survey utilizing the online Survey Monkey venue.

The target participants were secondary-level school-based agriscience teachers in Pennsylvania schools. These teachers facilitate day-to-day instruction in their programs as well as make program decisions such as curriculum, equipment to purchase, and certifications to offer students in their program. Age and experience of teachers vary widely from early 20's to 50+, and from 1-30+ years of experience. Teachers invited to participate in this study work in programs in rural, urban, and suburban geographies. The subjects taught by these educators include plant and animal science, agricultural biotechnology, agricultural mechanics and

technology, veterinary science, forestry and wildlife, as well as agricultural business and leadership.

Data Collection

Data for this study was obtained for descriptive purposes only. As identified by the four aforementioned research objectives, this study intended to create an inventory of industry certifications offered in the state of Pennsylvania including programs without a Chapter 339 approved program, identify gaps between industry certifications available in the state of Pennsylvania and those certifications offered in secondary school-based agriscience programs around the state, identify opportunities for future research on industry certifications offered in secondary school-based agriscience programs, and define professional development opportunities for Pennsylvania school-based agriscience educators.

Census of Industry Certifications Offered

In order to identify credentialing gaps within secondary-level Pennsylvania school-based agriscience education programs, the researcher first acquired a list of industry-recognized certification programs. In this phase of data collection, the purpose was to create a list of the industry-recognized certification programs being offered by secondary-level school-based agriscience education programs.

The list of industry-recognized certifications was acquired via records provided by Mr. Chris Weller, Career & Technical Education Advisor for Agricultural Education with the Pennsylvania Department of Education Bureau of Career and Technical Education. Mr. Weller audits approved school-based agriscience programs throughout Pennsylvania as part of the Chapter 339 funding requirements. Mr. Weller provided a list of 10 industry-recognized

certifications offered by secondary-level school-based agriscience programs he has audited as of September of 2013. This list was not representative of all programs in the state of Pennsylvania because not all school-based agriscience programs were qualified as approved programs, therefore were not included in the Bureau of Career and Technical Education auditing process. This list of industry-recognized certification programs was then used to collect additional data in the first phase of data collection.

The remaining data collected in phase 1 of the data collection process was intended to survey both secondary-level school-based agriscience educators that were included in the Pennsylvania Bureau of Career and Technical Education Chapter 339 audits as well as those not included in the Chapter 339 audits. This missing data was obtained via questionnaire style survey of Pennsylvania secondary-level school-based agriscience teachers. The Pennsylvania State University Center for Professional Personnel Development produces an annual directory for Pennsylvania secondary-level school-based agriscience teachers. This directory was utilized to obtain the necessary contact information for the first stage of the data collection. The data collection instrument was distributed to the survey participants via a Survey Monkey web link emailed to teachers identified in the Center for Professional Personnel Development Agricultural Education Directory. The data, once collected, was compiled into a Microsoft Excel spreadsheet for analysis.

Instrumentation

The data collection instrument utilized in phase 1 of the data collection process was developed utilizing an existing list of industry-certifications offered in secondary school-based agriscience programs obtained from the Pennsylvania Bureau of Career and Technical Education's 2013 publication, *Industry-Recognized Certifications for Career and Technical Education Programs: A Resource Guide for Pennsylvania's Career and Technology Centers* (PDE, 2013). The Pennsylvania Department of Education resource guide listed 10 industry-

recognized certifications that were offered by at least one school-based agriscience education program in the state of Pennsylvania as of 2013. This list of potential industry-recognized certification programs was used in the data collection instrument distributed to PA school-based agriscience teachers. Participants in data collection phase 1 selected the industry-recognized certification programs currently offered in their school-based agriscience education program at the time the data collection instrument in phase 1 survey was administered.

The data collection instrument was entirely “Forced-Choice” items. Dillman, Smyth, & Christian (2014) recommended this type of response format due to the fact that previous research has shown that respondents are forced to make an explicit judgment about each item, therefore, yielding responses that more accurately describe respondents situation. Respondents tended to answer items more quickly with a check-all-that-apply format, and paid less attention to each item, often times paying the most attention to items at the top of the list and disregarding items nearer to the bottom. The forced-choice format was used to force respondents to carefully read each item and make an attentive decision respectively.

The text in the data collection instrument was formatted according to Dillman, Smyth, & Christian (2014) recommendation that darker and larger print be used for the question stem and lighter, smaller print be used for answers and answer spaces. This was done to create a clear distinction between the question stem and the item choices, in order to prevent any respondent confusion while completing the data collection questionnaire. The item choices were also standardized to prevent any biasing of the respondents selection, as well as preventing respondent confusion which could have discouraged the respondent from completing the questionnaire, which would have resulted in a lower survey response rate. No unnecessary text or graphics were utilized to avoid visual clutter within the data collection instrument.

The Pennsylvania State University IRB provided approval for this thesis study, IRB Study 00004838, on September 28, 2016. In accordance with Pennsylvania State IRB policy, the

results from the data collection were kept on password-protected computers in a locked room for data security purposes. A statement assuring survey respondents of data confidentiality security was included in the survey invitation email. This served as both a measure of compliance with Penn State IRB as well as a measure to improve the survey response rate as recommended by Dillman, Smyth, and Christian (2014). Another measure used to increase the response rate of survey was to include a voucher for a free Uber ride courtesy of the researcher. Participants in the survey were sent a voucher with the invitation email. Dillman, Smyth, and Christian (2014) wrote that the sending of such an incentive with the request to respond represents a behavioral commitment on the part of the surveyor.

Invitation Email

The email sent to Pennsylvania secondary school-based agriscience educators inviting them to participate in the survey was created according to Penn State University IRB guidelines. This email informed potential study participants of the purpose for the research. Potential participants were also informed that their participation in the study was completely voluntary and that they would provide implied consent to participate as soon as they clicked to begin completing the online questionnaire.

Non-Response Error

Accounting for non-response bias in the first stage of data collection was addressed by re-sending the invitation email to all participants in the study population twice after the initial invitation to participate in the research study. The initial survey invitation was emailed to potential respondents on October 10, 2016. Within the first week of the survey being administered, a total of 55 participants responded. The first reminder email was sent on October 19, 2016 resulting in an additional 22 participants responding. The third and final reminder email was sent on October 31, resulting in 16 participants responding. Sending

reminders to potential survey participants as well as the formal pre-survey invitation email is a method of nonresponse bias avoidance Dillman, Smyth, & Christian (2014) describes as a highly effective means of preventing nonresponse bias. In Dillman, Smyth, & Christian (2014), the author describes a survey study in which potential respondents were contacted three different times after the initial survey invitation, each yielding a diminishing number of additional survey respondents. The result of multiple reminders to potential respondents yielded an end of survey response rate of 40% (93 out of 231 teachers).

The items in this instrument focused on industry-recognized certifications, a subject of relevancy to secondary school-based agriscience educators in Pennsylvania. Therefore, nonresponse due to lack of relevancy should not have resulted in potential respondents electing not to participate. This study also did not ask for personal, sensitive, or confidential information. Therefore, nonresponse due to potential respondents being uncomfortable with providing personal, sensitive, or confidential information should not have been a factor contributing to nonresponse bias.

Census of Industry Certifications Available

The second phase of data collection was focused on collecting industry input regarding the certifications that secondary level school-based agriscience programs were identified as offering to their students. Initially, it was the goal of the researcher to identify agribusiness companies that recruit and employ the majority of employees in Pennsylvania. As a means of identifying a convenience sample, it was the intent of the researcher to gain insight from Pennsylvania agribusiness employers that had the highest demand for future employees possessing an industry-recognized credential. In order to identify such employers, the researcher conducted an internet search of the largest agricultural employers in the Commonwealth of Pennsylvania. This internet search led the researcher to numerous websites maintained by

Pennsylvania governmental departments. While the Pennsylvania Department of Agriculture website described in detail the various sectors of Pennsylvania's agribusiness companies, as well as provided statistics regarding Pennsylvania's agribusiness productivity, the website did not specifically list agribusinesses according to their employment capacity.

The researcher visited the website of the Pennsylvania Department of Community and Economic Development. Within this website was a link to a document entitled, "Top 6 Agricultural and Food Production Companies", which listed the names of the 6 largest agribusiness companies in Pennsylvania according to the number of employees each employed. These 6 companies are: Hershey Foods Corporation, Bimbo Bakeries Inc., Hatfield Quality Meats Inc., Utz Quality Foods Inc., Cargill Meats Solutions Corporation, and JBS Souderton Inc. The researcher then conducted an internet search of each company listed to find the information necessary to contact each company to request their participation in this research regarding industry-recognized certifications. Once a list of contact information was created, the researcher began contacting each of the 6 companies. The researcher was unable to make contact with a representative of each company due to either automated answering systems, operator unable to identify which department of the company to connect with, or the representative the researcher spoke to elected on the company's behalf to not participate in the data collection process.

The researcher did not have a direct means of collecting data from agribusinesses that employ the majority of the agricultural workforce in Pennsylvania. Dillman, Smyth, & Christian (2014) suggests that hard-to-reach populations may be better reached utilizing what they call the "snowball" or "chain-referral method". This concept utilizes the social networks of the population being sought to produce a convenience sample versus a probability sample. Since this study was using data for descriptive qualitative purposes only, a probability sample was not necessary. The researcher next contacted PennAg Industries Association, which according to their mission statement, "Works to create and maintain an effective, viable, and competitive

environment for Pennsylvania agribusiness to grow and prosper” (PennAg, 2017). While PennAg Industries Association did not have a listing available of agribusiness employers that employ the most employees, the contact at PennAg referred the researcher to Kevin Paulk, of the United State Department of Agriculture. The researcher conducted a phone conversation with Kevin Paulk, described the nature of the research study for this thesis, and requested any agribusiness companies that Kevin Paulk could connect the researcher with. At that time, Kevin Paulk suggested the researcher contact Mary Wirth, Director of College Relations and Communications. Mary Wirth directs the Penn State College of Agricultural Sciences Ag Council, an advisory board of industry representatives from the state of Pennsylvania that provides feedback to the Penn State College of Agriculture Sciences on college programs, activities, and opportunities. The researcher contacted Mary Wirth via email, described the nature of the research study, and requested assistance with establishing contact with major agribusinesses from Pennsylvania. Mary Wirth sent an email to all members of the Penn State College of Agricultural Sciences Ag Council with the researcher’s contact information, inviting them to contact the researcher about providing insight regarding the industry-recognized certifications identified by teachers as being offered in secondary school-based agriscience programs during phase 1 of the data collection process. Once contacted by a member of the Penn State College of Agricultural Sciences Ag Council, the researcher sent via email the list of industry-recognized certifications teachers identified as offering in their programs, asking the Ag Council members to identify which certification programs from that list, if any, were pertinent and/or beneficial to an individual seeking employment within their company.

Limitations of Study

Limitations of this thesis study include a relatively low response rate from secondary school-based agriscience educators. With only 40% (93 out of 231) of teachers participating in

the survey, data from over 50% of the teachers in Pennsylvania was not able to be included in this study. It is possible that missing data from agricultural educators may have described a very different picture of the industry certifications offered within Pennsylvania school-based agriscience programs. Despite attempts to account for non-response, this response rate of 40% creates limitations for which the results of this study can be interpreted.

Description of Industry Certifications Surveyed

The following is a list of the industry certifications discussed and surveyed in this study. In most cases, the description includes the governing body that sponsors each certification as well as develops, markets, and oversees implementation of each certification. Information including age of target participants, expected outcomes, and the duration for which each certification is valid was included if that information was available.

Youth Pork Quality Assurance

According to the National Pork Board, the Youth Pork Quality Assurance Certification is the food safety, antibiotic use, and animal well-being awareness and education program for youth pork producers ages eight to 19. Youth Pork Quality Assurance mirrors the adult version of the program but presents it in a format conducive to youth learning. Youth that complete the Youth Pork Quality Assurance Certification are granted a one-year certification. In 2014, changes to the program included an online training, testing, and certification option. Additionally, in March of 2017, the Youth Pork Quality Assurance Program will be switched to the Youth for Quality Care of Animals program. Youth will only be able to complete the new training online with an advisor until 2018 when a face-to-face session of the Youth for Quality Care of Animals will become available.

Pennsylvania Nutrient Management Certification

According to Penn State Cooperative Extension the Pennsylvania Nutrient Management Certification Program certifies specialists to prepare and/or review nutrient management plans for agricultural operations. This certification determines whether or not the nutrient management plan is in compliance with the requirements of the Act 38.

Pennsylvania Certified Horticulturalist Certification

Managing or working within a nursery, landscape or garden center business requires in-depth knowledge of plant growth and maintenance, landscape design and installation, and retail operations. According to the Pennsylvania Landscape & Nursery Association, the Pennsylvania Certified Horticulturalist program is a formal way for the landscape or nursery professional to test this knowledge and gain professional credibility.

Pennsylvania Pesticide Applicator Certification

The Pennsylvania Pesticide Control Act requires very stringent control of chemicals used to combat and/or prevent pests. Penn State Cooperative Extension lists the following as major components to the Pesticide Applicator Certification Program:

- Labeling, distribution, storage, and registration of pesticide chemicals
- Classification of restricted use pesticides
- Certification of pesticide applicators
- Licensing of pesticide dealers, pesticide application businesses, and pest management consultants
- Registration of pesticide application technicians
- Notification of procedures for pesticide applications

Pesticides covered under the Pesticide Applicator Certification Program are any substance used to control, kill, or mitigate pest organisms. These include but are not limited to, herbicides, fungicides, insecticides, and rodenticides. Applicator certification can be divided into two groups: commercial/public applicators and private applicators.

Pennsylvania Environmental Agricultural Conservation of Excellence Certification

The Penn State Department of Animal Sciences describes the Pennsylvania Environmental Agricultural Conservation of Excellence Certification as a certification program to promote environmentally safe agricultural practices among livestock and poultry producers, to encourage them to minimize risks the environment and in turn minimize personal liability, and to recognize those producers who meet or exceed standards as established by the Pennsylvania Environmental Agricultural Conservation Certification of Excellence.

Instructor, Trail Guide, Disabilities, Equine Facility Manager & Seasonal Equestrian Staff Certification

According to the Certified Horsemanship Association, the Instructor, Trail Guide, Disabilities, Equine Facility Manager & Seasonal Equestrian Staff Certification is for use in recreational programs, lower level instructional programs and programs that include both progressive skill building and trail-riding. For instructors working in programs that provide recreational, instructional, or mainstream riding for persons with disabilities – cognitive and physical. This certification was developed to meet the needs of seasonal riding program operators, such as summer camps, youth organization, guest ranches and trail program operators. For seasonal equestrian staff, participants must be 18 years or older to achieve certification. The purpose of this program is to provide training and certification for seasonal or temporary riding staff that work under the supervision of a certified instructor or guide.

Pennsylvania Beef Quality Assurance Certification

As described by the Pennsylvania Beef Council, The Pennsylvania Beef Quality Assurance program has evolved to include the best practices around good record keeping and protecting herd health, which can result in more profits for producers. When better quality cows leave the farm and reach the market place, the producer, packer, and consumer all benefit. When better quality beef reaches the supermarket, consumers are more confident in the beef they are buying, and this helps beef consumption.

National Safe Tractor & Machinery Operator Certification

According to Penn State Cooperative Extension, the National Safe Tractor and Machinery Operator Certification Program is a project of the United States Department of Agriculture Cooperative States Research, Education and Extension Service's Hazardous Occupations Safety Training for Agriculture (HOSTA) Program. It was developed as a responsive certification program to address the need for resources to inform and support the Youth Farm Safety Education and Certification Regulation, which is administered by the U.S. Department of Labor. Training is designed to consistently cover core content areas including safety basics, agricultural hazards, tractors, connecting and using implements with tractors and materials handling. Testing includes a written exam along with skills and driving/operating tests.

Wildland Firefighting Certification PA-130

The Pennsylvania Department of Conservation of Natural Resources (DCNR) states that the Pennsylvania Bureau of Forestry is tasked with protecting life, property, and natural resources in the Commonwealth from wildfire. Through the Wildland Firefighting Certification Program, Pennsylvania Firefighters are trained and qualified under national wildland standards to function either as a member of an organized incident management team or as a member of a wildland

crew. This certification process may be implemented with youth as long as a certified instructor facilitates the training. The Wildland Firefighting Certification is recognized in all lower 48 states and Alaska. Completers of this certification program are able to carry training content from this program over to other careers such as controlled burn for land and forest management.

Summary

Data for this thesis research study was collected for descriptive purposes only. The data was collected in two phases, the first being a survey of secondary level school-based agriscience educators to determine which of the 10 previously identified industry-recognized certifications they offer in their program. This survey was conducted using SurveyMonkey as the data collection instrument. To account for nonresponse, the researcher sent potential survey participants two reminder emails inviting them to participate. This yielded a total of 93 responses. The goal of the second phase of data collection was to get feedback from agribusiness industry as to which of the industry-recognized certifications from phase 1 are necessary and/or beneficial to an individual seeking employment in their respective industry. The second phase of data was collected utilizing the snowball effect as described in Dillman, Smyth, and Christian (2014). When finding industry contacts became a challenge, an individual from Penn State University's College of Agricultural Sciences assisted the researcher by connecting the researcher with members of the Pennsylvania State College of Agricultural Sciences Ag Council.

Chapter 4

Findings

The following chapter describes the findings from the study and both phases of data collection. The first section of this chapter details the participants that engaged in both phases of data collection for this study, followed by a section describing the data collected during both phases of data collection. The costs associated with offering each certification as well as the benefits to completers for obtaining each certification is included in this chapter. The final section describes how the data collected aligns to the research objectives outlined in Chapter 1.

Purpose and Objectives

The purpose of this research was to create a profile of certification opportunities in secondary school-based agriscience education programs in Pennsylvania. In addition to inventorying the certification programs offered throughout the state of Pennsylvania, a major focus of this study was to identify gaps that exist between the certification programs available and those that were being implemented in school-based agriscience education programs at the time of this research. The following research objectives served as a guide for this study:

- 1.) Identify the industry-recognized certifications offered in Pennsylvania secondary school-based agricultural education programs as of 2016.
- 2.) Identify gaps that exist between industry-recognized certification programs available and those that are being offered in Pennsylvania secondary school-based agricultural education programs as of 2016.
- 3.) Identify potential opportunities for future research on industry certification opportunities offered in secondary school-based agricultural education.
- 4.) Identify professional development opportunities for Pennsylvania agriscience educators to aid them in offering industry-recognized certifications to their students.

Objective 1: Identify the industry-recognized certifications offered in Pennsylvania secondary school-based agricultural education as of 2016.

Data was collected by inviting 231 secondary school-based agricultural educators from Pennsylvania to participate in the study. Of the 231 teachers invited, 93 (n=93) participated in total for a response rate of 40%. Some participants elected to skip participation on certain items. Variables such as participant gender, age, ethnicity, and years of service were not included in the survey because these variables are not relevant to the research objectives of this study.

Table 4.1 includes each survey item that was included in the questionnaire for teachers along with the number of respondents that indicated they do offer each certification as well as the number of respondents that did not offer each certification. The percentage of respondents that did or did not offer each certification is also displayed based on the total number of respondents that responded to each item. As seen in Table 4.1 *Certifications Offered in Secondary School-Based Agriscience Education Programs*, not all survey participants responded to each item. The number of participants that did not respond to a specific item is also included in Table 4.1 *Certifications Offered in Secondary School-Based Agriscience Education Programs*.

Based on the responses in this survey, the two certifications most frequently offered in Pennsylvania Secondary School-based Agriscience programs are National Safe Tractor and Machinery Operator Certification and Youth Pork Quality Assurance Certification. These certifications were the only two certifications that over 50% of respondents indicated that they offered to students in their programs. The next certification with the highest percent of respondents indicating that they offered that certification to their students was the Pennsylvania Pesticide Applicator's Certification, 37 (40%) respondents indicated "Yes".

Table 4.1 *Certifications Offered by Pennsylvania School-Based Agriscience Education Programs*

Survey Item	Question	Yes(%)	No(%)	(N)
1	Do you offer Youth Pork Quality Assurance Certification to your students?	55(59)	38(41)	93
2	Do you offer PA Nutrient Management Certification to your students?	3(38)	89(97)	92
3	Do you offer PA Certified Horticulturalist Certification to your students?	2(2)	91(98)	93
4	Do you offer Certified Landscape Technician Certification to your students?	1(1)	92(99)	93
5	Do you offer PA Pesticide Applicator Certification to your students?	37(40)	56(60)	93
6	Do you offer PA Environmental Agricultural Conservation of Excellence (PAECCE) Certification to your students?	2(2)	90(98)	92
7	Do you offer Instructor, Trail Guide, Disabilities, Equine Facility Manager & Seasonal Equestrian Staff Certification to your students?	0(0)	93(100)	93
8	Do you offer PA Beef Quality Assurance Certification to your students?	35(38)	58(62)	93
9	Do you offer National Safe Tractor & Machinery Operator Certification to your students?	54(58)	39(42)	93
10	Do you offer Wildland Firefighting Certification to your students?	2(2)	89(98)	91

Table 4.2, *Certifications Offered From Most Frequently Offered to Least*, lists the 10 certifications teachers were surveyed about in this study. The top three certifications offered by Pennsylvania secondary school-based agriscience teachers were discussed previously. The only certification from the study with an offering frequency of 0 was the Instructor, Trail Guide, Disabilities, Equine Facility Manager & Seasonal Equine Staff Certification. The certifications with an offering frequency of less than 5 were PA Nutrient Management Certification, Wildland Firefighting Certification, Pennsylvania Environmental Agriculture Conservation of Excellence Certification (PAECCE), Pennsylvania Certified Horticulturalist Certification, and the Pennsylvania Certified Landscape Technician Certification.

Table 4.2 *Certifications Offered From Most Frequently Offered to Least*

Name of Certification	# of programs offering the certification
1. Youth Pork Quality Assurance Certification	55
2. National Safe Tractor & Machinery Operator Certification	54
3. PA Pesticide Applicators Certification	37
4. PA Beef Quality Assurance Certification	35
5. PA Nutrient Management Certification	3
6. Wildland Firefighting Certification	2
7. PA Environmental Agricultural Conservation of Excellence Certification (PAECCE)	2
8. PA Certified Horticulturalist Certification	2
9. PA Certified Landscape Technician Certification	1
10. Instructor, Trail Guide, Disabilities, Equine Facility Manager & Seasonal Equine Staff Certification	0

Objective 2: Identify gaps that exist between industry-recognized certification programs available and those that are being offered in Pennsylvania secondary school-based agricultural education programs as of 2016.

Table 4.3 *Certifications identified as beneficial by Pennsylvania agribusinesses*, lists the data collected by agribusinesses in the state of Pennsylvania. For confidentiality/proprietary privacy, the names of the individuals as well as their respective companies from which data was collected is not provided. Seven agribusiness companies volunteered to participate based on the invitation by Penn State College of Agricultural Sciences Ag Council and were contacted by the researcher for input regarding the certifications being offered to students in secondary school-based agriscience programs in the state of Pennsylvania. These agribusinesses represented the career areas of plant & soil science/agronomy, landscape construction, commercial nursery production, mushroom production, and urban forestry/arboriculture. The two certifications with the highest frequency of identification by the employers surveyed as being beneficial to a prospective employee were Pennsylvania Pesticide Applicators Certification and Pennsylvania Nutrient Management Certification, each identified by 3 employers. National Safe Tractor and Machinery Operators (NSTMOP) certification and Pennsylvania Certified Horticulturalist were identified by 2 employers as being beneficial to prospective employees. Pennsylvania Environmental Agricultural Conservation of Excellence Certification (PAECCE) and Pennsylvania Certified Landscape Technician were each identified by 1 employer as being beneficial to a prospective employee. Out of the 8 agribusinesses that responded as willing to participate in the data collection process, 7 actually provided data. Based on the 7 out of 8 (87% response rate) employers that participated in this study (n=7), Youth Pork Quality Assurance certification, Pennsylvania Beef Quality Assurance Certification, Wildland Firefighting

Certification, and Instructor, Trail Guide, Disabilities, Equine Facility Manager & Seasonal Staff certification were not identified as being beneficial for a prospective employee to possess.

In addition to the list of industry certifications identified as being offered to students in secondary school-based agriscience programs in Pennsylvania by teachers, employers were asked to provide any certifications not listed that they like to see a prospective employee possess. These additional certifications are also included in Table 4.3 *Certifications identified as beneficial to students by Pennsylvania agribusinesses*. Certified Crop Advisor was identified by two employers, Pennsylvania Commercial Drivers License (CDL) was identified by two employers, Google Adwords and ServSafe Safe Food Handling Certification were each identified by one employer as being beneficial to a prospective employee.

Table 4.3 *Certifications identified as beneficial to students by Pennsylvania agribusinesses*

Certification	Frequency
1. PA Pesticide Applicators Certification	3
2. PA Nutrient Management Certification	3
3. National Safe Tractor & Machinery Operator	2
4. PA Certified Horticulturalist Certification	2
5. PA Environmental Agricultural Conservation of Excellence Certification (PAECCE)	1
6. PA Certified Landscape Technician Certification	1
7. Wildland Firefighting Certification	0
8. Youth Pork Quality Assurance Certification	0
9. PA Beef Quality Assurance Certification	0
10. Instructor, Trail Guide, Disabilities, Equine Facility Manager & Seasonal Staff Certification	0

Table 4.4 *Additional certifications identified by Pennsylvania agribusinesses*

Certification Identified	Frequency
1. Certified Crop Advisor	2
2. PA Commercial Drivers License (CDL)	2
3. Google Adwords	1
4. ServSafe Safe Food Handling Certification	1

As part of the data collection process, agribusiness employers identified four certification programs that were not included in the school-based agriscience educator data collection process. The agribusiness that participated in this study identified the four certifications displayed in Table 4.4 as certifications they see as desirable in a job candidate with their company.

Objective 3: Identify potential opportunities for future research on industry certification opportunities offered in secondary school-based agricultural education.

A side-by-side comparison of the data collected from Pennsylvania secondary level school-based agriscience educators and the data collected from Pennsylvania agribusinesses can be found in Table 4.5

Table 4.5 *Comparison of certifications listed by agriscience educators and industry*

Certifications Offered in PA Secondary Agriscience Programs	Frequency	Certifications Identified by PA Agriscience Industry	Frequency
1. Youth Pork Quality Assurance Certification	55	1. PA Pesticide Applicators Certification	3
2. National Safe Tractor & Machinery Operator Certification	54	2. PA Nutrient Management Certification	3

Table 4.5 Continued

Certifications Offered in PA Secondary Agriscience Programs	Frequency	Certifications Identified by PA Agriscience Industry	Frequency
3. PA Pesticide Applicators Certification	37	3. National Safe Tractor & Machinery Operator Certification	2
4. PA Beef Quality Assurance Certification	35	4. PA Certified Horticulturalist Certification	2
5. PA Nutrient Management Certification	3	5. PA Environmental Agricultural Conservation of Excellence Certification (PEACCE)	1
6. Wildland Firefighting Certification	2	6. PA Certified Landscape Technician Certification	1
7. PA Environmental Agricultural Conservation of Excellence Certification (PEACCE)	2	7. Wildland Firefighting Certification	0
8. PA Certified Horticulturalist Certification	2	8. Youth Pork Quality Assurance Certification	0
9. PA Certified Landscape Technician Certification	1	9. PA Beef Quality Assurance Certification	0
10. Instructor, Trail Guide, Disabilities, Equine Facility Manager & Seasonal Equine Staff Certification	0	10. Instructor, Trail Guide, Disabilities, Equine Facility Manager & Seasonal Staff Certification	0

Objective 4: Identify professional development opportunities for Pennsylvania agriscience educators to aid them in offering industry-recognized certifications to their students.

The certification programs identified throughout this thesis represent various agriscience industries in Pennsylvania. Each certification prepares an individual for employment within that industry or validates that a certain set of industry skills and knowledge have been attained. These certifications are either sponsored and/or facilitated by a respective industry association, such as Pennsylvania Beef Council, or by a Penn State Cooperative Extension Unit such as Penn State Biological & Agricultural Engineering. Table 4.6 lists each certification, any costs associated with obtaining each certification, as well as the specific benefit to a completer of the certification program. Table 4.6 could be a useful resource when planning and designing professional development programming for school-based agriscience educators.

Table 4.6 *Costs of each industry certification and benefits to completers for obtaining*

Certification	Cost	Benefit to Completer	Source
1. Youth Pork Quality Assurance Certification	\$12 online/\$3 instructor-led	- qualifies youth to exhibit pigs at many local, county, and state fairs/expos, also required by many packers for youth to sell their pigs at local, county, and state fairs	National Pork Council Pork Checkoff www.pork.org
2. PA Nutrient Management Certification	\$50 Exam Fee	- qualifies completers to develop and review commercial, public, and private nutrient management plans	Penn State Cooperative Extension www.extension.psu.edu
3. PA Certified Horticulturalist Certification	\$125 fee/\$50 study manual	- validates completers industry knowledge, demonstrates a commitment to the profession, and enhances employability of the completer	PA Landscape and Nursery Association www.plna.com
4. Certified Landscape Technician	\$125 fee/\$50 study manual	- validates completers industry knowledge, demonstrates a commitment to the profession, and enhances employability of the completer	PA Landscape and Nursery Association www.plna.com
5. PA Pesticide Applicator Certification	\$50 Core Cost/\$10 per category	- allows completers to legally and safely apply pesticides for private and commercial use, enables completers to apply for employment in positions requiring a commercial pesticide applicators license	Penn State Cooperative Extension www.extension.psu.edu
6. PA Environmental Agricultural Conservation of Excellence (PEACCE) Certification	No cost found, free on-farm assessment as part of process	- validates a commitment to excellence in conservation by producers that complete the requirements of the program	Penn State Cooperative Extension www.extension.psu.edu

Table 4.6 Continued

Certification	Cost	Benefit to Completer	Source
7. Instructor, Trail Guide, Disabilities, Equine Facility Manager & Seasonal Equestrian Staff Certification	\$650-\$880/participant depending on program location	- qualifies completers to seek employment as or volunteer as equestrian trail guides, facility managers, and therapeutic equestrian facilitators	Certified Horsemanship Association www.chahse.org
8. PA Beef Quality Assurance Certification	No cost to school or participant	- validates completers industry knowledge, qualifies completers to seek employment as beef herd/ranch managers, demonstrates a commitment to food safety and quality	PA Beef Council www.pabqa.org
9. National Safe Tractor & Machinery Operator Certification	\$5 fee for laminated completion card	- qualifies youth ages 14 and 15 to seek employment in an agricultural capacity in which they may operate farm tractors and machinery	Penn State Cooperative Extension www.extension.psu.edu
10. Wildland Firefighting Certification	costs dependent on instructor	- qualifies completers nationally to serve as wildland firefighters, qualifies completers to seek employment where wildland firefighting certification is required	PA Department of Conservation of Natural Resources www.dcnr.state.pa.us

Summary

Table 4.1 and 4.2 show that certifications offered by Pennsylvania secondary school-based agriscience educators with the highest frequency of offering include two animal production certifications, Youth Pork Quality Assurance and Pennsylvania Beef Quality Assurance. Also among the certifications with the highest frequencies of offering is the National Safe Tractor & Machinery Operator Certification which is a certification that be utilized across numerous aspects of agriculture including production, landscaping, and support/supply industries. Environmental Conservation, Management, and Preservation was not represented frequently in the survey results with two out of 93 secondary school-based agriscience educators indicating that they offered the Wildland Firefighting Certification and the Pennsylvania Environmental Agriculture

Conservation of Excellence Certification. Table 4.3 illustrates the data provided by a sampling of agribusiness employers from around Pennsylvania. Employers most frequently identified Pennsylvania Pesticide Applicator certification, Pennsylvania Nutrient Management certification, Pennsylvania Certified Horticulturalist certification, and National Safe Tractor and Machinery Operators certification as certifications they desire job candidates to possess. Additionally, as displayed in Table 4.4 employers identified Certified Crop Advisor, Pennsylvania Commercial Drivers License, Google Adwords, and ServSafe Safe Food Handling Certification as beneficial to a prospective employee seeking employment with their company. The data found in Table 4.6 describes the costs associated with each certification as well as the benefits to completers. The sponsoring institution of each is also included. Data included in Table 4.6 can be used to plan and design professional development for secondary school-based agriscience educators.

Chapter 5

Conclusions, Recommendations, and Implications

Chapter 5 will describe how the findings of this research study relate to the research objectives as well as provide recommendations for future research. The purpose for this research study was to examine the industry-related certifications offered to secondary school-based agriscience students in Pennsylvania schools. A global need for an agriculturally and vocationally prepared workforce made examining the industry-related certifications offered to secondary students a topic of high relevance.

Purpose and Objectives

The purpose of this research was to create a profile of certification opportunities in secondary school-based agriscience education programs in Pennsylvania. In addition to inventorying the certification programs offered throughout the state of Pennsylvania, a major

focus of this study was to identify gaps that exist between the certification programs available and those that were being implemented in school-based agriscience education programs at the time of this research. The following research objectives served as a guide for this study:

- 1.) Identify the industry-recognized certifications offered in Pennsylvania secondary school-based agricultural education as of 2016.
- 2.) Identify gaps that exist between industry-recognized certification programs available and those that are being offered in Pennsylvania secondary school-based agricultural education programs as of 2016.
- 3.) Identify potential opportunities for future research on industry certification opportunities offered in secondary school-based agricultural education.
- 4.) Identify professional development opportunities for Pennsylvania agriscience educators to aid them in offering industry-recognized certifications to their students.

Objective 1: Identify the industry-recognized certifications offered in Pennsylvania secondary school-based agricultural education as of 2016.

A list of 10 certifications were created and used in the data collection section of this study. This list was pulled from a compilation of results from Pennsylvania Department of Education Chapter 339 auditing of approved agriscience programs (PDE, 2013). Every three years the Pennsylvania Department of Education is tasked with auditing approved career and technical education programs that receive funds for program implementation via the Carl D. Perkins Career and Technical Education Act of 1998 (USDE, 1998). As a result of this auditing process, a list of industry certifications each audited program utilizes is created and included in a

publically available report (PDE, 2013). The complete list of these 10 certifications can be found in Table 4.1 of this document.

Conclusions

According to the results of the school-based agriscience educator survey a total of 10 different industry-related certifications were offered in Pennsylvania secondary school-based agriscience programs as of October 2016. This list was compiled from data reported by Pennsylvania Department of Education as a result of approved program auditing (PDE, 2013). The researcher acknowledges that analyzing industry-related certifications by geographical region in the state of Pennsylvania would be beneficial as a topic for future research. This will be described in further detail in this section. Four additional certifications were identified from data collected by surveying Pennsylvania agribusinesses. These four certifications were, Certified Crop Advisor, Pennsylvania Commercial Drivers License (CDL), Google Adwords, and ServSafe Safe Food Handling Certification.

Implications

The list of certifications educators were surveyed about in this study was taken from a report published by the Pennsylvania Department of Education (PDE, 2013) as a result of mandated Chapter 339 auditing. Although the Chapter 339 auditing involves numerous secondary school-based agriscience programs, perhaps there are programs not audited by the Pennsylvania Department of Education that offer industry-related certifications not included in the list of 10 utilized in this study. Identifying such programs may better serve the interests of career-readiness as it relates to agriculture in the state of Pennsylvania, due to the fact that other secondary school-based agriscience educators could potentially offer these certifications if they are made aware of their existence.

Recommendations

School-based agriscience educators should be made aware of all industry-related certifications that are available to offer their students. As described in the paragraph above, there may be programs that are not audited by the Pennsylvania Department of Education that offer industry certifications different than those identified in the report entitled, “Industry-recognized certifications for career and technical education programs: Resource guide for Pennsylvania’s career and technology centers” (PDE, 2013). If the aforementioned is true, it would be beneficial to identify those programs and the “unknown” certifications they offer. Future research studies should be conducted to target agriscience programs that specifically are not audited by Pennsylvania Department of Education for Chapter 339 purposes. This research should focus on the certifications, if any, those programs utilize. A comparison between the data acquired in that research and the results of this study should be analyzed. School-based agriscience educators should be made aware of any industry-related certifications identified in future research that were not identified in this study.

Objective 2: Identify gaps that exist between industry-recognized certification programs available and those that are being offered in Pennsylvania secondary school-based agricultural education programs as of 2016.

A list of 10 industry-related certifications was compiled and used in this survey. Based on the 93 survey respondents, 6 out of those 10 certifications were offered by less than 40% of the educators that responded. Specifically, those 6 certifications were offered by 3 or fewer of the 93 educators that participated in the research study.

Conclusions

According to the data collected in this research study, out of the 10 certifications available for secondary school-based agricultural educators to offer their students, 4 certifications were primarily being utilized. These certifications were: Youth Pork Quality Assurance, National Safe Tractor & Machinery Operator Certification, Pennsylvania Pesticide Applicators Certification, and Pennsylvania Beef Quality Assurance Certification.

Implications

Despite career readiness being a focal point in career and technical education, over 50% of the industry related-certifications available for agriscience educators to offer their students were not being utilized according to the data collected in this study. The question is why not? Is it because school-based agriscience educators were not aware of the certifications available? Is it because school-based agriscience educators felt they were not prepared to make those certifications available to their students? One reason why Pennsylvania secondary level school-based agriscience educators might elect to offer their students one certification over another may be the ease of which the certification can be offered in a traditional public school classroom. Age of students enrolled in secondary school-based agriscience programs could be a factor causing educators to not offer certain certifications in their program. For example, 0 out of 93 survey participants indicated that they offer the Equestrian Staff, Trail Guide, and Equine Facility Manager & Seasonal Staff certification. Parts of this particular certification requires participants to be 18 years of age or older to acquire, such as certified instructor. However, participants must only be 16 years of age to acquire certification as an assistant instructor. Agriscience educators may not be aware of this option. While some secondary students may be 18 years of age, many are not. Despite the fact that this secondary-level students may not commonly be of age to acquire this certification, perhaps through educator professional development secondary school-based agricultural education programs can incorporate the content of this certification into the scope and sequence of their curriculum to prepare students to become certified with this

credential when they do reach the age of 18. Perhaps the certifications not frequently offered by educators require equipment that is not commonly available for educators to use. The Pennsylvania Certified Landscape Technician Certification may require equipment such as commercial turf equipment, skid steer loaders, and/or excavating equipment that is not available for a secondary-level agriscience program to use. Another reason may be that the content of a lesser utilized industry certification is not relevant to the curriculum offered in most Pennsylvania Department of Education approved programs. For example, the Pennsylvania Nutrient Management Certification focuses on managing waste runoff and fertilizer/nutrient applications on a farm. As school-based agricultural education has evolved to reach a more general, often non-agricultural audience, content material such as this may not be relevant to a majority of students in an agricultural classroom. If a secondary level school-based agriscience program is not a Pennsylvania Department of Education approved program, then there is no requirement to offer an industry certification at all. There could be many factors contributing to why a Pennsylvania secondary school-based agriscience educator elects to not offer a particular industry certification to students in their program.

Recommendations

As industry recognized credentialing has become a vital part in preparing students to meet the demands of a workforce shortage (Bartlett, Sujin, and Minu, 2005), making industry-related certifications available to secondary school-based agriscience students is vital to ensuring that the demands of the agricultural workforce are met in Pennsylvania. Future research identifying the factors which determine whether or not secondary school-based agriscience educators offer an industry-related certification in their program should be conducted. Additionally, research identifying which industry-related certifications an educator chooses to offer their students is also necessary. Variables such as educator preparedness, facility-needs,

resources for implementation, and support of the school district and community should be considered.

Objective 3: Identify potential opportunities for future research on industry certification opportunities offered in secondary school-based agricultural education.

Conclusions

Secondary school-based agriscience educators that participated in this research study primarily offered 4 out of 10 industry-related certifications. This data indicates that over 50% of the industry-related certifications available for educators to offer their students are not being utilized.

Implications

Although the educators that participated in this research study represent less than 50% of all secondary school-based agriscience educators in the state of Pennsylvania, there appeared to be a gap between the industry-related certifications available and those actually utilized. This objective identifies a need for further research to be conducted relating to the industry-related certifications being offered to secondary school-based agriscience students in Pennsylvania.

Recommendations

Future research focusing on the factors that determine if a secondary school-based agriscience educator does or does not offer an industry-related certification to their students should be explored. Specifically, research should be conducted to examine whether or not geographical area plays a role in determining which, if any, certifications should be offered is of interest. As discussed, a program that is approved for one particular Classification of Instructional

Program (CIP) code may be more inclined to offer certain industry certifications relevant to that specific Classification of Instructional Program code. Additional research should be conducted to stratify the industry certifications offered by programs of each agricultural Classification of Instructional Program code. The type and amount of local agricultural careers is another factor that could be researched in future studies. Examining local agricultural education advisory boards and their influence on the type and number of industry-related certifications offered in a respective agriscience program is another topic for future research. Factors such as cost of the industry-related certification to implement, alignment to the existing curriculum, and level of teacher-preparedness to implement the industry-related certification in the classroom are areas for future research to explore.

As illustrated in Table 4.4, the three industry certifications most frequently offered by secondary level school-based agriscience educators that participated in this study were also the three certifications with the lowest cost to obtain. Future research should focus on analyzing specifically cost as a factor that may prevent school-based agriscience programs from offering industry certifications. Additionally, analyzing the cost for an educator to become qualified to facilitate an industry certification program as a factor preventing educators from offering certifications should be included in future research.

Objective 4: Identify professional development opportunities for Pennsylvania agriscience educators to aid them in offering industry-recognized certifications to their students.

Conclusions

Based on the data collected for this study, there appears to be a skewed tendency for Pennsylvania secondary school-based agriscience educators to offer certain industry certifications to students in their programs more often than other industry certifications. Table 4.1 shows the

number of Pennsylvania secondary school-based agriscience educators offering each of the 10 industry certifications identified by the Pennsylvania Department of Education Chapter 339 auditing report (PDE, 2013). Table 4.2 illustrates that out of those same 10 industry certifications, 4 in particular are offered most frequently. They are: Youth Pork Quality Assurance Certification, National Safe Tractor & Machinery Operator Certification, Pennsylvania Pesticide Applicators Certification, and Pennsylvania Beef Quality Assurance Certification. Agribusiness representatives were asked to review the same list of 10 industry certifications educators were shown and identify which, if any, were beneficial for a prospective employee to possess. These results are shown in Table 4.3. Employers most frequently identified Pennsylvania Nutrient Management Certification and Pennsylvania Pesticide Applicators Certification as beneficial to a prospective employee. Of this list, only the Pennsylvania Pesticide Applicators Certification was the certification represented as one of the most frequent certifications offered.

Implications

Based on the findings of this study it would appear as though the certifications most frequently offered by educators in Pennsylvania secondary school-based agriscience programs are not the certifications identified by agribusinesses in Pennsylvania as beneficial to a prospective employee. This gap between the certifications educators are offering in their program and certifications Pennsylvania agribusiness employers see as beneficial to a prospective employee could possibly indicate a workforce supply graduating without the types of certifications employers would like to see. This in turn, could indicate a need for professional development related to industry certifications be made available to Pennsylvania secondary school-based agriscience educators to better meet the needs of Pennsylvania's anticipated workforce shortage, (Crabbe, 2015), as discussed in Chapters 1 and 2 of this thesis.

Recommendations

The researcher recommends further exploration of the professional development available to Pennsylvania secondary school-based agriscience educators regarding industry certification opportunities for students in their programs. Additional research to identify any industry-recognized certifications being offered by Pennsylvania secondary school-based agriscience programs other than the 10 certifications included in this study would be beneficial. Professional development focused specifically on educating agriscience teachers on the industry-recognized certification opportunities should be made available. Also, developing a means to inform teachers of the benefits to a graduate of their program possessing an industry certification could have on that students' future employability. Upon future research being concluded on identifying the common barriers educators face when attempting to implement an industry certification program in their classrooms, future professional development to help educators overcome those barriers identified in future research is also recommended. Professional development for school-based agriscience educators could include, but should not be limited to, web-based training/discussion on offering industry certifications, face-to-face professional development events on offering specific industry certifications, and opportunities for educators and industry representatives to discuss the importance of possessing specific industry certifications for students seeking employment within their respective industries.

Implications and Recommendations for Key Stakeholders

Current School-based Agriscience Educators:

The researcher recommends based on the findings of this study that current school-based agriscience educators work closely with school administration, students, their agricultural advisory boards, and industry association representatives to analyze any industry certifications currently offered in their program as well as identify new certifications that can be offered. Based

on employment projections, the current and future demand for industry credentialed graduates in the Pennsylvania agricultural industry warrants every school-based agriscience program in Pennsylvania offering at least one high demand certification to students in their program. Additionally, current school-based agriscience educators are encouraged to attend and participate in any and all future professional development opportunities related to industry certifications. This would serve as a means of aiding them in overcoming any barriers they face while attempting to implement an industry-recognized certification in their program. School-based agriscience educators are also encouraged to participate in any future research studies pertaining to industry credentialing in secondary school-based agriscience programs. This can only serve to better understand the certifications offered throughout the state of Pennsylvania as well as barriers preventing more certifications from being offered.

School Principal:

School principals are encouraged to engage with agriscience educators in their schools regarding industry certifications offered in their agriscience programs. While limitations exist, it is the recommendation of the researcher for school principals to work with their agriscience educators to identify and mitigate barriers that exist institutionally, procedurally, or financially that prevent industry-recognized certifications from being offered to students in their program. It is recommended that school principals participate in agricultural advisory board discussions pertaining to industry-recognized credentials in order to hear and understand input from other key stakeholder groups.

Policy Maker:

As policy makers in Pennsylvania decide when, how, and what students in Pennsylvania schools will learn, the researcher recommends that industry credentialing be a part of the discussion. For example, as legislators and Department of Education officials determine and revise new graduation requirements for students in the state of Pennsylvania, it is recommended

that they consider the instructional time that will remain for students in career and technical education programs. This instructional time can be utilized to complete industry-recognized certification programs that will not only increase the employability of completing students but as this study suggests also aid in preparing them for higher education in agricultural content areas. As career and technical education funding is determined and appropriated, the researcher recommends that equipment and facility needs are considered to give educators any items that are needed in order for them to offer quality industry-recognized certifications to their students. Future research is needed to identify specific needs of teachers to offer certain industry certifications.

School-based Agriscience Student:

As the agricultural industry continues to meet the growing global demand for agricultural commodities and services, students interested in an agricultural career are encouraged to prepare themselves as much as possible. As part of the preparation process, students participating in secondary school-based agriscience programs should seek out opportunities to acquire any and all industry-recognized certifications in their future career cluster once it has been determined. Possessing industry-recognized credentials will make the student more employable when they begin job searches in their future careers. Students possessing industry certifications identified as highly desirable by agribusiness companies will be most employable.

Agribusiness Industry:

Members of the agribusiness community in Pennsylvania are highly encouraged to work with schools both locally and statewide. Meeting the demands of the global challenge must be a collective effort between educators, industry, and the students that these two groups will educate and hire respectively. As educators, their administrators, and local advisory boards discuss and

plan the content of school-based agriscience education programming input from agribusiness industry needs to be involved. Graduates of school-based agriscience programs are the future employees of agribusiness companies and in order to meet the projected demands of a growing global challenge coupled with an aging and retiring workforce in Pennsylvania agribusiness are key stakeholders in recommending which certifications should be offered in Pennsylvania school-based agriscience programs. Additionally, agribusiness industry can play a key role in lobbying policy-makers to make decisions with the best interests of school-based agriscience programs and industry-recognized certification programs in mind.

Summary

Routine Chapter 339 auditing has identified 10 industry certifications that are offered in Pennsylvania Department of Education approved school-based agriscience programs. When Pennsylvania agriscience educators were asked to review that list of 10 certifications and identify which if any they offered to students in their program, 4 certifications in particular were identified as being offered more than the other 6. When agribusiness representatives were surveyed and asked to review that same list of 10 certifications identified from Chapter 339 reporting and identify which, if any, were beneficial to a prospective employee seeking employment with their company, one certification, Pennsylvania Pesticide Applicator Certification, was at the top of both lists. From this comparison various conclusions, implications, and recommendations can be derived. Future research is recommended in order to more comprehensively identify industry certifications offered in Pennsylvania secondary school-based agriscience programs that are not audited for Chapter 339 purposes. Future research is also recommended to identify specific common variables that prevent Pennsylvania agriscience educators from offering any one specific

industry certification, or any certifications at all, in their program. Likewise, it is recommended that future research investigate the factors that affect which industry certification an agriscience educator chooses to offer or not offer to students in their program. Lastly, it is recommended that professional development opportunities relating to industry certifications be explored such as professional development focused on helping educators overcome barriers to offering an industry certification in their program, as well as making educators aware of the industry certifications available and which could be most beneficial to their students as they meet the demands of Pennsylvania's agricultural workforce.

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Appendix A

Penn State IRB Approval

IRB Program

Office for Research Protections

EXEMPTION DETERMINATION

Date: September 28, 2016

From: Stephanie Krout, IRB Analyst **To:** John Ewing

Vice President for Research
The Pennsylvania State University 205 The 330 Building
University Park, PA 16802

Phone : (814) 865-1775

Fax: (814) 863-8699

Email : orprotections@psu.edu Web : www.research.psu.edu/orp

Type of Submission:

Initial Study

Title of Study: A Profile of Credentialing Programs Offered in Pennsylvania
Secondary School-based Agri-Science Programs

Principal Investigator: Jonathan T. Seaman

Study ID: STUDY00004838

Submission ID: STUDY00004838

Funding: Not Applicable

Documents Approved:

- Survey ag teachers (1), Category: Data Collection Instrument
- Survey Industry (1), Category: Data Collection Instrument
- Updated HRP-591 - Protocol for Human Subject Research: Industry Certification (9/28/16 version 2), Category: IRB Protocol

The Office for Research Protections determined that the proposed activity, as described in the above-referenced submission, does not require formal IRB review because the research met the criteria for exempt research according to the policies of this institution and the provisions of applicable federal regulations.

Continuing Progress Reports are **not** required for exempt research. Record of this research determined to be exempt will be maintained for five years from the date of this notification. If your research will continue beyond five years, please contact the Office for Research Protections closer to the determination end date.

Changes to exempt research only need to be submitted to the Office for Research Protections in limited circumstances described in the below-referenced Investigator Manual. If changes are being considered and there are questions about whether IRB review is needed, please contact the Office for Research Protections.

Penn State researchers are required to follow the requirements listed in the Investigator Manual ([HRP-103](#)), which can be found by navigating to the IRB Library within CATS IRB (<http://irb.psu.edu>).

This correspondence should be maintained with your records.

Appendix B

Educator Data Collection Instrument

Census of PA Secondary Ag Ed Industry Certification Offerings

Welcome, and thank you for participating in this survey

Below, you will find a list of questions regarding PA Agricultural Industry Certifications. Please select YES if you offer that certification to your students or select NO if you DO NOT offer that certification to your students. Your responses will be kept confidential and are being collected for research purposes only. Your participation in this study is voluntary, you may elect to end your participation in this study at any time by closing out of the survey window. By clicking to begin the survey, you are giving your consent to participate. Completing this survey should take no more than 5 minutes of your time. Thank you for your time and participation.

1. Do you offer your students Youth Pork Quality Assurance certification? 

- YES
 NO

2. Do you offer PA Nutrient Management Certification to your students? 

- YES
 NO

3. Do you offer PA Certified Horticulturalist certification to your students? 

- YES
 NO

4. Do you offer Certified Landscape Technician certification to your students? 

- YES
 NO

5. Do you offer PA Pesticide Applicator certification to your students? 

- YES
 NO

6. Do you offer PA Environmental Agricultural Conservation of Excellence (PAECCE) certification to your students? 

- YES
 NO

7. Do you offer Instructor, Trail Guide, Disabilities, Equine Facility Manager & Seasonal Equestrian Staff certification to your students? 

- YES
 NO

8. Do you offer PA Beef Quality Assurance certification to your students? 

- YES
 NO

9. Do you offer National Safe Tractor and Machinery Operator certification to your students? 

- YES
 NO

10. Do you offer Wildland Firefighting Certification to your students? 

- YES
 NO
-