

COMPETENCIES NEEDED BY GRADUATES OF SECONDARY AGRICULTURAL
EDUCATION IN THE ANIMAL SYSTEMS CAREER PATHWAY
FOR ENTRY-LEVEL EMPLOYMENT:
A DELPHI STUDY OF INDUSTRY
EXPERTS IN OKLAHOMA

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DEDICATION

Dedicated to my mother, Judy Slusher. She has provided me with life, served as a positive role-model, but most importantly she is and always will be my best friend.

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It's funny how ironic life can be. As an Oklahoma State University master's student, the first person I met on my first day of classes was Dr. Shane Robinson. As I entered the classroom, he greeted me with a handshake and an energetic welcome to the class. In life I have been taught that first impressions are priceless. I could tell from this brief encounter that he is a person who is passionate about what he teaches and cares about his students.

As the semester moved on, it came time for me to map out the direction of my thesis. Once the idea had been formulated, I began to consider who I would want to serve as my committee chair. Considering the time and effort put forth for such a study, I wanted to work with an individual that I felt would be as avid about my topic as I am. In addition, a person whose opinions I respect and would feel comfortable discussing and debating the generation of the study and research data. Previous experiences in Dr. Robinson's class led me to believe that he would be an excellent colleague to embark on this adventure.

When I met with Dr. Robinson and presented my idea, he was able to help me narrow down my focus to a more specific topic area. Further, his previous experiences and research during his dissertation provided an excellent source of reference for my study. The truth be known, without his leadership, persistence to better this research study and patience with my inability to write a research paper, I may not have been as successful in completing my thesis. I am thankful for the opportunity to work with Dr. Robinson and grateful to have him serve as my chair.

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CHAPTER 1

INTRODUCTION

Our nation is facing a dilemma. There is an “unprecedented shortage of skilled workers” (Gray & Herr, 2006, p. 17). This shortage is projected to lead to a 5% decrease in our nation’s gross domestic product (Gray & Herr). Previous research by Gray and Herr showed that 30% of high school graduates seeking employment were not provided the necessary skills in high school, which has resulted in high unemployment rates of high school graduates (College, 2007). Although the number of students pursuing post-secondary education has increased over time, a large number of American high school graduates seeking employment following completion of secondary education still exists (College, 2007).

Even though many high school graduates are seeking employment, our nation faces the compounding issue of a shortage of skilled workers because “baby boomers” are retiring at an alarming rate. This condition is creating a rapid depletion of employees in the job market, and prompting a massive need to fill these vacated positions (Carnevale, 2003). The term “baby boomer” refers to those individuals who were born between 1946 and 1964 (Kamalick, 2007). According to Kamalick (2007), the “wave of Boomer retirees will take on biblical proportions in 2012, when the first Boomers achieve 66 years and become eligible for full retirement benefits” (p. 14).

Additional changes in the employment sector are occurring simultaneously with the retirement of baby boomers. These changes include jobs which require at least some technical training or post-secondary education (Carnevale, 2003). Ellwood (2001)

projected that, although our workforce has seen an increase in employers by 35% in the past 20 years, the combination of job market shifts will cause employment growth to slow to 16% over the next decade, which will result in an even greater shortage of workers. In fact, an increase of at least 20 million workers will be needed in the United States job market over the next 20 years (Carnevale, 2003). It would appear that education could serve this role in the employment sector for students seeking careers following high school and fill this void in the U.S. Labor force.

According to Castellano, Stringfield, and Stone III (2003), “much of what occurs in U.S. high schools is shaped by state laws and local programs. However, these changes are often questioned as to their effectiveness in public schools” (p. 246). The report *A Nation at Risk: The Imperative for Educational Reform* (1983) remarked that “statistics and their interpretation by experts show only the surface dimension of the difficulties we [those associated with education] face” (p. 10). Difficulties are generally characterized as the fear students will not be prepared for work or college (National Commission, 1983). It could be surmised that these fears have prompted commitment to improved education, resulting in a wave of reforms advocating the implementation of standardized testing within the secondary school setting. This movement began in the 1970s with the adoption of minimum competency examinations (MCE), which evaluated individual student performances regarding secondary academic curriculum (Bishop & Mane, 2001). Since that time, standardized testing has increased in importance and now guides much of the content taught within academic courses in secondary education.

Legislative acts over the past decade have provided change in how Career and Technical Education programs are designed, conducted, and measured. Castellano et al.

(2003) stated that “the legislation mandates not only measures of gains in specific career-related competencies but also traditional measures such as academic achievement tests” (p. 231). The *Goals 2000: Educate America Act* and *No Child Left Behind Act of 2001* (NCLB), increased pressure on school administrators, teachers, and students to meet academic standards in secondary education. *Goals 2000* focused on all academic areas: English, foreign language, civic and government, economics, the arts, history, and geography, with a heavy emphasis placed on mathematics and science. Specifically, the report stated, the “United States students will be first in the world in mathematics and science achievement” (Goals 2000, p. 1) by the year 2000. Further, students completing designated occupational clusters would be presented certifications, indicating their completion and understanding of the respective occupational area. Occupational clusters would be associated with school-to-work programs, such as career and technical education.

Although *Goals 2000* was implemented as a means to improve students’ math and science aptitudes, the *No Child Left Behind Act of 2001* was “designed with the ultimate goal of holding all students to the same academic standards” (Martin, Fritzsche, & Ball; 2006, p. 100). However, academic assessment score targets are developed on a state-by-state basis, as are the stipulations for students who fail to meet the standards. Under NCLB, Adequate Yearly Progress (AYP) goals display a school’s level of student performance toward closing the achievement gap between all students. “Schools that fail to meet improvement targets must adopt alternative instructional approaches or programs. . .” (Linn, Baker, & Betebenner, 2002, p. 4).

The “New Basics” curriculum presented in *A Nation at Risk: The Imperative For Education Reform* (1983), represented the idea that “high school curriculum should also provide students with programs requiring rigorous effort in subjects that advance personal, educational, and occupational goals, such as the fine and performing arts and vocational education [i.e. Career and Technical Education]” (p. 20). Career and technical education (CTE) programs provide students with entry-level competencies for careers (Lynch, 2000). However, controversial legislative acts, such as NCLB, “seem most likely to ignore these kids [who are not pursuing post-secondary education] or even to justify their neglect and the elimination of programs – such as high school CTE – that could serve them by providing occupational skills that pay well and are in demand” (Gray & Herr, 2006, p. 12). Further, Castellano et al. (2003) stated, “although many argue that preparation for jobs should be concentrated primarily in the postsecondary phase of students’ lives (e.g., in community and technical colleges), many students are developmentally ready to prepare for occupations at earlier ages” (p. 245).

In addition Cohen and Besharov (2002) identified that 93% of public schools in the United States offer one or more courses under the CTE umbrella. Beyond general introductory courses, areas of specialization are offered to students with specific industry interests. CTE programs experienced a steady increase in enrollment until the early 1980’s (Cohen & Besharov, 2002; Lynch, 2000). However, from 1982 to 1994 a sudden decline in enrollment numbers occurred. Reasons for the decline have been associated with the lack of CTE programs meeting the needs of students, an increase in college preparatory classes, and the overall negative public perception of CTE programs (Lynch, 2000).

Specifically, CTE courses “suffered from an image of a dumbed-down curriculum” (Lynch, 2000, p. 2). Even though CTE’s major contribution to the educational system has been the concept of applied learning, public perception still viewed CTE curriculum with a negative image (Wills, 2002). This image convinced many that “high school curriculum had been dumbed-down for vocational education programs and the general track curriculum as well” (Wills, 2002, p. 6). However, Cohen and Besharov (2002) reported that to some degree this perception has changed. Public perception of CTE programs has been reported to be more positive in recent years; however, the public’s perception was that CTE programs only existed to serve non-college bound students (Cohen & Besharov, 2002). The idea that CTE programs could be valuable to all students was not apparent.

In 1993, Findlay surmised that regardless of the profession, “competence in one’s professional work role is important in the overall learning process” (p. 46). Further, Stanford (2002) concluded, “involvement in career oriented education programs at the high school level can give students the experience needed to help with career placement once leaving the school setting” (p. 1). Therefore, providing a curriculum in which students can acquire technical skills is essential (Lynch, 2000).

In addition to technical skill acquisition, workers in the 21st century also need to possess non-technical (i.e., general employability) skills such as problem-solving and analytic, decision-making, organization and time management, risk-taking, and communication (Evers, Rush, & Berdrow, 1998; Lynch, 2000; Robinson, Garton, & Vaughn, 2007). Lynch (2000) posited, “. . . there is a tremendous demand for educated people with general employability and specialized technical skills. . .” (p. 4). Therefore,

a need exists to determine what types of skill sets are demanded of secondary high school graduates in industry because there is a “general consensus that occupational preparation. . . should begin sometime in high school” (Lynch, 2000, p. 7).

To increase awareness and enrollment in CTE programs, efforts to modify curriculum to meet the needs of students and the labor force have been made (Lynch, 2000). Around 1990, numerous CTE programs in the United States began making changes in the presentation and content of their curriculum. The reformed curriculum offered more “rigorous industry standards, and higher academic standards and related general education knowledge” (p. 3). Recent federal legislation has introduced the *Carl D. Perkins Career and Technical Education Improvement Act of 2006* (Perkins IV). Its purpose is to “develop more fully the academic and career and technical skills of secondary education students and postsecondary education students who elect to enroll in career and technical education programs” (p. 683). This allows students enrolled in CTE the opportunity to train for the workforce and prepare for college simultaneously (Roberts & Ball, 2009). Additionally, it parallels many of the themes intended to be addressed by education, including preparation for high skill, high wage, high demand careers, and the integration of academic and technical education, and strengthening America’s workforce to be competitive in the global economy (Martinez Jr., 2007).

To ensure students are provided opportunities to acquire the needed skills to be competitive in the workforce, CTE has endorsed the use of the 16 Career Clusters (Ruffing, 2006). Career clusters are “groupings of occupations/career specialties” (States’ Career Clusters Initiative, 2008) manifested by career pathways. Pathways provide knowledge and skills for their respective career cluster. The purpose of the 16 Career

Clusters is to address the needs of increasing integration of standards for both academia and industry while encompassing curricula changes and tools for measuring assessments of the program (Ruffing, 2006).

In response to the 16 Career Clusters created by the National Association of State Directors for Career Technical Education Consortium (NASDCTEC), Oklahoma agricultural education implemented curriculum standards based on the 16 Career Clusters into its programs in 2006. This inclusion sought to “ensure that Oklahoma agricultural education student’s [would] have the skills and abilities to be successful in college or successful in the workplace” (Oklahoma Agricultural Education, 2007b). Curriculum standards were based on the proposed National Career Cluster initiative to guide students into a chosen career pathway.

There are seven total career pathways created for the Agricultural, Food, and Natural Resource career cluster. These pathways consist of agribusiness systems, animal systems, environmental service systems, food products and processing systems, natural resource systems, plant systems, and power, structural and technical systems. In addition to these seven pathways, students can be administered competency examinations in their respective areas to determine the success the program had on preparing the individual for the workforce in that particular career pathway. These examinations provide information for future employers to assess potential employees’ abilities within their chosen career of study and their readiness for employment. According to a staff member of the Department of Oklahoma Career and Technical Education, adopting the career clusters “prepares students for a broad range of career options: employments, technical and

postsecondary education, lifelong learning, and increases our ability to meet industry expectations” (Murray, personal communication, June 12, 2007)

Career clusters are one answer to the changes and demands detected in the agricultural industry and agricultural education, a component of CTE. Thompson and Balschweid (1999) reported that “increased high school graduation requirements have pressured agricultural programs by limiting opportunities for students to enroll in elective courses” (p. 73). Further, “in 1988, the National Research Council recommended that agricultural courses be expanded to increase the rigor of scientific and technical content to better prepare students for advanced study and employment” (Warnick, Thompson, & Gummer, 2004, p. 62). Additionally, it was concluded that the integration of science in agricultural education classes produced a positive impact on students’ test scores on standardized tests (Chiasson & Burnett, 2001; Thompson & Balschweid, 1999).

The teaching of science in agricultural classes, or agriscience as it is often called in many states, is a concept that has been around for nearly 100 years (Warnick & Thompson, 2007). To enhance visibility, programs across the United States have begun offering science credits to students taking approved agricultural education courses (Chiasson & Burnett, 2001). Budke (1991) postulated that “agriculture provides a marvelous vehicle for teaching genetics, photosynthesis, nutrition, pollution control, water quality, reproduction, and food processing where real life examples can become part of the classroom experimentation and observation” (p. 4). The concept of integrating the two subjects could produce a more effective way of teaching science (Warnick et al., 2004).

Science and agriculture are integrated in the animal systems career pathway, which is one of seven pathways offered in Oklahoma agricultural education programs. In 2007, nearly 300 Oklahoma agricultural education programs offered courses in the animal systems career pathway (Kurt Murray, personal communication, April 14, 2008). Courses in the animal systems career pathways include basic introductory animal science classes, nutrition, reproduction, and equine science. Beginning in the 2007 academic year, “over 8% of student enrolled in Oklahoma agricultural education programs had committed to the animal systems pathway for their course of study” this being the most popular of the pathways (Murray, personal communication, April 14, 2008). These courses have the opportunity to offer career competencies and the integration of agriculture and science concepts which have been associated with students achieving higher standardized test scores in science (Chiasson & Burnett, 2001).

Providing guidance for future employment and/or post-secondary education is vital for the success of students. Oklahoma agricultural education programs served over 26,000 students in 2007 (Oklahoma Career and Technology, 2007). Approximately, 55% of these students were projected to enroll into college after graduating from high school (Oklahoma Agricultural Education, 2007a). The remaining 45% of Oklahoma agricultural education high school graduates will enlist into military service, enter the workforce, or be unemployed (Oklahoma Agricultural Education, 2007a). Therefore, obtaining valuable skill sets needed to be employable and a successful citizen is imperative for these graduates as well as society.

Theoretical Framework

The theoretical framework for this study was based on the Human Capital Theory. The origin of the Human Capital Theory is rooted in the works of economist Adam Smith and H. von Thünen, who concluded that “all of the acquired and useful abilities of all of the inhabitants of a country [should be considered] as part of capital [of a nation]” (Shultz, 1971, p. 27). Further, John Stuart Mill and Alfred Marshall, addressed applications of human capital in economic issues (Sweetland, 1996). Smith (1952) assessed the relationship between a nation’s wealth and the productivity of its people which lent to two foundational principals of the Human Capital Theory. The first operationalized labor inputs as more than merely a quantitative assessment and acknowledged them as qualitative. This included “the acquired and useful abilities of all the inhabitants or members of society” (Smith, 1952, p. 119). Secondly, persons enhancing their abilities through “education, study, or apprenticeship, always cost a real expense, which is capital fixed and realized. . .” (Smith, 1952, p. 119). However, Smith stated that placing a market value on benefits received through enhancing one’s abilities had not been fully determined.

John Stuart Mill (1926) as cited stated by Sweetland (1996), equated human abilities to economic utilities, which could lead to enhanced wealth of an individual, thus providing some evidence of monetary value for human capital. In the late 1950s, Jacob Mincer (1958) fashioned a theoretical framework that linked formal and informal training to higher earnings (Sweetland, 1996). Mincer concluded that differences in training led to diverse levels of income. Although research related to the human capital concept continued to be conducted, a firm characterization of the theory had not been established.

Commitment to the understanding and application of the capital concept would be carried out by Theodore Shultz and Howard Beck in the early 1960s (Little, 2003). Their work would evolve to the conceptualization of the Human Capital Theory. According to Little (2003),

The propositions of human capital theory were that the skills that people acquire are a form of capital, human capital; that these are acquired through deliberate investments in education; that skills are the capacities that contribute to economic production; and that earnings in the labour market are the means by which a person's productivity is rewarded (p. 438).

In addition to facilitating the defining of the Human Capital Theory, Schultz (1961), created five major categories that could lead to improved human capital. Among these categories, "on-the job training, . . .and formally organized education at the elementary, secondary, and higher levels. . ." (p. 9) were acknowledged.

Today, "education has recently been re-theorized under Human Capital Theory as primarily an economic device" (Fitzsimons, 1999, p. 1). Castellano et al. (2003) posited "Formal education is society's best available route to assure citizens' participation in the world of work. The relationship between education and income has never been stronger than at present" (p. 239). As such, investments spent in educating individuals increases their competency levels and future earnings. Moreover, Becker (1964) posited that education plays the largest role in human capital.

In its simplest form, human capital can be viewed as investment in education and training (Becker, 1964). When analyzed, "it is *human* because it is embodied in man, and it is *capital* because it is a source of future satisfactions, or of future earnings, or both"

(Shultz, 1971, p. 48). It is often argued whether human capital is limited to reading and writing or specialization within a given industry. Nevertheless, investing in an individual's knowledge of any given field will result in that person becoming a more productive asset to society.

Specifically, "education has become a major source of economic growth in winning the abundance that is to be had by developing a modern agriculture and industry" (Shultz, 1971, p. 56). It is for these and related reasons children are required to attend elementary and secondary education. Becker (1964) further explained that "many workers [and students] increase their productivity by learning new skills and perfecting old ones while on the job [or through work-experience programs]" (p. 9). The success of our nation and its ability to overcome barriers would not be possible if individuals were "predominantly illiterate and unskilled" (Shultz, 1971, p. 56).

Secondly, Agricultural education has had to overcome its own barriers in developing as an educational program which effectively serves the needs of its audience such that the enhancement of its student's human capital occurs. Historically, among those debating the purpose of agricultural education, Charles Prosser, David Snedden, and John Dewey are often cited as key actors who were involved from the beginning of this debate. Prosser viewed agricultural education as a "separately administered, and narrowly focused, vocational training [as] the best available way to help non-academic students secure employment after completing school" (Hyslop-Margison, 2001, p. 24). Snedden, a proponent of "social efficiency" reinforced a similar philosophy, believing that vocational education should meet the needs of the job market, i.e., the future employers of education high school graduates (Gordon, 1999). At the other end of the

spectrum, Dewey supported the idea that “education should be a form of “vocational exploration as a means to acquire practical knowledge, apply academic content, and examine occupational and societal values” (Gordon, 1999, p. 29). Further, he was against “vocational education as merely trade education” (Gordon, 1999, p. 29). Finally, Dewey expressed a desire to encourage all students to enroll in vocational education courses (Gordon, 1999).

With these views in mind, Roberts and Ball (2009) developed a conceptual model to provide an understanding of the role of the 21st century agricultural industry plays in agricultural education programs (Figure 1). Based on the model, curricula utilized in agricultural education courses should reflect the needs of the industry. Further, teachers must “stay current in the technical content of the profession [i.e., agricultural industry]” (Talbert, Vaughn, Croom, & Lee, 2007, p. 57) because the agricultural industry “provides the basis for the curricula taught and for teacher preparation” (Roberts & Ball, 2009, p. 83).

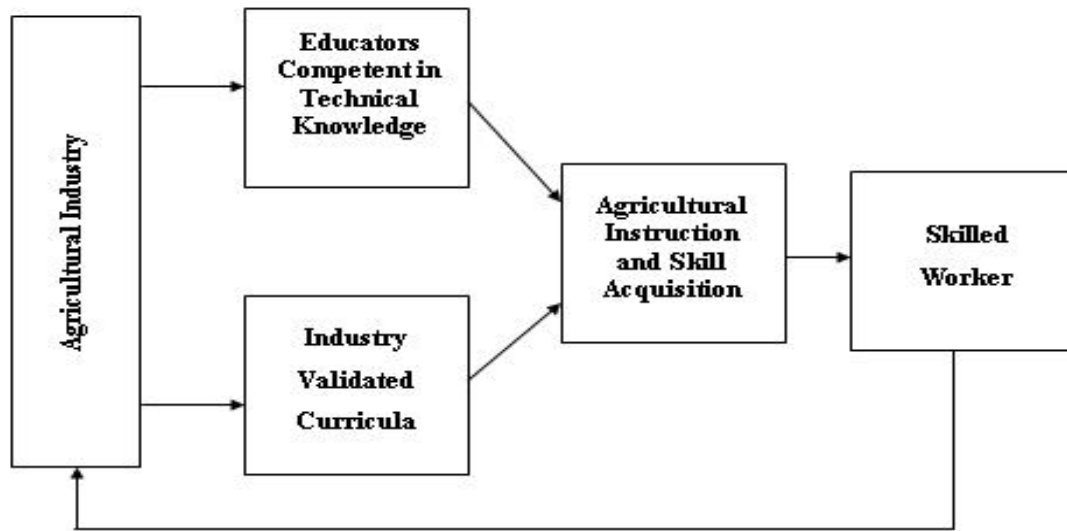


Figure 1. A content-based model for teaching agriculture (Roberts & Ball, 2009).

Moreover, instructors should “provide industry-relevant instruction that results in observable skill acquisition” (Roberts & Ball, 2009, p. 83). The end result is for students to gain skills and competencies which enable them to gain successful employment within the industry.

Although it preceded the Roberts and Ball (2009) model, the National Association of State Directors of Career Technical Education consortium created the 16 Career Clusters which is in accordance with what Roberts and Ball asserted. This includes the Agriculture, Food, and Natural Resources cluster, which contains an animal science career pathway (Oklahoma Career Clusters, n.d.). The pathway allows for a sequence of courses to be completed by students interested in pursuing a career or post-secondary education in animal science. Further, the career pathway (see Appendix A) serves as a vehicle for curriculum delivery which could include competencies necessary for entry-

level employment of students in the animal agriculture industry following their high school graduation.

Statement of the Problem

To a degree, career and technical education exists to provide the necessary tools and skill sets for successful student employment in the agricultural industry (Phipps & Osborne, 1988). However, a lack of available research leads one to wonder if the current curriculum, such as the 16 Career Clusters followed in Oklahoma, is meeting the needs of agricultural industry leaders who employ high school graduates of agricultural education programs. If students do not acquire these competencies deemed necessary by employers, they decrease their probability of employment in the future, thus, increasing the number of unemployed high school graduates in the United States (College, 2007; Gray & Herr, 2006).

Purpose of the Study

The purpose of this study was to describe the perceptions of Oklahoma animal science industry leaders as it related to competencies necessary for the entry-level employment of high school graduates who had completed coursework in the Oklahoma Agricultural, Food and Natural Resources, animal systems pathway.

Research Objectives

To fulfill the purpose of the study, the following research objectives were addressed:

1. Identify the technical competencies deemed necessary for entry-level employment in the animal science industry of high school graduates upon successfully completing coursework in the animal systems career pathway;

2. Identify the non-technical competencies deemed necessary for entry-level employment in the animal science industry of high school graduates upon successfully completing coursework in the animal systems career pathway; as determined by consensus of an expert panel of animal science industry leaders in Oklahoma.

Terms and Definitions

Agriculture, Food and Natural Resources Career Cluster: “Prepares learners for careers in the planning, implementation, production, management, processing, and/or marketing of agricultural commodities and services, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products. It also includes related professional, technical and educational services” (National Association, 2008, p. 5).

Agriscience: “Instruction in agriculture emphasizing the principles, concepts and laws of science and their mathematical relationships supporting, describing, and explaining agriculture” (Buriak, 1992, p. 4).

Career Clusters: “Groupings of occupations/career specialties used as an organizing tool for curriculum design and instruction. Occupational/career specialties are group into the Career Clusters based on the fact that they require a set of common knowledge and skills for career success” (States’ Career Clusters, 2009, para. 2).

Career Pathways: “Sub-groupings of occupations/career specialties used as an organizing tools for curriculum design and instruction. Occupations/career specialties are grouped into Pathways based on the fact that they require a set of common knowledge and skills for career success” (States’ Career Clusters, 2009, para. 3).

Competence: Tools or skills an individual possess for successful performance (Dubois, 2005).

Curriculum: “The list of all courses offered in a school; also a group of related courses, such as the agricultural education curriculum” (Talbert et al., 2007, p. 512).

Delphi Methodology: “Method of eliciting and redefining group judgments” (Dalkey, 1969, p. V) by gathering responses from an expert panel and utilizing responses to create useful statement (Stitt-Gohdes & Crews, 2002).

Entry-level Employment: Employment obtained by entry-level employees. This group of persons are characterized as “employees that are recent high school graduates hired as new entrants into the workforce at an entry-level wage in a beginning level position” (Richens, 1999, p. 9).

General (Basic) Skills: “reasoning ability, general problem-solving skills, and behavioral skills” (Carnevale, 2003, p. 6).

High-Demand Occupations: “Occupations having more than the median number of total (growth plus replacement) openings for statewide or a particular region” (Oregon Employment Department, n.d., p. 1).

High-Skill Occupations: “Occupations with a minimum educational requirement of postsecondary or higher, and, occupations with long-term on-the-job training or related work experience as a minimum educational requirement, and postsecondary training or

above as a competitive educational requirement” (Oregon Employment Department, n.d., p. 1).

High-Wage Occupations: “Occupations paying more than the all-industry, all-ownership median wage for statewide or a particular region” (Oregon Employment Department, n.d., p. 1)

Professional Ranks: Careers that require advanced degrees “e.g., accounting, educators, physicians, lawyers, engineers” (Gray & Herr, 2006, p. 8).

Secondary Agricultural Education: “A program or instruction in and about agriculture and related subjects” (Talbert et al., 2007, p. 4) offered in “a school with grades seven through 12” (p. 522).

Specialized Skills: Skills designed for a specific trade, industry, or employment (Carnevale, 2003).

Assumptions

The following assumptions were made for this study:

1. The animal science industry experts (i.e., Delphi panelist) from Oklahoma had either hired a high school graduate before or were considering hiring a high school graduate.
2. The animal science industry experts accurately reported their perceptions of the competencies needed by high school graduates for entry-level employment in the animal science sector.

3. The animal science industry experts responded to the questions truthfully and without undue bias.
4. The animal science industry experts represented each sector of the animal science industry in Oklahoma and were representative of the industry as a whole.

Limitations

The following limitations were made for this study:

1. This study was limited to a select panel of animal science industry experts within the state of Oklahoma.
2. Time and financial resources limited this study to a sample ($n = 42$) of the animal science industry experts in Oklahoma.
3. Due to the nature of the data collection process, only those individuals who had access to the Internet and could respond to the study's questionnaire via e-mail were considered as potential panelist.
4. Due to the limited sample from which the data was collected, the analysis of the data will also be limited to the sample population of animal science industry experts in Oklahoma who responded to the study.

Significance of the Study

Bottoms (1982) stressed that courses taught in occupational areas should be representative of employer's needs. *The National Research Agenda: Agricultural Education and Communication* (2007) outlined five research areas of high priority for the years to come. The question of how agricultural education programs can effectively prepare students for career success was identified. Accordingly, this initiative identifying

workforce needs for global competitiveness, determining skills sets needed by industry for high-demand careers, curriculum standards, and developing instructional systems to meet industry needs were stipulated (National Research Agenda, 2007).

Researchers have shown that not all students will pursue higher education beyond high school. For example, Lynch (2000) concluded “. . . that upward of one-third of all secondary students enrolled in Career and Technical Education programs are not college bound” (p. 6). This group of students will need job-specific preparation to successfully make the transition from school to the workforce (Rojewski, 2002).

In many states, agricultural education teachers have made significant attempts to better integrate core academic areas into their curricula to assist in preparing students for standardized tests (Warnick et al., 2005). The implementation of the 16 Career Clusters provides students with transparent opportunities to acquire competencies congruent with employment in the agricultural industry. Economically, the Oklahoma agricultural industry could be seen as largely dependant upon areas of focus within the Agricultural, Food and Natural Resources career cluster.

Livestock, poultry, and their products are the leading source of income for the Oklahoma agricultural industry (United States Department of Agriculture, n.d.). With more than 8% of students initially enrolling in the animal systems career pathway during its first year of implementation (Kurt Murray, personal communication, April 14, 2008) and the economical drive in the animal science sector of the agricultural industry, research regarding industry curriculum and, thus, pertaining to this area would help define competencies needed for the successful entry-level employment of high school graduates. This, in turn, could assist in resolving the shortage of skilled job seekers for

employment in the animal science industry. Further, the promotion and integration of agriculture and science would continue to support the preparation of students for standardized testing in science.

CHAPTER II

REVIEW OF LITERATURE

This section of the research proposal will review relevant literature on the topics of employment, education, career and technical education, the creation of career and technical education career clusters, and the purpose of agricultural education. This chapter consists of eight sections and will proceed deductively. This includes: employment changes, educational reforms, history of career and technical education in the United States, career and technical education today, career and technical education and employment, career and technical education and the 16 Career Clusters, secondary agricultural education, integration of curriculum in agricultural education, and standardized testing as a measure of student learning.

Employment Changes

Conroy (1998) opined that a person's occupational identity is created based on the encounters that he or she has with political, family, and environmental influences. It is important for high school students to begin to consider and understand which paths they may decide to follow as it relates to future careers, because this will determine in part the courses they undertake in secondary education and beyond. However, Conroy (1998) believed that the "alternative philosophy that has dominated societal views about education has been one that evaluates schools based on whether they 'deliver the goods' rather than developing people" (p. 2). This philosophy leads students to develop into worker-citizens that can meet industry goals, or what others have called "social efficiency" (Snedden, as cited in Drost, 1967).

Currently, one of the most significant changes in the job market is the retirement of baby boomers which will span over the next 20 years (Carnevale, 2003). As boomers move into their late 50s, this will create a rapid depletion in the job market. Czaja (2006) reports that as soon as “2010, the number of workers aged 55 + will be at about 26 million . . .” (p. 283). This increase in retirees will open up areas of employment in top level positions among all industries (Carnevale, 2003), thus, requiring high-skilled employees to emerge in the workplace. Although employment opportunities will be available, the question remains whether there will be viable employees to fill these positions. Czaja (2006) found that “at the same time that the work force is aging there is also a slowed growth in the number of younger workers and slowing in the growth of the labor supply” (p. 283). So, it could be hypothesized that this will create an opportunity for willing and able high school graduates to fill needed positions of employment if they possess the desired skill sets those employers need.

Researchers (Carnevale, 2003; Conroy, 1998; Lynch, 2000; Rojewski, 2002) have referred to the current employment outlook as the *new economy*. This *new economy* emphasizes fast communications, information, decision-making, and social skills to meet its demands (Lynch, 2000). However, the need for technical workers is debated by researchers. Carnevale (2003) advocated the greatest demand for workers will be seen in management and office jobs. Czaja (2006) reaffirmed this concept by stating that, “in the next few years [2006 and thereafter] a gain of about 6.9 million jobs is projected for professional and related occupations as computer and technical specialist, health care practitioners, and education-related occupations” (p. 290).

Gray and Herr (2006) and Lynch (2000) noted the job market will have the highest demand for technical and technological skills. Whether employees are seeking careers in professional or technical positions, they will need employability skills. Robinson (2000) found that “most discussions concerning today’s workforce eventually turn to employability skills” (p. 1). Employability skills are seen as “basic skills” (Robinson, 2000, p. 1) that aid individuals in “getting, keeping, and doing well on a job” (Robinson, 2000, p. 1). These skills can, but are not limited to reliability, responsibility, problem-solving, and social competencies (Robinson, 2000). Overtom (2000) defined employability skills as “transferable core skill groups that represent essential functional and enabling knowledge, skills, and attitudes required by the 21st century” (p. 1). Overtom (2000) discussed that employability skills are necessary for success in the job market regardless of the chosen career path, employment level, or educational background.

Czaja (2006) and Ascher (1988) asserted that employers will focus more on previous work experience than academic accomplishments. Additionally, employers will need to be able to learn on the job and use a cognitive style of skills, which will include handling success and failure on the job and recovering from the resulting outcomes (Carnevale, 2003). Employers will demand future employees have basic job skills. Such as problem-solving and behavioral skills (Ascher, 1988). “Problem-solving and behavioral skills also are required in order to create new kinds of value added” products and services (Carnevale, 2003, p. 6). In addition, employers will seek employees who have the ability to work in teams and perform under increased human interaction scenarios between employees and consumers (Carnevale, 2003). The question remains,

where will students be able to acquire such skills for future employment? Public School systems could be a viable source for meeting employees' demands. Can the nation's Public Schools meet these needs as well as the challenges associated with legislative mandated educational reforms?

Educational Reforms

National academic standards were introduced on March 31, 1994, when *Goals 2000: Educate America Act* was initiated. The initiative postulated that when students were required to meet higher academic standards, they would achieve higher levels of academic success within the school setting (Balschweid & Huerta, 2008). "The Act provided resources to states and communities to ensure that all students reach their full potential" (Goals 2000, p. 1). Among the eight goals that outlined the Act, emphasis was placed on students in the fourth, eighth, and twelfth grades obtaining competencies to become responsible citizens, leads productive lives, and contribute to our nation's economy. In the academic areas, mathematics and science were highlighted. Specifically, goal four stated that the "United States students will be first in the world in mathematics and science achievement" (Goals 2000, p. 1).

As a result of *Goals 2000: Educate America Act*, schools began requiring students to receive passing scores on minimum competency examinations (MCE) before receiving a high school diploma. Students who did not receive satisfactory scores were provided several opportunities to pass; however, this resulted in delayed graduation and, in extreme cases, students opted to withdraw from their high school. However, Bishop and Mane (2001) opined that some "students who believe they cannot pass the MCE might

nevertheless continue to attend high school because they enjoy socializing and playing sports, or because they are learning a trade” (p. 3).

A more recent legislative act that expanded educational standards was the *No Child Left Behind Act (NCLB) of 2001*. NCLB, which was signed by President G. W. Bush in 2001, was created to encourage students to meet higher academic standards (Martin et al., 2006). The NCLB legislation is based on four principles: accountability of results based on state assessment instruments, i.e., standardized tests, choices for parents to send their student to schools meeting academic standards implemented by the state, greater local control and flexibility of how federal funds are allocated to school districts, and justification on doing what works based on scientific research. The NCLB legislation has resulted in mandated standardized testing within all states. To ensure quality, “schools will be monitored by their students’ results and the standards set by legislation” within their respective states (Martin et al., 2006, p. 100).

The History of Career and Technical Education in the United States

Research suggests career and technical education (CTE) can provide students with entry-level competencies for prosperous careers (Conroy, 1998). Moreover, “the field of Career and Technical Education (CTE) in the United States has evolved over the past 100 years to serve a variety of populations” (Martinez, 2007, p. 27). CTE, formally known as Vocational Education, was embodied in our nation before the first colonist settled on the eastern shores of what is now the United States. The earliest observations of education in what would become the United States were made within Native American tribes. Even as tribes were uprooted west, they continued to train their youth in hopes to secure the continuation of their lifestyles and survival (Hawkins, Prosser, & White, 1951).

Formal education during Colonial times was provided through private schooling. This generally occurred in families with higher socio-economic status. However, various families were unable to send their children to these establishments and were forced to indenture their children as apprentices. A written contract was signed and the child became a student and faithfully served his or her master for the duration of the contract. “In return, the master agreed to train the apprentice for the master’s trade or business” (Hawkins et al., 1951, p. 2). In addition to learning a trade, reading, writing and ciphering were taught.

During the 19th century, several legislative acts shaped vocational education. Senator Justin Morrill of Vermont is credited with crafting the first *Morrill Act of 1862*. This Act “set aside funds for teacher education in agricultural and mechanical arts” (Talbert, Vaughn, Croom, & Lee; 2007, p. 71). Additionally, financial support was provided to states and territories to purchase land for facilitates. The land purchased became known as Land-Grant colleges. In the years that followed, a second *Morrill Act* was passed (1890) to provide funding for African-American agricultural colleges (Talbert et al., 2007). During this span of time, the *Hatch Act of 1887* was adopted. This act supplied states with appropriations to establish agricultural experiment stations. Its purpose was to allow for “useful and practical information respecting the principle and application of agricultural science” (Hawkins et al., 1951, p. 75).

On November 16, 1906 the National Society for the Promotion of Industrial Education was formed with its purpose being to unite interested parties related to industrial education (Hawkins et al., 1951). This included improving working conditions and apprenticeships and developing a common level of education required for entry into

the workforce. The legislation further sought to obtain the attention of society and the realization that proper Vocational Education was needed. Associations were formed throughout the United States focusing on the needs of the industry and the course of action public vocational education programs would take to guarantee their students would be afforded the opportunity to attain these requirements.

CTE received another boost in its campaign for agricultural and mechanical arts in 1914 with the passage of the *Smith-Lever Act*, also known as the *Agricultural Extension Act* (Hawkins et al., 1951). During this period, American farmers who were unable to attend the land-grant colleges were not receiving sufficient education to improve their farming practices. The *Smith-Lever Act* answered this need by developing programs of cooperative extension in agriculture and home economics (Hawkins et al., 1951). Information gathered at land-grant universities was dispersed to county extension agents and then presented to producers in their respective locations. Demonstrations, forums, and meetings were used to disseminate information to large groups. This allowed those farmers who were unable to attend formal academic institutions the opportunity to participate in educational demonstrations and gain new knowledge and skills.

The *Smith-Lever Act* sparked the interest of Senator Carroll Page, a passionate supporter of vocational education. He believed that it was the responsibility of federal government to provide youth the opportunities for job-specific training (Talbert et al., 2007). Charles Prosser, secretary of the National Society for the Promotion of Industrial Education and long time supporter of vocational education lent his legislative influence to Senator Page. This drew interest from Representative Dudley Hughes and Senator Hoke

Smith. Through the collaboration of these four individuals and countless others the *Smith-Hughes Act of 1917* was passed.

The *Smith-Hughes Act* was developed to “provide funding to the states for the purpose of training teachers in agricultural education, industrial arts education, and home economics” (Talbert et al., 2007, p. 77). In addition to teacher training, funding for salaries and educational programs were generated. This was the first time that federal aid had been given to public secondary schools for vocational education, now career and technical education. From 1918 to 1963, several amendments would be made to increase funding and strengthen the *Smith-Hughes Act*. It would not be until the *Vocational Education Act of 1963*, that vocational agricultural education, now secondary agricultural education, would be broadened to include instruction in non-farming areas of agriculture.

Since the inception of formalized, federally supported vocational education and training (VET), the debate remains as to its purpose. John Dewey and Charles Prosser in particular are known to have prominent but albeit opposing views on VET’s purpose. According to Gordon (1999), Dewey believed that “vocational exploration [should be used] as a means to acquire practical knowledge, apply academic content, and examine occupational and societal values” (p. 29). However, Gordon (1999) clarified that Dewey did not believe vocational education should be used solely for trade education.

On the other hand, Charles Prosser viewed education in general as “the development of human capital for the success of the industrial economy” (Gordon, 1999, p. 31). Further, to achieve such a goal, a structured sequence, production-oriented system was created based on principles taken from the industrial sector and implemented into

public schools (Spring, 1990; as cited in Gordon, 1999). Further investigation of Prosser's and Dewey's philosophical criteria provides insight on their differences.

Teaching methodology under Prosser was based on a step-by-step approach from basic concepts to more integral theories and practices (Gordon, 1999). However, Dewey believed that problem-solving methods employed by instructors would enhance student's knowledge base (Gordon, 1999). Prosser believed that student's learning should benefit the industry and its needs, but Dewey posited that the student's responsibility was to themselves (Gordon, 1999). Further, Dewey strongly believed VET's was meant for all students, whereas Prosser opined that it was suited for only those who showed a general interest and could potentially benefit from its coursework in their future endeavors.

Career and Technical Education Today

The debate remains today with increasing changes in education, the challenges to the United State's economy and society. CTE has had and continues to reform itself to meet these demands. Although challenges are pervasive, the principle of career and technical education is preparation of individuals for employment, which can be seen in curriculum reform of the introduction of career clusters. These principles are grounded on career and technical education's purpose which is to provide a "planned program of courses and learning experiences that begins with exploration of career options, supports basic academic and life skills, and enables achievement of high academic standards, leadership, preparation for industry-defined work, and advanced and continuing education" (Office of Superintendent of Public Instruction, n.d., p. 1).

During the 1990s, a wave of reforms was made in education that would concern Career and Technical Education, which included the integration of academics into Career and Technical Education (Cohen & Besharov, 2002), developing general work skills that could be transferable from one job to another (Rojewski, 2002), and the use of technological skills (Retooling for Career Technical Education, 2007). As a result, Hoachlander (2008) reported increases in student enrollment in CTE courses, which provides evidence that preparation for college and career can occur concurrently.

Career and Technical Education and Employment

Several studies have examined CTE and its role in the employment of U.S. citizens (Conroy, 1998; Lynch, 2000; Martinez Jr., 2007; Rojewski, 2002). Conroy's (1998) study related to "gender and program of enrollment to adolescents' occupational and educational aspirations . . ." (p. 1). Forty-one percent of participants intended to pursue professional careers post-high school graduation. However, they did not intend to pursue post-secondary education and assumed they would receive lower job position versus individuals who had obtained some post-secondary education. Based on these findings, Conroy (1998) suggested that CTE courses should be "integrated into the total education program, and provide a broad-based exposure to the world of work through experiential learning" (p. 9).

Lynch (2000), reaffirmed the concepts of integrating CTE into the overall education curriculum by stating that "career and technical education is integral to whole school, comprehensive reform; it is not separate from it" (p. 8). Moreover, Lynch believed that the future of CTE should include preparing students from both "the workplace and continuing education" (p. 9). Key concepts that should be examined for

the improvement of CTE include contextual teaching and learning, work-based learning, authentic assessment, career academics, and tech prep (Lynch , 2000).

Examining the future of CTE programs was discussed by Martinez Jr. (2007) in the article titled *An Evolving Set of Value-Based Principles for Career and Technical Education*. Based on previous legislative acts and changing educational systems, Martinez Jr. (2007) proposed a set of principles to assist in guiding CTE in the future. These principles sought to encourage “accessibility”, which refers to the idea that CTE should be open to all students in the public school systems; “accountability,” which include the needs of the community, stakeholders, and job market; “equity,” which reinforces the acceptance of special needs and diverse students; “learning,” which reiterates the concept of lifelong learning; “usefulness,” which outlines comprehensive programs and adhering to work ethics; and “safety,” which reinforces the need for “physical, psychological and emotional safety” (p. 80-81) in CTE.

Finally, Rojewski (2002) confirmed that to ensure courses offered in CTE programs provided students the necessary skills for success in the workplace or post-secondary education, content areas should be grouped together. Further, Rojewski stressed the role of the educator by stating “a strong effort should ensure that emerging teachers are aware of workplace inequities and be able to change them when possible” (p. 14). The ability to adapt to the demands and needs of the workforce can help to ensure that CTE programs have a place in public school systems in the years ahead.

“Since the inception of public career and technical education in the early 1990’s economic developments have had major influences on the content and direction of curricula at secondary and post-secondary levels” (p. 5). Further, good work ethics,

employability skills, and the skill to make career-decisions are important for students desiring to attend post-secondary education institutions (Conroy, 1998).

Programs under the Oklahoma umbrella of CTE encompass the following areas: Agriculture, Food, and Natural Resources; Architecture and Construction; Arts, A/V Technology, and Communications; Business, Management, and Administration; Education and Training; Finance; Government and Public Administration; Health Science; Hospitality and Tourism; Human Services; Information Technology; Law, Public Safety, Corrections, and Security; Manufacturing; Marketing, Sales, and Service; Science, Technology, Engineering, and Mathematics; and Transportation, Distribution, and Logistics. All CTE programs will need to seek ways to meet the needs of their future employers. Agricultural education is not immune to this need. Rojewski (2002) questioned how CTE will respond to the dramatic shifts in the workforce. Ascher (1988) commented that “few employers prefer workers with only specialized vocational training” (p. 3). Both authors believed these students may have a difficult time applying specialized skills to a more generalized workforce.

It has been suggested that the agricultural industry will see a decrease in sustainable employment opportunities for entry-level graduates (Stanford, 2002). To help counterbalance this crisis, research performed by Kemple, Poglinco, and Snipes (1999) found that when students in high school were involved in programs that were career oriented, they were provided experiences needed to assist in career placement following high school graduation. These experiences will allow entry-level applicants to improve their resumes and knowledge of the workplace while providing them the competencies needed to further their careers.

Career and Technical Education and the 16 Career Clusters

In response to changing legislative acts, academic standards, employment and student needs, the National Association of State Directors for Career Technical Education Consortium (NASDCTEC) set forth in the late 1990s to design a new pathway for CTE. This act addressed the needs of increasing integration of standards, for both academics and industries, while addressing changes in curricula and providing tools for assessing program quality (Ruffing, 2006).

During the 1990s, the U.S. Department of Labor released a document, under the Secretary's Commission on Achieving Necessary Skills (SCANS), outlining the skills that would be needed to survive the changing workplace (Ruffing, 2006). These skills were described as basic, interpersonal, and employability skills. These foundation skills reflected on a person's ability to function within the workplace and interact with co-workers. Additional assessment was performed through the National Skills Standards Board (NSSB). This group was created from the *Goals 2000: Educate America Act*. It proposed broad career clusters which could be implemented in high school curriculum to guide students in future employment opportunities. During this same time, the National School to Work Office (NSTWO) began requiring states to "develop portable credentials based on industry recognized skill standards" (Ruffing, 2006, p. 1). It was then that these groups realized that they were all working toward the same goal.

The collaboration of the groups created the Building Linkages project in 1996. Using combined resources, they developed curriculum plans for broad career clusters from school to work (Ruffing, 2006). Pilot studies were conducted in three areas: retail and banking, health, and manufacturing. However, even after the pilot studies, questions

remained as to how these programs would “fit” into secondary education. It was unclear whether CTE programs would absorb this new curriculum framework or if it would be implemented into the general education course offering.

The 22 pilot programs created the foundation for career pathways focusing on existing skills. However, collaborators associated with Building Linkage believed there were additional skills which should be included for new careers. As the Building Linkage project worked toward its common goal, states across the country developed their own competency standards and applied them to their respective CTE programs. Although this initiative was a step in the right direction, the standards from state to state differed largely, creating a disagreement regarding the appropriate competency levels for students. In an attempt to unify all programs, the Office of Vocational and Adult Education (OVAE) adopted the 16 Career Clusters in 1999 and began forming one set of curriculum that could be federally mandated for all schools in the United States (Ruffing, 2006).

Based on research, OVAE chose to use two specific models to create the 16 Career Clusters. These models consisted of the occupational and industrial approaches. The occupational approach was based largely on the Standard Occupation Classification system. The industrial approach focused on “broad industry areas of economic sectors” (Ruffing, 2006, p. 4). These two areas provided students the greatest opportunity for future employment. The model selected for the 16 Career Clusters was based on the following levels: foundation, pathway, and specialty. Each level builds on the previous level, leading students from a broad view of their chosen career into specific competencies needed for that industry.

To encourage states to adopt the 16 Career Clusters, the “OVEA required states to use Career Clusters as one way to report student enrollment for the Perkins accountability requirements” (Ruffing, 2006, p. 5). States who agreed to use the 16 Career Clusters formed together as one group under the Oklahoma Department of Career and Technology Education (ODCTE) and applied to NASDCTEC for a grant to continue research for the program. It was then, in 2000, when the grant was received, that ODCTE volunteered to serve as the headquarters for the 16 Career Clusters.

Guidelines were developed through the grant to require states to create a national advisory committee, as well as define their clusters, goals, and competencies students would need for success. Additionally, pathways were created, which provided students with the appropriate courses needed to prepare for a specific career. On the national level, several boards were created to oversee the state committees. Their purpose was to provide guidance and ensure states were following through with the guidelines. Hard work by both the state committees and national boards led to the unveiling of the 16 Career Clusters in September 2002. Although career clusters are currently being implemented and used in secondary education today, the need to examine current practices and update curriculum continues to exist.

In Oklahoma, Career and Technical Education has introduced seven pathways for students in agricultural education. These areas include Agricultural Communications; Agribusiness and Management; Agricultural Power, Structures, and Technology; Animal Systems; Food Products and Processing Systems; Natural Resources and Environmental Science; and Plant and Soil Science. Within these seven pathways, a sequence of recommended courses is provided for completion of the pathway. The implementation of

career pathways in agricultural education is one of the newest changes to agricultural education curriculum being taught in the United States.

Secondary Agricultural Education

The creation of agricultural education was “originally meant for those students who planned to enter the farming profession” (Talbert et. al, 2007, p. 59). Legislative reforms over the course of the past decade have broadened this view to incorporate “training in non-farm agricultural occupations” (Talbert et al, 2007, p. 59). Agricultural education’s mission is to prepare “students for successful careers and a lifetime of informed choices in the global agriculture, food, fiber and natural resources system” (What is agricultural science, n.d.). It accomplishes these goals by basing the program on a three circle model that incorporates classroom and instruction laboratory, a supervised agricultural experience program, and youth leadership development through National FFA Organization (What is agricultural science, n.d.). Each aspect of the model overlaps, thus creating a balanced comprehensive agricultural education program. The idea is that this model will provide opportunities for “students who wish to pursue advanced interest for careers develops in agricultural education” (Oklahoma Agricultural Education, 2007a, p.1).

Secondary Agricultural Education, Integration Curriculum in Agricultural Education, and Standardized Testing

While industry workforce needs should be an important driver of curriculum changes in agricultural education, academic standards are playing a growing role as well. ERIC Clearinghouse (1988) found “high school graduation requirements in academic areas have increased, and the amount of time for vocational education courses [e.g.,

agricultural education] has been reduced” (p.2). National legislative acts, such as *Goals 2000* and *No Child Left Behind* have increased strain on agricultural education programs to address the core academic areas of testing. The idea of combining general education course or integrating agricultural education is not new.

Over the past 20 years, agricultural education programs have shifted from labeling their courses as “vocational agriculture” or “agricultural education” to “agriscience” or “agricultural science”. Buriak (1992) defined agriscience as “instruction in agriculture emphasizing the principles, concepts and laws of science and their mathematical relationships supporting, describing, and explaining agriculture” (p.4). This concept was espoused after the enactment of the *Hatch Act of 1887* for the use of experiment stations in post-secondary education. Chiasson and Burnett (2001) stated “the agriscience program addresses goals in science by teaching units on soils, cultivation of plant materials, producing livestock, animal genetics, natural resources” (p. 61).

Researchers have suggested that integrating general academic areas, such as science, increases students’ knowledge and their test scores (Chiasson & Burnett, 2001; Thompson & Balschweid, 1999). In particular, a study by Balschweid and Huerta (2008) concluded that “teaching advanced life science within the context of animal agriculture can enhance students’ immediate marketability in the workplace and provide students a launching pad for post-secondary educational pursuits” (Balschweid & Huerta, 2008, p. 18).

Success in this amalgamation could be attributed to the hands-on or applied approach of agricultural education courses. Thompson and Balschweid (1999) concluded that “integrating science into the curriculum will draw more high ability students into

agricultural education programs” (p.22). From this same study, teachers believed that integrating the different science courses into agricultural education had helped their ability to teach students to solve problems (Thompson & Balschweid, 1999).

A recent study conducted by Myers and Washburn (2008) examined the impact of science integration into Florida’s agricultural education programs. Based on this study, it was found that “71% of the participants reporting that integration of science into the agriculture curriculum is necessary. . .” (p. 34). Accordingly, it could be conclude that agricultural education instructors were willing to integrate science into their courses. Further, it was found that “31% of these [agricultural education instructors] reporting increased enrollments as a result” (p. 34). However, Myers and Washburn (2008) questioned “whether the existing curriculum is sufficient for teachers to integrate [the curriculum] effectively” (p. 34).

With current mandates set forth by NCLB, agricultural education teachers may want to capitalize on this opportunity to integrate core academics into their teaching and throughout all aspects of their programs. “Beginning in 2007, NCLB mandated that states measure student progress in science at least four times in a student’s progression from third to twelfth grade” (Myers & Washburn, 2008, p. 27). Specific impacts of legislative acts, such as NCLB (2001), on agricultural education programs have not yet been fully determined. However, Myers and Washburn (2008) pointed out that “agricultural education programs are not likely to be exempted from these increased expectations” (p. 27).

Summary

This review of the literature provided insight to the need for additional research regarding current secondary agricultural education curriculum and its relationship to the demands of the 21st century agricultural industry. The job market is changing. As such, the curriculum offered in schools will need to be modified to keep current and meet the needs of high school students in the 21st century; especially those who choose to enter the workforce immediately after graduation. As the literature has shown, a major depletion in our workforce will occur over the next decade due primarily to the retirement of numerous workers. This will create tremendous turnover in the workforce as recent graduates will be called on to fill the vacancies of these retirees. However, the technical career sector is already showing a high demand for skilled workers. This is an area in which CTE programs, such as agricultural education, can make an impact by supplying students with competencies considered essential for entry-level employment.

Additionally, educational reform is prompting the growing use of standardized testing in secondary education to document student achievement. Researchers have shown that the integration of science in agricultural education courses can have a positive impact on student test scores when these two academic areas are properly integrated. Integration, coupled with the opportunity to provide students with valuable job competencies can produce employees with highly demand skills for future careers. Focusing on key areas, including the animal systems sector, can provide answers for both Oklahoma public education school systems and Oklahoma agriculture industry leaders.

CHAPTER III

METHODOLOGY

Purpose of the Study

The purpose of this study was to describe the perceptions of Oklahoma animal science industry leaders as it related to competencies necessary for the entry-level employment of high school graduates who had completed coursework in the Oklahoma Agricultural, Food and Natural Resources, animal systems pathway.

Research Objectives

To fulfill the purpose of the study, the following research objectives were addressed:

1. Identify the technical competencies deemed necessary for entry-level employment in the animal science industry of high school graduates upon successfully completing coursework in the animal systems career pathway;
2. Identify the non-technical competencies deemed necessary for entry-level employment in the animal science industry of high school graduates upon successfully completing coursework in the animal systems career pathway;

as determined by consensus of an expert panel of animal science industry leaders in Oklahoma.

Research Design

The methodology for this research study was the Delphi technique. According to Stitt-Gohdes and Crews (2002), the Delphi technique is used to gather responses from an expert panel and utilize these responses to create useful statements for the purpose of future application. Further, “the Delphi technique is a method of eliciting and redefining group judgments” (Dalkey, 1969, p. V). The Delphi technique can be utilized to solicit,

collect, and obtain responses from a group of expert panel members to gain a general consensus (Delp, Thesen, Motiwalla, & Seshadri, 1977). The Delphi technique provides three features: anonymity, controlled feedback, and statistical group response (Dalkey, 1969). Stewart (2001) affirmed that the knowledge gained from professional educators using the Delphi technique is extremely useful in uncovering information that is often not verbalized.

Population and Sample

The population for this study was Oklahoma animal science industry experts from nine areas of specialization: beef cattle; dairy; equine; goat; implements/miscellaneous; poultry; sheep; swine; and veterinarians. Stitt-Gohdes and Crews (2002) stated that “careful selection of the panel of experts is the keystone to a successful Delphi study” (p. 60). Therefore, panel members were selected using a purposive sampling technique. According to Gay, Mills, and Airasian (2006), a purposive sampling “is the process of selecting a sample that is believed to be representative of a given population” (p. 113).

A sample population of ($n = 42$) was obtained for the study. The criterion used for selecting individuals was based on their prior experience and knowledge of the industry as it pertained to employment, including entry-level employees. For example, only those individuals who had previously hired or would consider hiring high school graduates were considered for this study. Additionally, all experts who served on the panel were affiliated with the animal science industry in the state of Oklahoma. Finally, due to the nature of the data collection process, only those individuals who had access to the Internet and could respond to the questionnaire via electronic mail (e-mail) were considered as panel members. Wicklein (1993) stated that it is important to have a strong

set of criteria when selecting a panel “because the success of the Delphi relies on the informed opinion” (p. 1050).

A professor of animal science, Department of Animal Science, Oklahoma State University suggested panel members based on personal and professional interactions. Following the initial collection of potential panel members, remaining committee members reviewed the list and made further additions. Panel members were then contacted via e-mail or telephone to determine their willingness to participate in the study.

Turoff and Linstone (2000) stated that a computer version of the Delphi technique “has the advantage of eliminating the delay caused in summarizing each round of Delphi . . .” (p. 5). Also, the heterogeneity of the panel members is protected and higher validity of the data results when utilizing an electronic questionnaire (Turoff & Linstone, 2000). Panel members who expressed a desire to participate were sent a consent form via e-mail. Their replies to the e-mail were considered as their consent to participate in the study.

Dalkey (1969) stated that when a Delphi group is larger than thirteen members, a reliability of at least .80 can be achieved. Of the 42 participants selected to participate, 32 responded in Round One. This produced a response rate of 76.2%. Round Two returned 26 respondents for a 61.9% response rate. Finally, in Round Three, 24 participants responded which was a 57.1% response rate. Based on Dalkey (1969), within all three rounds of the Delphi reliability was maintained, due to the level of responded on the panel surpassed the thirteen member mark.

Accordingly, the sample for the research study consisted of 10 beef cattle specialists, seven dairy cattle specialists, four equine specialists, two goat specialists, four

implements/miscellaneous specialists, six poultry specialists, three sheep specialists, four swine specialists, and two veterinarians (Figure 2).

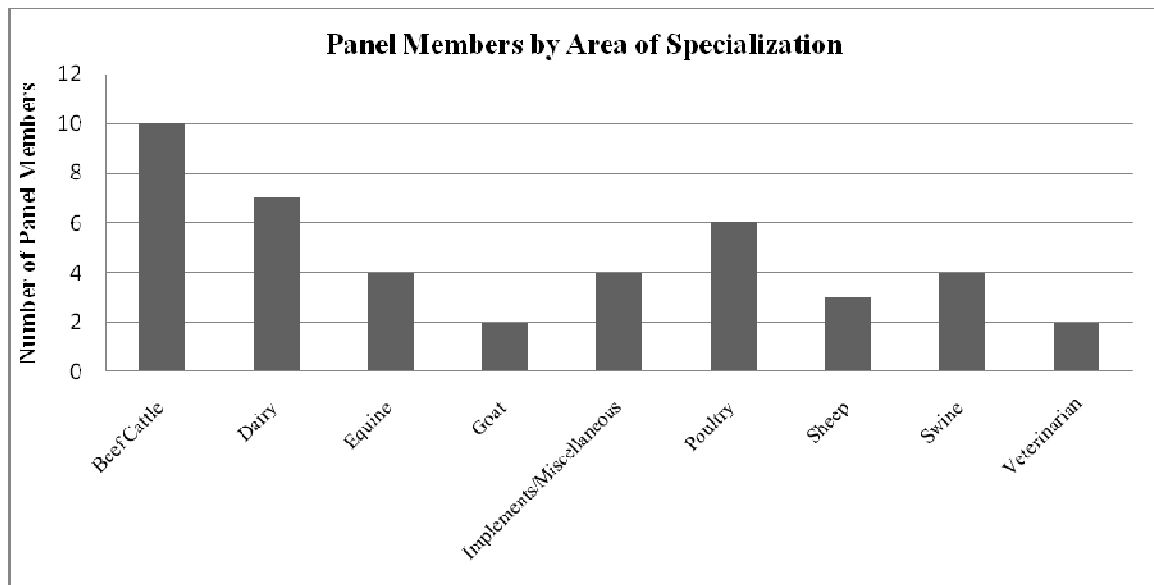


Figure 2. Delphi panel members by area of specialization.

Further, areas of specialization parallel with livestock, equine, and poultry raised in Oklahoma (Table 1).

Table 1

Oklahoma Equine, Livestock, and Poultry: Estimated Number of Head Produced Per Annual

| <i>Livestock</i> | <i>Quantity</i> | <i>U.S. Rank</i> |
|--|-----------------|------------------|
| Broilers and other meat-type chickens* | 44,314,617 | 13 |
| Cattle and calves** | 5,400,000 | 4 |
| Layers* | 3,323,802 | 26 |
| Hogs and Pigs** | 2,340,000 | 7 |
| Equine*** | 326,000 | 4 |
| Goats (meat and other types)** | 115,000 | 3 |
| Sheep** | 80,000 | 18 |
| Dairy Cattle* | 64,000 | |

*Note: * 2008 State Agriculture Overview – Oklahoma. ** January 2009 National Agricultural Statistics Services. *** 2005 American Horse Council*

As outlined in Table 2, selected personal characteristics were obtained from participants in Round One. Of the 32 participants who responded, 29 (90.63%) were male and ranged in age from 31 to more than 60 years of age, with the largest percentage being between 46 to 50 years of age (31.25%). All participants (100.00%) indicated their ethnicity as White or Caucasian.

Table 2

Selected Personal Characteristics of the Delphi Panelists

| Area | Characteristics | <i>n</i> | % |
|-------------------------|------------------------|-----------------|----------|
| <i>Gender</i> | Female | 3 | 9.38 |
| | Male | 29 | 90.63 |
| <i>Age</i> | 18 to 25 | 0 | 0.00 |
| | 26 to 30 | 0 | 0.00 |
| | 31 to 35 | 7 | 21.88 |
| | 36 to 40 | 3 | 9.38 |
| | 41 to 45 | 4 | 12.50 |
| | 46 to 50 | 10 | 31.25 |
| | 55 to 60 | 2 | 6.25 |
| | 60+ | 6 | 18.75 |
| <i>Ethnicity</i> | White or Caucasian | 32 | 100.00% |
| <i>Education</i> | Doctoral Degree | 5 | 15.63% |
| | Master's Degree | 7 | 21.88% |
| | Bachelor's Degree | 16 | 50.00% |
| | Technical Degree | 1 | 3.13% |
| | High School | 2 | 6.25% |
| | Diploma | 2 | 6.25% |
| | Other | 1 | 3.13% |

Additionally, participants had varying levels of education. One half ($n = 16$) had received their bachelor's degree. Two received a high school diploma, and one

participant had received a technical degree. One participant checked the “other” box on the questionnaire and indicated that he/she had received 2.5 years of education at a four-year institution, but did not complete a degree program. Approximately, one-third of the panelist (37%) had earned a post-baccalaureate degree.

Instrument

The instrument used for this Delphi study consisted of multiple rounds of a Web-based questionnaire sent to the participants in the form of an e-mail message. Dillman, Lesser, Mason, Carlson, Willits, Robertson, and Burke (2007) asserted that personalization of questionnaire may have a positive impact on increasing the response rate. Personalization can include “pre-notification letters, variation in cover letter appeals between altruistic (i.e., appealing to the welfare of others) versus egoistic (i.e., appealing to selfish interests of potential respondents), respondent-friendly questionnaire” (p. 633).

Although a Web-based questionnaire was used, many of the “personalized” techniques used in mailed questionnaire were applied. Dillman et al. (2007) reported that in 26 studies conducted by Worthen and Valcarce (1985), they found an overall response rate of “45.3 percent for the personalized group and 41.1 percent for the non-personalized sample” (p. 633). Further, Turoff and Linstone (2000) stated that a computer version of the Delphi technique “has the advantage of eliminating the delay caused in summarizing each round of Delphi . . .” (p. 5). Also, the heterogeneity of the panel members were protected and provide a higher validity of the data results when an electronic questionnaire is utilized (Turoff & Linstone, 2000).

Once the initial list of potential panel members was constructed, panel members were contacted via e-mail message or telephone to determine their willingness to

participate in the study (see Appendix B). Their reply to the e-mail was considered sufficient as their consent to participate. As suggested by Dillman (2000), a pre-notice email (see Appendices C, D, and E) was sent to all participants three days prior to the start of all three rounds of the questionnaire.

E-mail messages sent to panel members consisted of brief directions for each round, panel member's ID number, and a hyperlink to the questionnaire (see Appendices F, G, and H). Each round, participants were asked to complete the questionnaire within one week. Reminder e-mail messages were sent three days into each round to prompt participants who had not yet completed the questionnaire (see Appendices I, J, and K). Following the study, panel members were sent a "thank you" letter (see Appendix J) to express the appreciation of the researcher and committee members.

The initial questionnaire was created by the researcher and committee members in Microsoft WORD and then transcribed into the WS FTP 95 software program. The methodology consisted of three rounds. The questionnaire and related techniques used were modified from Dyer, Breja, and Ball (2003). Round One of the Delphi questionnaire was characterized as "exploration of the subject under discussion" (Turoff & Linstone, 2000, p. 5). The questions for Round One were developed by the researcher. Participants were asked to list as many technical and non-technical skills they believed potential employees would need to obtain entry-level employment in the participants' respective areas of the animal science industry. Additionally, panel members completed a second set of questions describing selected personal characteristics (see Appendix M). Three independent coders assessed the responses (Montgomery &

Crittenden, 1977) so that statements similar in nature could be consolidated and placed into theme areas.

Round Two of the questionnaire (see Appendices N, O, and P), asked participants to rate 48 technical competencies statements and 33 non-technical competencies, which were originated from panel members in Round One of the study. A four-point summative-rating scale was employed for this purpose: (“1” = “Strongly Disagree”, “2” = “Disagree”, “3” = “Agree”, “4” = “Strongly Agree”). According to Turoff and Linstone (2000), Round Two was used to form an understanding of how participants viewed the competencies. Statements receiving a mean rating of less than 3.00 were re-submitted and further assessed in Round Three.

In Round Three, participants were asked to indicate whether they agreed or disagreed with 21 statements from the technical category (see Appendix P). Participants were encouraged to consider re-writing all statements, which received a mean score of 2.99 or less, in a fashion in which they could agree. This provided additional clarity from the group and allowed consensus to be reached.

Data Collection

Round One consisted of the allocation of two open-ended questions designed by the researcher and committee members. In all, 32 participants responded to Round One for a 76.2% response rate. The following open-ended statements were administered to panel members.

- Please list all the animal science-related technical skills you believe a high school agricultural education graduate should have to obtain entry-level employment in your area of the animal science sector.

- Please list all the non-technical (e.g., strong work ethic, punctuality, ability to communicate, etc.) you believe a high school agricultural education graduate should have to obtain entry-level employment in your area of the animal science sector.

The generated responses from Round One were transcribed into a Microsoft Word document and categorized into themes. Three researchers independently coded the statements into themes and then negotiated consensus regarding the appropriate categorization i.e., the emergent themes (Montgomery & Crittenden, 1977). Statements under the technical category were grouped into eight themes: Animal Handling/Husbandry; Animal Selection and Evaluation; Business, Marketing, and Data Management; Health and Nutrition; Operation and Maintenance of Tools and Machinery; Policies and Food Safety; Production Agriculture; and Reproduction and Genetics. Further, statements representing non-technical competencies were grouped into six themes: Communication; Decision Making; Lifelong Learning; Personal Organization and Time Management; Personal Strengths; and Problem Solving. Following the categorization of Round One responses, Round Two questions were developed in Microsoft WORD and transcribed into the WS FTP 95 software program. The Round Two questionnaire asked participants to rank statements using a 4-point summative-rating scale: (“1” = “Strongly Disagree”; “2” = “Disagree”; “3” = “Agree”, “4” = “Strongly Agree”). Round Two yielded a response rate of 82%.

Round Three sought to reach consensus on all statements that received a mean rating of less than 3.00 in Round Two. Panel members in Round Three were asked to determine whether or not they “Agreed” or “Disagreed” with the statements. If

participants disagreed, they were asked to re-write the statement, if possible, so that they then would agree. A response of rate of 92% was achieved per Round Three. Statements for Round Three were created in Microsoft WORD and transcribed into the WS FTP 95 program.

Data Analysis

Round One consisted of two open-ended questions, which were developed by the researcher and committee members. Questions about selective personal characteristics were included in the questionnaire as well. The researcher and committee members then categorized statements into eight technical themes and six non-technical themes. Statements that appeared to be similar in nature were combined into single items for future rating. This form of evaluation was modified from a study conducted by Montgomery and Crittenden (1977) who discussed how to increase coding reliability for open-ended questions. A total of 48 technical statements and 33 non-technical statements were developed for the Round Two questionnaire.

Data collected in Round Two was placed into Microsoft Excel spreadsheets and descriptive statistical analysis was conducted to determine means, standard deviations, and percentage of agreement. For each statement, the mean developed was used to determine level of consensus for that statement. Round Two produced 20 statements, which were re-submitted to panel members. All statements fell under the technical category. No non-technical skills received a mean score of 2.99 or less during Round Two. As such, consensus of agreement was met. Therefore, no non-technical competencies were re-submitted to the panel in Round Three.

Round Three data were examined in a similar fashion to Round Two. Statements receiving a two-thirds consensus (i.e., 17 panel members had to agree) from panel members were accepted (Dr. Glen Shinn, personal communication, May 14, 2009). Of the 20 statements sent to panel members in Round Three, only one statement did not reach the level of consensus. The statement “Identify prevalent agricultural policies at the state and national level” received only nine “Agree” replies.

Summary

The use of the Delphi methodology employed allowed the researcher to obtain responses, via a Web-based questionnaire, from the expert panel regarding technical and non-technical competencies. Further, selected personal characteristics of the panelists were gathered to further describe the expert panel. The sample population for the research study was Oklahoma animal science industry experts who had previously employed or would consider employing high school graduates. Additionally, these participants all had access to e-mail.

A sample population ($n = 42$) was obtained for the study. In Round One, 32 panelists responded to the questionnaire. Round Two and Three produced 26 and 24 panelist respectively. The ability of the researcher to maintain an expert panel of 13 or greater increased reliability of at least .80 of the study, based on finding in Dalkey (1969) study. Nearly 91% of panel members were male. Two-thirds of the panel members were between the ages of 46 to 50 and one-half had received their bachelorette degree.

The instrument used for the Delphi study consisted of a three-round Web-based questionnaire. The initial questionnaire was created by the researcher and committee members containing two open-ended statements followed by a selective personal

characteristics section. Statements acquired in Round One were analyzed and categorized into eight technical and six non-technical themes by three independent coders. The non-technical themes were categorized according to similar categories developed by Evers et al. (1998).

Panelists were asked to rate technical and non-technical statements on a four-point summative-rating scale in Round Two. Based on panel members responses, statements receiving a mean rating of 3.00 or higher were considered by the researcher to have reached consensus from the expert panel. Further, statements that received a mean rating of less than 3.00 were resubmitted to panel members via Round Three for additional assessment. Per Round Two, 27 technical and 33 non-technical statements reached consensus from panelist. It should be noted that all non-technical statements reached consensus in Round Two; therefore, Round Three consisted solely of technical statements. In Round Three, panelists were asked to “agree” or “disagree” with the statement. If they did not agree with the statement, they were encouraged to re-write the statement so that they would agree. Of the 21 statements re-submitted to panelist in Round Three, 20 statements reached consensus, and were approved by two-thirds of panelists.

CHAPTER IV

FINDINGS

The purpose of this study was to describe the perceptions of Oklahoma animal science industry leaders as it related to competencies necessary for the entry-level employment of high school graduates who had completed coursework in the Oklahoma Agricultural, Food and Natural Resources, animal systems pathway.

Research Objectives

To fulfill the purpose of the study, the following research objectives were addressed:

1. Identify the technical competencies deemed necessary for entry-level employment in the animal science industry of high school graduates upon successfully completing coursework in the animal systems career pathway;
2. Identify the non-technical competencies deemed necessary for entry-level employment in the animal science industry of high school graduates upon successfully completing coursework in the animal systems career pathway;

as determined by consensus of an expert panel of animal science industry leaders in Oklahoma.

Objective One

Objective one sought to identify technical competencies deemed necessary for entry-level employment following students' high school graduation in the animal science industry. After the initial distribution of the Round One questionnaire, 133 statements were collected from the 32 respondents. This procedure produced 48 technical competency statements for Round Two (see Appendix P). The statements were

categorized into eight categorized theme areas: Animal Handling/Husbandry (5 competencies); Animal Selection and Evaluation (4 competencies); Business, Marketing and Data Management (11 competencies); Health and Nutrition (10 competencies); Operation and Maintenance of Tools and Machinery (5 competencies); Policies and Food Safety (4 competencies); Production Agriculture (3 competencies); and Reproduction and Genetics (7 competencies).

Based on panel members' responses, 27 of the 48 statements reached consensus of agreement by receiving a mean rating score of 3.00 or higher (see Table 3) during Round Two. Of those, seven (25.9%) statements from Business, Marketing and Data Management; six (22.2%) statements from Health and Nutrition; four (14.8%) statements came from Operation and Maintenance of Tools and Machinery; four (14.8%) statements from Reproduction and Genetics; three (11.1%) statements came from Animal Handling/Animal Husbandry; two (7.4%) statements from Policies and Food Safety; one (3.7%) statement came from Animal Selection and Evaluation; and one (3.7%) statement from Production Agriculture. The remaining 21 statements not reaching consensus (i.e., $M = 3.00$ or greater) were sent back to panel members in Round Three of the study (see Appendix R).

The three statements on which participants strongly agreed entry-level graduates should possess were "use basic math skills" ($M = 3.54$; $SD = 0.51$), "execute general farm safety practices" ($M = 3.54$; $SD = 0.65$), and "understand animal needs" ($M = 3.54$; $SD = 0.65$) (Table 3). Additionally, participants reached agreement on the following statements: "identify unhealthy animals" ($M = 3.46$; $SD = 0.58$), "operate farm equipment in a safe manner" ($M = 3.42$; $SD = 0.64$), "value general animal health" ($M =$

3.35; $SD = 0.63$), “read and interpret equipment operating procedures” ($M = 3.27$; $SD = 0.53$), “understand male and female anatomy of specific livestock/equine” ($M = 3.27$; $SD = 0.67$), “record and maintain relevant data” ($M = 3.23$; $SD = 0.65$), “understand basic animal reproduction” ($M = 3.19$; $SD = 0.63$), “use basic accounting skills” ($M = 3.19$; $SD = 0.69$), “monitor an unhealthy animal” ($M = 3.15$; $SD = 0.61$), “understand the strengths and weaknesses of artificial insemination versus natural service breeding programs” ($M = 3.12$; $SD = 0.65$), “follow basic business policies, laws, and legalities” ($M = 3.12$; $SD = 0.86$), “understand livestock/equine ‘point of balance’ and behaviors when handling” ($M = 3.08$; $SD = 0.63$), “transport livestock/equine” ($M = 3.08$; $SD = 0.63$), “create career development documents” ($M = 3.08$; $SD = 0.69$), “understand livestock/equine nutrition” ($M = 3.08$; $SD = 0.69$), “understand proper use of antibiotics, vaccinations, other medical remedies” ($M = 3.08$; $SD = 0.74$), “identify prevalent agricultural policies at the state and national level” ($M = 3.08$; $SD = 0.74$), “administer antibiotics and vaccinations” ($M = 3.07$; $SD = 0.74$), “understand selected aspects of production agriculture” ($M = 3.04$; $SD = 0.53$), “understand available markets for specific livestock segments” ($M = 3.04$; $SD = 0.66$), “create and send emails” ($M = 3.04$; $SD = 0.72$), “understand bio-security threats in the agriculture industry” ($M = 3.04$; $SD = 0.77$), “recognize gestation periods for various livestock/equine” ($M = 3.04$; $SD = 0.77$), and “operate Microsoft Office” ($M = 3.04$; $SD = 0.87$).

Sixteen technical competency statements received mean ratings ranging from 2.99 to 2.77. The bottom five statements which participants agreed least were “perform general welding practices” ($M = 2.69$; $SD = 0.68$), “understand commodity markets” ($M = 2.69$; $SD = 0.68$), “understand general agricultural politics” ($M = 2.62$; $SD = 0.57$), “interpret

expected progeny differences” ($M = 2.62$; $SD = 0.90$), and “evaluate and comprehend carcass data” ($M = 2.50$; $SD = 0.86$).

Table 3
Agreement Levels for Entry-level Technical Skills Needed in the Animal Science Sector According to Animal Science Experts per Round Two of the Delphi Procedure (N = 26)

| Statement | Topic Theme | <i>M</i> | <i>SD</i> | % Agreement (marked 3 or 4) |
|--|--|----------|-----------|-----------------------------|
| 1. Use basic math skills | Business, Marketing, and Data Management | 3.54 | .51 | 100.00 |
| 2. Execute general farm safety practices | Operation and Maintenance of Tools and Machinery | 3.54 | 0.65 | 92.30 |
| 3. Understand animal needs | Animal Handling/Husbandry | 3.54 | 0.65 | 92.30 |
| 4. Identify unhealthy animals | Health and Nutrition | 3.46 | 0.58 | 96.15 |

Table 3. (continued)

| | Statement | Topic Theme | <i>M</i> | <i>SD</i> | % Agreement (marked 4 or 3) |
|----|---|--|----------|-----------|--------------------------------|
| 5. | Operate farm equipment in a safe manner | Operation and Maintenance of Tools and Machinery | 3.42 | 0.64 | 92.30 |
| 6. | Value general animal health | Health and Nutrition | 3.35 | 0.63 | 92.30 |
| 7. | Read and interpret equipment operating procedures | Operation and Maintenance of Tools and Machinery | 3.27 | 0.53 | 96.15 |
| 8. | Understand male and female anatomy of specific livestock/equine | Animal Selection and Evaluation | 3.27 | 0.67 | 88.46 |

Table 3. (continued)

| | Statements | Topic Theme | <i>M</i> | <i>SD</i> | % Agreement (marked 3 or 4) |
|-----|--|--|----------|-----------|--------------------------------------|
| 9. | Record and maintain relevant data | Business, Marketing, and Data Management | 3.23 | 0.65 | 88.46 |
| 10. | Understand basic animal reproduction | Reproduction and Genetics | 3.19 | 0.63 | 88.46 |
| 11. | Use basic accounting skills | Business, Marketing, and Data Management | 3.19 | 0.69 | 84.61 |
| 12. | Monitor an unhealthy animal | Health and Nutrition | 3.15 | 0.61 | 88.46 |

Table 3. (continued)

| | Statements | Topic Theme | <i>M</i> | <i>SD</i> | % Agreement (marked 3 or 4) |
|-----|---|--|----------|-----------|--------------------------------|
| 13. | Understand strengths and weaknesses of artificial insemination versus natural service breeding programs | Reproduction and Genetics | 3.12 | 0.65 | 84.61 |
| 14. | Follow basic business policies, laws, and legalities | Business, Marketing, and Data Management | 3.12 | 0.86 | 92.00 |
| 15. | Understand livestock/equine 'point of balance' and behaviors when handling | Animal Handling/Husbandry | 3.08 | 0.63 | 84.61 |

Table 3. (continued)

| Statements | Topic Themes | <i>M</i> | <i>SD</i> | % Agreement (marked 3 or 4) |
|---|--|----------|-----------|--------------------------------|
| 16. Transport livestock/equine | Animal Handling/Husbandry | 3.08 | 0.63 | 84.61 |
| 17. Create career development documents | Business, Marketing, and Data Management | 3.08 | 0.69 | 80.76 |
| 18. Understand livestock/equine nutrition | Health and Nutrition | 3.08 | 0.69 | 80.76 |
| 19. Understand proper use of antibiotics, vaccinations, other medical remedies | Health and Nutrition | 3.08 | 0.74 | 76.92 |

Table 3. (continued)

| Statements | Topic Theme | <i>M</i> | <i>SD</i> | % Agreement (marked 3 or 4) |
|--|--|----------|-----------|--------------------------------|
| 20. Identify prevalent agricultural policies at the state and national level | Policies and Food Safety | 3.08 | 0.74 | 53.84 |
| 21. Administer antibiotics and vaccinations | Health and Nutrition | 3.07 | 0.74 | 76.92 |
| 22. Understand selected aspects of production agriculture | Production Agriculture | 3.04 | 0.53 | 88.46 |
| 23. Understand available markets for specific livestock segments | Business, Marketing, and Data Management | 3.04 | 0.66 | 80.76 |

Table 3. (continued)

| Statements | Topic Theme | <i>M</i> | <i>SD</i> | % Agreement (marked 3 or 4) |
|---|--|----------|-----------|--------------------------------|
| 24. Create and send emails | Business, Marketing, and Data Management | 3.04 | 0.72 | 76.92 |
| 25. Understand bio-security threats in the agriculture industry | Policies and Food Safety | 3.04 | 0.77 | 80.76 |
| 26. Recognize gestation periods for various livestock/equine | Reproduction and Genetics | 3.04 | 0.77 | 73.07 |
| 27. Operate Microsoft Office | Business, Marketing, and Data Management | 3.04 | 0.87 | 84.00 |

Table 3. (continued)

| Statements | Topic Theme | <i>M</i> | <i>SD</i> | % Agreement (marked 3 or 4) |
|---|--|----------|-----------|--------------------------------|
| 28. Use basic mechanical tools | Operate and Maintenance of Tools and Machinery | 2.99 | 0.49 | 88.46 |
| 29. Prevent bio-security risks | Policies and Food Safety | 2.99 | 0.75 | 80.76 |
| 30. Feed livestock | Health and Nutrition | 2.96 | 0.66 | 84.61 |
| 31. Brand/tag livestock/equine in a safe manner | Animal Handling/Husbandry | 2.92 | 0.63 | 76.92 |
| 32. Demonstrate work experience in the livestock industry | Production Agriculture | 2.88 | 0.59 | 76.92 |

Table 3. (continued)

| | Statements | Topic Theme | <i>M</i> | <i>SD</i> | % Agreement (marked 3 or 4) |
|-----|---|---------------------------------|----------|-----------|--------------------------------|
| 33. | Describe significant livestock/equine breeds and their relation to industry | Animal Selection and Evaluation | 2.88 | 0.77 | 65.38 |
| 34. | Recognize nutritional needs pre/post breeding | Health and Nutrition | 2.88 | 0.86 | 65.38 |
| 35. | Evaluate livestock/equine based on composition | Animal Selection and Evaluation | 2.85 | 0.67 | 69.23 |
| 36. | Understand basic elements of plant and soil sciences | Production Agriculture | 2.81 | 0.63 | 69.23 |

Table 3. (continued)

| Statements | Topic Theme | <i>M</i> | <i>SD</i> | % Agreement (marked 3 or 4) |
|---|---------------------------|----------|-----------|-----------------------------|
| 37. Identify the strengths and weaknesses of individual pedigrees | Reproduction and Genetics | 2.81 | 0.63 | 69.23 |
| 38. Break/train livestock/equine | Animal Handling/Husbandry | 2.81 | 0.63 | 65.38 |
| 39. Identify causes of animal illnesses/diseases and parasites | Health and Nutrition | 2.81 | 0.75 | 61.53 |
| 40. Understand the estrus cycles of various species | Reproduction and Genetics | 2.81 | 0.94 | 68.00 |

Table 3. (continued)

| Statements | Topic Theme | <i>M</i> | <i>SD</i> | % Agreement (marked 3 or 4) |
|--|--|----------|-----------|--------------------------------|
| 41. Understand various feed intakes | Health and Nutrition | 2.77 | 0.71 | 69.23 |
| 42. Perform basic marketing skills | Business, Marketing, and Data Management | 2.77 | 0.82 | 53.84 |
| 43. Perform a cost/benefit analysis to determine potential costs, profit, and losses | Business, Marketing, and Data Management | 2.77 | 1.03 | 56.00 |
| 44. Perform general welding practices | Operation and Maintenance of Tools and Machinery | 2.69 | 0.68 | 65.38 |

Table 3. (continued)

| Statements | Topic Theme | <i>M</i> | <i>SD</i> | % Agreement (marked 3 or 4) |
|--|--|----------|-----------|-----------------------------|
| 45. Understand general agricultural politics | Policies and Food Safety | 2.62 | 0.57 | 57.69 |
| 46. Understand commodity markets | Business, Marketing, and Data Management | 2.62 | 0.70 | 57.69 |
| 47. Interpret expected progeny differences | Reproduction and Genetics | 2.62 | 0.90 | 56.00 |
| 48. Evaluate and comprehend carcass data | Animal Selection and Evaluation | 2.50 | 0.86 | 42.30 |

Note. Scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Agree; 4 = Strongly Agree

In Round Three, 19 of the 20 technical statements sent back to panelist reached the consensus (see Appendix Q). The statement that did not reach consensus came from the theme of Policies and Food Safety. The remaining 19 technical statements reached a two-thirds majority consensus from the panel members or greater (i.e., at least 17 of the 25 panel members in Round Three agreed with the statement). Further, panel members

who did not agree with the statement were provided the opportunity to change the statement such that their agreement could be secured. As such, panel members took the liberty to modify 17 technical statements in an effort to reach agreement (Table 4).

Table 4

Statements that Received Alternative Forms According to Animal Science Experts per Round Three (N = 24)

| Topic Theme | Original Statement (<i>Modified Statements Underneath</i>) | % Agreement |
|-------------------------------|--|-------------|
| Animal | Evaluate livestock/equine based on composition | 92.00 |
| Selection and Evaluation | <i>Evaluate livestock/equine based on structural conformation</i> <i>Based on conformation</i> | |
| Product Agriculture | Demonstrate work experience in the livestock industry (e.g., production, food processing, agricultural sales) <i>Have some knowledge of various agricultural enterprises</i> | 92.00 |
| Animal Handling/ Husbandry | Brand/tag livestock/equine in a safe manner <i>Able to use approved livestock identification products and techniques</i> | 88.00 |

Table 4. (continued)

| Topic Theme | Original Statement (<i>Modified Statements Underneath</i>) | % Agreement |
|-------------------------------|---|-------------|
| Health and Nutrition | Feed livestock (e.g., loading/unloading feeds, mixing rations) <i>Be aware of general nutrition and delivery systems</i> <i>Know basics of feed mixing and delivery logistics</i> <i>Loading/unloading if physically able, knowledge of mixing rations</i> | 84.00 |
| Health and Nutrition | Understand various feed intakes (e.g., vitamin/mineral supplements, forage, energy) <i>Understand various basic nutritional requirements</i> | 84.00 |
| Health and Nutrition | Recognize nutritional needs pre/post breeding <i>Pre/post partum</i> | 84.00 |
| Reproduction and Genetics | Understand the estrus cycle of various species <i>Understand the reproduction process of various domesticated species</i> | 84.00 |
| Animal Handling/ Husbandry | Break/train livestock/equine (e.g., halter, saddle, lead) <i>Handle livestock utilizing contemporary animal well-being techniques</i> | 80.00 |

Table 4. (continued)

| Topic Theme | Original Statement (<i>Modified Statements Underneath</i>) | % Agreement |
|---|---|-------------|
| Business, Marketing, and Data Management | Perform a cost benefit analysis to determine potential costs, profits, and losses <i>Understand how the cost of ingredients, supplies and breeding stock make-up the total cost of products sold</i> <i>Perform a cost/benefit analysis to determine potential costs, profit, and losses - be able to read basic financial statements</i> | 80.00 |
| Policies and Food Safety | Understand agricultural politics generally <i>What elected officials are in your district and how to talk with them</i> <i>General understanding of the political process and how it effect the agriculture industry</i> | 80.00 |
| Animal Selection and Evaluation | Evaluate and comprehend carcass data <i>Evaluate, understand, and use carcass data selection</i> | 76.00 |

Table 4. (continued)

| Topic Theme | Original Statement (<i>Modified Statements Underneath</i>) | % Agreement |
|--------------|---|-------------|
| Business, | Understand commodity markets | 76.00 |
| Marketing, | <i>Have a general understanding of commodity markets</i> | |
| and Data | <i>Understand commodity markets (e.g. risk, protection,</i> | |
| Management | <i>effects on market prices)</i> | |
| | <i>And how to use them to protect investments</i> | |
| | <i>Understand commodity markets and be able to efficiently</i> | |
| | <i>communicate about them with others</i> | |
| Health and | Identify causes of animal illnesses/diseases and parasites | 76.00 |
| Nutrition | <i>Be made aware of different illnesses and symptoms</i> | |
| | <i>Should know some of the vaccinations and parasite</i> | |
| | <i>treatment requirements</i> | |
| | <i>Identify common causes</i> | |
| Operation | Perform general welding practices | 76.00 |
| and | <i>Have general maintenance skills/electrical, plumbing, etc.</i> | |
| Maintenance | <i>Identify and perform various maintenance procedures</i> | |
| of Tools and | | |
| Machinery | | |

Table 4. (continued)

| Topic Theme | Original Statement (<i>Modified Statements Underneath</i>) | % Agreement |
|--|---|-------------|
| Reproduction and Genetics | Interpret expected progeny differences (EPD data) <i>Understand methods of genetic selection - general knowledge</i> <i>Interpret expected progeny differences (EPD data) or breeding values</i> | 76.00 |
| Business, Marketing, and Data Management | Perform basic marketing skills (e.g., target market, advertising, product placement) <i>Aware of the skills</i> <i>Understand basic marketing skills</i> <i>Understand basic marketing technique and customer expectations</i> | 72.00 |
| Reproduction and Genetics | Identify the strengths and weaknesses of individual pedigrees <i>Identify the strengths and weaknesses of individual pedigrees as associated with industry marketable traits</i> | 72.00 |

Table 4. (continued)

| Topic Theme | Original Statement (<i>Modified Statements Underneath</i>) | % Agreement |
|--------------------------|--|-------------|
| Policies and Food Safety | Identify prevalent agricultural policies at the state and national level <i>How agricultural policy effects agriculture at the state and national level</i> <i>General knowledge</i> <i>Not only identify these issues, but understand their impact</i> <i>Identify prevalent agricultural policies at the local, state, and national levels</i> | 64.00 |

Objective Two

Objective two sought to identify non-technical competencies deemed necessary for entry-level employment following students' high school graduation in the animal science industry. After the distribution of the Round One questionnaire, 164 responses were collected from the 33 competencies. Categories presented by Evers, Rush, and Berdrow (1998) were used as a framework to assist in creating and categorizing competencies originated by the panel. The 33 non-technical competencies were submitted for consideration by the panelists during Round Two (see Appendix R). To ensure quality and convenience, statements were categorized in the following areas: Personal Strengths (9 competencies); Communication (8 competencies); Personal Organization

and Time Management (5 competencies); Decision Making (4 competencies); Lifelong Learning (4 competencies); and Problem Solving (3 competencies).

As shown in Table 5, all 33 non-technical statements reached consensus by receiving a mean score of 3.00 or higher. Further, 29 of the 33 (87.9%) statements received a mean score of 3.50 or higher during Round Two indicating the panelists strongly agreed with these statements. Due to the acceptance of all 33 non-technical statements, no non-technical skills were sent back to panelist during Round Three of the study.

The statement “be honest” ($M = 4.0$; $SD = 0.00$), was the most noted competency originated by the panel (Table 5). Moreover, the following statements received a mean score of 3.73 or higher: “demonstrate a strong work ethic” ($M = 3.96$; $SD = .20$), “maintain a positive attitude” ($M = 3.77$; $SD = 0.43$), “gain trust of employer” ($M = 3.77$; $SD = 0.43$), “display a desire to learn new skills/information” ($M = 3.77$; $SD = 0.43$), “function as a team member” ($M = 3.77$; $SD = 0.43$), “adhere to deadlines” ($M = 3.73$; $SD = 0.45$), “acquire new knowledge on-the-job efficiently” ($M = 3.73$; $SD = 0.45$), and “respond verbally to customers, co-workers, and supervisors appropriately” ($M = 3.73$; $SD = 0.45$). Twenty non-technical competency statements received mean ratings between 3.69 to 3.50.

In addition, four statements received a mean score of 3.49 or lower from participants. Those statements were “apply knowledge gained through past work experience(s) to future task(s)” ($M = 3.42$; $SD = 0.50$), “recognize the needs of co-workers and supervisors” ($M = 3.42$; $SD = 0.50$), “practice strong public relation skills”

($M = 3.38$; $SD = 0.57$), and “correspond in writing to customers, co-workers, and supervisors appropriately” ($M = 3.38$; $SD = 0.57$) (Table 5).

Table 5

Agreement Levels for Entry-level Non-technical Skills Needed in the Animal Science Sector According to Animal Science Experts per Round Two of the Delphi Procedure (N = 42)

| | Statement | Topic Theme | <i>M</i> | <i>SD</i> | % of Agreement (marked 3 or 4) |
|----|---|--------------------|----------|-----------|--------------------------------|
| 1. | Be honest | Decision Making | 4.00 | 0.00 | 100.00 |
| 2. | Demonstrate a strong work ethic (e.g., responsible, accountable, dependable) | Personal Strengths | 3.96 | 0.20 | 100.00 |
| 3. | Maintain a positive attitude | Personal Strengths | 3.77 | 0.43 | 100.00 |
| 4. | Gain trust of employer | Decision Making | 3.77 | 0.43 | 100.00 |

Table 5. (continued)

| | Statement | Topic Theme | <i>M</i> | <i>SD</i> | % of Agreement (marked 3 or 4) |
|----|--|---|----------|-----------|-----------------------------------|
| 5. | Display a desire to learn new skills/information | Lifelong Learning | 3.77 | 0.43 | 100.00 |
| 6. | Function as a team member | Communication | 3.77 | 0.43 | 100.00 |
| 7. | Adhere to deadlines (e.g., accomplish tasks on time) | Personal Organization and Time Management | 3.73 | 0.45 | 100.00 |
| 8. | Acquire new knowledge on-the-job efficiently | Lifelong Learning | 3.73 | 0.45 | 100.00 |
| 9. | Respond verbally to customers, co-workers, and supervisors appropriately | Communication | 3.73 | 0.45 | 100.00 |

Table 5. (continued)

| | Statement | Topic Theme | <i>M</i> | <i>SD</i> | % of Agreement (marked 3 or 4) |
|-----|---|--|----------|-----------|-----------------------------------|
| 10. | Motivate to perform at an optimal level | Personal Strengths | 3.69 | 0.47 | 100.00 |
| 11. | Realize the success of the enterprise | Decision Making | 3.69 | 0.47 | 100.00 |
| 12. | Follow instructions | Communication | 3.69 | 0.47 | 100.00 |
| 13. | Be attentive | Communication | 3.69 | 0.47 | 100.00 |
| 14. | Demonstrate punctuality (e.g., arrive on time for work/meetings) | Personal Organization and Time Management | 3.69 | 0.84 | 100.00 |
| 15. | Perform tasks independently | Personal Strengths | 3.65 | 0.49 | 100.00 |

Table 5. (continued)

| | Statement | Topic Theme | <i>M</i> | <i>SD</i> | % of Agreement (marked 3 or 4) |
|-----|---|-----------------------|----------|-----------|-----------------------------------|
| 16. | Display passion for the job being performed | Personal Strengths | 3.65 | 0.49 | 100.00 |
| 17. | Demonstrate a desire to progress forward in his or her career | Lifelong Learning | 3.65 | 0.49 | 100.00 |
| 18. | Understand ethical implications of decisions made | Decision Making | 3.62 | 0.50 | 100.00 |
| 19. | Respond positively to constructive criticism | Personal Strengths | 3.58 | 0.50 | 100.00 |
| 20. | Identify problems | Problem Solving | 3.58 | 0.50 | 100.00 |

Table 5. (continued)

| | Statement | Topic Theme | <i>M</i> | <i>SD</i> | % of Agreement (marked 3 or 4) |
|-----|--|---|----------|-----------|-----------------------------------|
| 21. | Recognize possible solutions to problems | Problem Solving | 3.58 | 0.50 | 100.00 |
| 22. | Apply best solutions | Problem Solving | 3.58 | 0.50 | 100.00 |
| 23. | Maintain attention to detail | Personal Organization and Time Management | 3.58 | 0.86 | 100.00 |
| 24. | Utilize resources to overcome personal weaknesses | Personal Strengths | 3.54 | 0.51 | 100.00 |
| 25. | Listen to the views of fellow co-workers and supervisors | Communication | 3.54 | 0.51 | 100.00 |

Table 5. (continued)

| | Statement | Topic Theme | <i>M</i> | <i>SD</i> | % of Agreement (marked 3 or 4) |
|-----|---|--|----------|-----------|-----------------------------------|
| 26. | Practice efficiency while on the job | Personal Organization and Time Management | 3.54 | 0.86 | 100.00 |
| 27. | Demonstrate leadership attributes | Personal Strengths | 3.50 | 0.51 | 100.00 |
| 28. | Exhibit a professional appearance (e.g., appropriate attire, physical appearance, personal hygiene) | Personal Strengths | 3.50 | 0.51 | 100.00 |
| 29. | Maintain organization of task/work responsibilities | Personal Organization and Time Management | 3.50 | 0.86 | 100.00 |

Table 5. (continued)

| Statements | Topic Theme | <i>M</i> | <i>SD</i> | % of Agreement (marked 3 or 4) |
|---|-------------------|----------|-----------|-----------------------------------|
| 30. Apply knowledge gained through past work experience(s) to future task(s) | Lifelong Learning | 3.42 | 0.50 | 100.00 |
| 31. Recognize the needs of co-workers and supervisors. | Communication | 3.42 | 0.50 | 100.00 |
| 32. Practice strong public relation skills | Communication | 3.38 | 0.57 | 96.15 |
| 33. Correspond in writing to customers, co-workers, and supervisors appropriately | Communication | 3.38 | 0.57 | 96.15 |

Note. 1 = Strongly Disagree; 2 = Disagree; 3 = Agree; 4 = Strongly Agree

Summary

Round One of the research study produced 133 statement technical statements from 32 panel members which were condensed into 48 technical statements by three independent coders. Further, 164 non-technical statements were obtained from panelists and condensed into 33 statements. Statements formed in Round One were re-submitted to panelist via Round Two of the research study.

Round Two produced participation from 26 panelists. In total, there were 27 technical statements which reached consensus based on the four-point summative-rating scale. Statements receiving a mean rating of 3.00 or higher were accepted into the study. The theme areas “Business, Marketing, and Data Management” and “Health and Nutrition” received the highest number of accepted technical statements from panelist. The statement receiving the highest mean rating was “use basic math skills” ($M = 3.54$; $SD = 0.51$). Moreover, of the 33 non-technical statements submitted to panelist per Round Two, all 33 statements reached consensus from panel members. More importantly, 29 of the 33 (87.9%) non-technical statements received a mean rating of 3.50 or higher. The statement “be honest” received the highest mean rating ($M = 4.00$; $SD = 0.00$) of all non-technical competency statements. Further, because all 33 non-technical statements reached consensus in Round Two, no non-technical statements were re-submitted to panelist in Round Three.

Round Three resulted in participation from 24 panel members. Of the 21 technical statements re-submitted to panelist, 20 reached consensus by a two-thirds agreement from panel members. The statement failing to reach consensus came from the theme of Policies and Food Safety theme. Further, panel members who did not agree with the

statements re-submitted alternative forms of the statement. A total of 35 re-written statements were provided to the researcher for 18 statements.

CHAPTER V

CONCLUSIONS, RECOMMENDATIONS, IMPLICATIONS AND DISCUSSION

The purpose of this study was to describe the perceptions of Oklahoma animal science industry leaders as it related to competencies necessary for the entry-level employment of high school graduates who had completed coursework in the Oklahoma Agricultural, Food and Natural Resources, animal systems pathway.

Research Objectives

To fulfill the purpose of the study, the following research objectives were addressed:

1. Identify the technical competencies deemed necessary for entry-level employment in the animal science industry of high school graduates upon successfully completing coursework in the animal systems career pathway;
2. Identify the non-technical competencies deemed necessary for entry-level employment in the animal science industry of high school graduates upon successfully completing coursework in the animal systems career pathway;

as determined by consensus of an expert panel of animal science industry leaders in Oklahoma.

Conclusions, Recommendations, Implications and Discussion

Conclusions

Based on objective one, a total of 48 technical statements were attained from the expert panel members who participated in the study. Because the 48 statements originated from Oklahoma animal science industry experts and fell into the “real limits” of “agreement” ($M = 2.5 - 3.49$), it can be concluded that they need to be included in the

curriculum designed for the animal systems pathway component of secondary agricultural education in Oklahoma.

Of the 48 technical competency statements developed, 27 reached agreement of consensus by panel members per Round Two. Considering the 27 technical competency statements that reached consensus, the theme areas “Business, Marketing, and Data Management” and “Health and Nutrition” represented the largest number of accepted statements. Notably, panelists “strongly agreed” that entry-level employees should be able to use basic math, practice farm safety, and understand animal needs to be employable in the animal science industry.

Per objective two, panelists reached consensus on 33 non-technical statements. As such, it was noted that panelists submitted more statements in the non-technical competency category than they did in the technical competency category. Additionally, because 100% consensus on the non-technical competencies was reached in Round Two, it can be concluded that expert panelists were in complete agreement with non-technical competencies, and, as such, placed a higher level of emphasis on non-technical competencies than they did the technical competencies.

Moreover, panelists “strongly agreed” with 29 of the 33 non-technical competencies that emerged in Round One further reinforcing the importance of non-technical competencies among the panel of animal science industry experts in Oklahoma. The theme area “Personal Strengths” comprised the most accepted statements identified by the panelists. Statements in this category included skills such as “strong work ethic,” “maintain a positive attitude,” and “motivate to perform at an optimal level.” The importance of these skills is supported by Robinson (2000) who verified that employees

will need skills such as reliability, responsibility, problem-solving, and social skills to perform efficiently in a job setting. Panel members unanimously agreed that the statement “be honest” ($M = 4.0$) was the most important non-technical skill for a potential employee to possess.

Recommendations for Practice

It is recommended that secondary agricultural education instructors seek out opportunities to integrate basic math into their existing animal science lessons per the animal systems pathway. As high school graduation requirements increase, courses such as agricultural education have experienced students struggling to enroll in their classes and meet graduation standards (Thompson & Balschweid, 1999). As such, professional development and in-service workshops should focus on helping agricultural education instructors recognize where math naturally exists within the animal systems pathway and determine ways in which it can be emphasized in animal science lessons. Specifically, instructors should be exposed to models and methods which would enable them to integrate math through the context of agriculture (Parr, Edwards, & Leising, 2006).

Additionally, secondary agricultural education instructors should emphasize general farm safety in animal systems pathways courses. Typically, “safety” is a unit predominantly taught in secondary agricultural power and technology courses. Because it was an important finding in this study, secondary agricultural education instructors should seek ways to highlight safety in secondary animal science courses. Again, professional development and in-service training seminars should exist to help instructors emphasize, or in some cases include a complete unit of instruction on general farm safety, as it relates to handling livestock and operating machinery in the animal science industry.

Because, the importance of non-technical skills unanimously reached agreement of consensus among the study's panelists, it is important that secondary agricultural education instructors integrate these competencies into the curriculum where appropriate. To increase the awareness regarding the importance of entry-level employees with non-technical competencies in the animal science industry, secondary agricultural education instructors should model related behaviors to students enrolled in animal systems pathway courses. The skill "be honest," in particular, should be modeled; as it was the only skill in the study to receive a unanimous agreement. In support Lynch (2000) posited that employers seek out employees with general employability skills, including honesty and integrity.

Because the statement "be honest" was unanimous among panelists, it should be emphasized in secondary agricultural education animal science classrooms. As such, secondary agricultural education instructors should consider offering units of study that encompass ethics, professionalism, and decision making. Specifically, curriculum materials such as case studies involving animal science issues should be integrated in which students must employ honesty and integrity in making decisions and solving problems related to class assignments.

Recommendations for Future Research

It is recommended that this study be replicated in other states. It is possible that important entry-level skills identified in this study would be similar to other states. However, because of cultural and ethnical differences, geographic location, and variation in the agricultural industry, future studies could produce different technical and non-technical skills preferred by employers in their respective states. If so, then adjustments

would need to be made to meet the needs of employers to ensure that high school graduates receive adequate instruction to prepare them for future employment.

Further, it is recommended that the views and opinions of students and agricultural education instructors be described in future studies. Although employers' needs have been examined, it is important to remember that students are the primary and foremost clientele that secondary agricultural education serves. The building of their human capital (Shultz, 1961) is dependent on the skills and knowledge gained in secondary education, which is presented to them by their instructors. Students' perceptions coupled with investigating agricultural education instructors' viewpoints and triangulating their responses with the current study curriculum could further improve the appropriateness of the animal systems pathway. Agricultural education instructors may be able to inform researchers of methods, unit topics, examples, learning resources shown to work best in their particular classroom and laboratory settings.

Additionally, the findings of this study should be cross-walked with the current Oklahoma secondary animal systems career pathway. If the study's findings are not substantially congruent with the current curriculum taught in the animal systems career pathway i.e., deficiencies exist, curriculum revisions should be made to ensure the 27 technical and 33 non-technical competencies on which industry experts agreed, are evident. If modifications to existing animal systems curriculum are forthcoming, then, it is recommended that additional research be conducted to examine the impact the changes made to the curriculum had on entry-level graduates' employability.

The Agricultural, Food and Natural Resources career cluster provides students the opportunity to complete competency examinations upon their completion of a pathway.

Therefore, it is recommended that technical and non-technical competency statements retrieved from panelists be compared with current competency examinations objectives in the animal systems career pathway. These comparisons would provide further insight in determining if animal systems curriculum, testing materials, and industry demands are aligned.

Finally, while this study sought to determine the skills high school graduates should possess in entrance into the animal science sector, it is recommended that future studies in other areas of the secondary agricultural education curriculum be pursued. For instance, what is the skill sets deemed necessary for employment in the remaining six pathways (e.g., Agricultural Communications pathway, Agribusiness and Management pathway). Studies should investigate these areas to ensure the curriculum is meeting industry needs and assisting graduates in entering post-secondary education (Roberts & Ball, 2009).

Implications and Discussion

Currently, secondary agricultural education is divided into curriculum areas based on the Agricultural, Food and Natural Resources Career Cluster and represented by seven pathways. Students should be able to simultaneously prepare for entry-level employment in industry and post-secondary education. This implication supports the finding by Roberts and Ball (2009) who argued that career and technical education courses, such as agricultural education, can teach content that prepares students for the workforce and college simultaneously. Their position is congruent with Stanford (2002) who found that students who were involved in career-oriented programs during high school, such as

agricultural education, can gain experiences and skills that help with job placement after graduation.

As outlined by Oklahoma Agricultural Education (2008), clustering similar occupations, such as animal systems, with outlined curriculum better ensures that students learn competencies necessary for success in college and the workplace. This implication is supported by the theoretical framework posited by Human Capital Theory. As stated by Shultz (1961), among the five best ways to improve human capital are “formally organized education at the elementary, secondary and higher levels . . .” (p. 9) and to provide humans with opportunities to acquire skills needed in the labor force.

Likewise, it could be assumed competencies acquired in the animal systems pathway not only enhance students’ probability of entry-level employment, but also provide a vehicle for the integration of core academics, such as mathematics and science. This implication is supported by Balschweid and Huerta (2008) who concluded “teaching advanced life science within the context of animal agriculture can enhance students’ immediate marketability in the work place and provide students a launching pad for post-secondary educational pursuits” (p. 18).

Specifically, theme areas, such as health and nutrition, reproduction and genetics, and business, marketing, and data management could provide avenues for the integration of core academics into agricultural education courses (Balschweid & Huerta, 2008). Integrating core curriculum in agricultural courses could contribute to mandates outlined by legislative acts such as *Goals 2000* and *No Child Left Behind* by increasing standardized test scores of high school students (Chiasson & Burnett, 2001).

Agricultural education is not immune to increased expectations to assist students in achieving higher test scores (Myers & Washburn, 2008). While academic rigor and the need for additional courses in the core subjects persists, perhaps, taking the lead to a increased perception of value for agricultural education courses in U.S. public schools and simultaneously increase students' standardized test scores, thus, establishing a strong argument for the need to retain agricultural education courses in the general school curriculum. Courses in agricultural education, such as animal science, not only provide students opportunities to acquire and practice career competencies but also the integration of core concepts, such as science (Chiasson & Burnett, 2001). Animal science also could be an appropriate context in which to effectively integrate mathematics in addition to science.

Further, it appears safety is a "critical" concern across the entire animal science industry. Based on the current animal systems career pathway (see Appendix A), limited opportunities exist for students to receive instruction on safety. If safety is only emphasized in agricultural power and technology courses, students in secondary agricultural education who choose the animal systems pathway will not have the opportunity to secure technical competencies as it relates to safety. So, instructors must understand the importance of general farm safety and teach students the practice of being safe when handling animals and operating machinery on the farm. These two findings are transferable to numerous settings, not just animal science. For example, Ascher (1988) stated that workers should have less specialized and more general skills upon entering the workforce.

Because every non-technical competency statement generated by the panel of experts reached consensus of agreement, it can be implied that these skills are in the greatest demand regarding entry-level employment. As such, it can be assumed that greater emphasis is placed on non-technical competencies as opposed to technical competencies. This is consistent with research by other scholars (Evers et al., 1998; Lynch, 2000; Robinson et al., 2007), who concluded that workers in the 21st century will need to possess non-technical skills. Based on the non-technical competency statements endowed by participants in this study, it could be surmised that employee honesty is an issue regarding their job performance. The statement “be honest” received the highest mean rating ($M = 4.0$) from panelist per Round Two. Therefore, secondary agricultural education instructors should teach honesty when appropriate. Further, these instructors should always seek to exhibit and model honesty to their students.

It is likely that, the debate about the purpose of secondary agricultural education will continue to be disputed in the future. However, agricultural education has the opportunity to find a compromise between the Prosser versus Dewey view as to the purpose of secondary agricultural education. As supported by the literature review in this study, technical and non-technical skills serve a dual purpose for post-secondary education and the workforce. The findings from this study can be shown to support the needs of the workforce. If it is found that current curriculum in the animal systems pathway is not meeting the needs of employers, then changes should be investigated and implemented.

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APPENDICES

Appendix A

Oklahoma Career Pathway: Animal System (2009)

| Pathways | Animal Science | |
|------------------------------------|--|--|
| Career Majors | Equine Production (1050 Hours Total) | Animal Science (720 Hours Total) |
| | Equine Vital Signs 25 Hours | Advanced Biological Animal Science 120 Hours |
| | Pasture Management 25 Hours | Equine Science 120 Hours |
| | Resumes & Job interviews 15 Hours | Small Animal and Vet Assisting 120 Hours |
| | Advanced Mare Reproduction 30 Hours | Livestock Production 120 Hours |
| | Applied Equine Nutrition 75 Hours | Introduction to Animal Science 120 Hours |
| Recommended Course Sequences | Stallion Reproduction 65 Hours | Introduction to Agriscience 120 Hours |
| | Equine Genetics 65 Hours | |
| | Equine Anatomy and Physiology 75 Hours | |
| | Equine Judging and Selection II 90 Hours | |
| | Conditioning 30 Hours | |
| | Breeds, Color, and Markings 45 Hours | |

| | |
|------------------------------------|--|
| | Equine Marketing Strategies 45 Hours |
| | Introduction to Nutrition 30 Hours |
| | Orientation to Tractor and Feeding Operations 15 Hours |
| Recommended Course Sequences | Introduction to Mare Reproduction 60 Hours |
| | Equine Judging and Selection Techniques 90 Hours |
| | Equine Parturition 60 Hours |
| | Health Disease & Parasites 90 Hours |
| | Basic Handling and Care 120 Hours |

Appendix B

Introduction Email

September 8, 2008

[Prefix] [Name]:

The Department of Agricultural Education, Communications and Leadership at Oklahoma State University is interested in what animal science industry experts perceive to be the skills/competencies high school graduates need in order to secure employment within the animal science sector. Specifically, this study will focus on high school graduates who have completed the animal systems career pathway in agricultural education.

Career pathways are a relatively new addition to the agricultural education curriculum. The purpose of the pathways is to provide knowledge and skills for a respective area (i.e., animal science). As stated before, this particular study will focus on the animal systems career pathway, because this pathway is offered in nearly every Oklahoma agricultural education program and was reported to have the highest number of enrollees.

Our intent is to establish a solid set of skills and competencies for each area represented under the animal systems pathway. Hopefully, the information you provide will be used by administration, curriculum specialist, and others to evaluate and make changes, if necessary, to the current agricultural education curriculum. As an active member in the Oklahoma agricultural industry, your career experiences and expertise within your respective area will benefit our study greatly. Information provided by you will lend the support needed to enhance secondary agricultural education animal science curriculum in Oklahoma. Additionally, the findings of this study will aid high school graduates, who have participated in the animal systems career pathway, obtain employment in the animal science sector.

For this study, there will be a series of three questionnaires. Each set of questions will build upon the previous data collected. The participants must have internet access and e-mail capabilities as the questionnaires will be sent electronically. A summary of the results will be provided to you upon completion of the study.

Thank you in advance for your participation. If you can, please respond to this e-mail to confirm or deny your willingness to participate in this study. Again, thank you and I look forward in hearing from you soon.

Regards,

Wendy L. Slusher
Graduate Student

J. Shane Robinson, PhD
Assistant Professor

Appendix C

Round One Questionnaire Pre-notice Email Reminder

October 8, 2008

[Prefix] [Name]:

Thank you for agreeing to participate in the research study. **On October 10, 2008**, you will receive an email containing a Website link and participant number for round one of the questionnaire. The questionnaire should take approximately 30 minutes to complete. If you have any questions, please feel free to contact me via email at wendy.slusher@okstate.edu.

Thank You,
Wendy

Appendix D

Round Two Questionnaire Pre-notice Email Reminder

December 1, 2008

[Prefix] [Name]:

Thank you for responses in round one of the research study. **On December 3, 2008**, you will receive a Website and participant number for round two of the questionnaire. If you have any questions, please feel free to contact me at wendy.slusher@okstate.edu.

Thank You,

Wendy

Appendix E

Round Three Questionnaire Pre-notice Reminder

February 1, 2009

[Prefix] [Name]:

Thank you for responses in round two of the research study. **On February 3, 2009**, you will receive a Website and participant number for round two of the questionnaire. If you have any questions, please feel free to contact me at wendy.slusher@okstate.edu.

Thank You,

Wendy

Appendix F

Round One Questionnaire Email

October 10, 2008

[Prefix] [Name]:

Thank you again for agreeing to participate in the research study. Below you will find a link that will navigate you to the first questionnaire. The first page is a consent form. Please read through the consent form. At the bottom you will be asked to enter your participation number. **Your participation number is [Insert number].** This will act as an electronic signature agreeing to the terms and conditions outlined in the consent form. **Please save this number**, as you will be asked to enter this at the beginning of each of the three rounds.

Once you have entered the number click "Submit". This will open a new page that begins the questionnaire. Once you are finished filling the form out please click "Submit".

If you have any questions please feel free to contact me at wendy.slusher@okstate.edu . **You will have one week to reply to this questionnaire.** Again, thank you.

Survey link : (<http://survey.okstate.edu/WS>)

Thank You,
Wendy

Appendix G

Round Two Questionnaire Email

December 3, 2008

[Prefix] [Name]:

Greetings! I hope you had a wonderful Thanksgiving and are looking forward to the upcoming holidays! I apologize for the delay in sending out the second round of the questionnaire. Due to the huge response rate and the detail of the information, Dr. Robinson and I took great care to ensure that the second round reflected your opinions and the opinions of the other panel members. Needless to say I'm very appreciative of your willingness to provide information for the research study and excited about how the study has progressed. Thank you!

Below you will find the link to the second round questionnaire. When you click on the link you will be brought to the consent form. Please read through and enter your personal identification code at the bottom. You will then be taken to the questionnaire. Instructions have been provided. If you have any questions please do not hesitate to contact me at wendy.slusher@okstate.edu. Please submit your responses **no later than Tuesday, December 9th.**

Your personal identification number is [Insert number]

<http://survey.okstate.edu/WS/>

Thank You,
Wendy

Appendix H

Round Three Questionnaire Email

February 3, 2009

[Prefix] [Name]:

I hope the winter holiday has treated you and your family well. First, I would like to apologize for the delay in sending the third round out for our research study. With the winter holiday and technical difficulties on our part, additional time was needed to ensure the quality of round three. I am pleased to announce that this will be the final round of the study and looking at the information you have presented thus far, the study promises to be a success.

With the previous rounds, you may click on the link below that will take you to the questionnaire web page. After reading the consent form, please enter your personal identification number and click “submit”. This will take you to another web page that will provide directions and questions for completing round three. **Please have your response submitted no later than Wednesday, February 9, 2009.**

Again, thank you very much for your participation in our research study. I hope you have enjoyed participating. As stated in the initial agree, once the study has been completed, a summary will be send to you via e-mail for your enjoyment. If you have any questions, please feel free to contact me at wendy.slusher@okstate.edu.

Participant Number: [Insert number]

Link: (<http://survey.okstate.edu/WS/>)

Thank You,
Wendy

Appendix I

Round One Questionnaire Email Reminder

October 13, 2007

[Prefix] [Name]:

Greetings! Just a reminder that if you have not had a chance to submit your response to the Round One Questionnaire **please do so October 14, 2007**. If you have any question please do not hesitate to contact me at wendy.slusher@okstate.edu.

The link below will take you to the website. Your participant number is [Insert number].
Questionnaire link: <http://survey.okstate.edu/WS>

Thank You,
Wendy

Appendix J

Round Two Questionnaire Email Reminder

December 5, 2008

[Prefix] [Name]:

I would like to remind you that the deadline for replying to round two of the questionnaire is **Tuesday, December 9th**. Please make every attempt to respond to the questionnaire. Your input is imperative to the research study. If you have any questions, please contact me at wendy.slusher@okstate.edu.

As a reminder, **your personal identification number is [Insert Number]**. The questionnaire can be accessed through this website: <http://survey.okstate.edu/WS/>

Thank You,
Wendy

Appendix K

Round Three Questionnaire Email Reminder

February 5, 2009

[Prefix] [Name]:

Just a friendly reminder that the deadline to submit your response to **Round Three of the research study is Monday, February 9, 2009**. Below is the link and your participation code. Thank you.

Participant Number: [Insert Number]

Link: (<http://survey.okstate.edu/WS/>)

Thank You,
Wendy

Appendix L

Thank You Email to Panel Members

June 1, 2009

[Prefix] [Name]:

On behalf of the Oklahoma State University Agricultural Education, Communications, and Leadership department, I would like to thank you for your assistance in the recent Delphi study. When we set-out to gather data, as a committee we realized the importance our expert panel members would serve in completing this task. I am pleased to report that your hard work and dedication to the study will prove to be beneficial to future agricultural education students, instructors, and employers in the animal science sector of the agriculture industry in Oklahoma.

I hope you have enjoyed this experience as much as I have. It's a great feeling to know that there are individuals, like you, who are willing to give their time to ensure that future employees will have job skills necessary to enhance their chances of obtaining employment in the agriculture industry. Again, thank you for your help in making this research study a success.

Sincerely

Wendy L. Slusher
PhD
Graduate Student

J. Shane Robinson,
Assistant Professor

Appendix M

Round One Questionnaire

Oklahoma State University

440 Agricultural Hall

Stillwater, Oklahoma 74078

(405) 744-3094

wendy.slusher@okstate.edu

Round One: Competencies for the Animal Science Sector and Demographics

*Directions: Each section of the questionnaire will provide you with directions for completing that specific section. This questionnaire has three sections. After you have responded to all questions please click the **submit button** located at the bottom of your screen. If you have any questions regarding this study please e-mail me at wendy.slusher@okstate.edu.*

Please list all the animal science-related technical skills you believe a high school agricultural education graduate should have to obtain entry-level employment in your area of the animal science sector.

Oklahoma State University

440 Agricultural Hall

Stillwater, Oklahoma 74078

(405) 744-3094

wendy.slusher@okstate.edu

**Round One: Competencies for the Animal Science Sector and Demographics
(continued)**

Please list all the soft skills (e.g., strong work ethic, punctuality, ability to communicate, etc.) you believe a high school agricultural education graduate should have to obtain entry-level employment in your area of the animal science sector.

Oklahoma State University

440 Agricultural Hall
Stillwater, Oklahoma 74078
(405) 744-3094

wendy.slusher@okstate.edu

Round One: Demographics of Animal Science Industry Experts

For each of the following items, put an X beside the choice that best describes you.

1. Gender: Male___ Female___

2. Age: 18-25___ 26-30___ 31-35___ 36-40___ 41-45___ 46-50___ 55-60___ 61+___

3. Ethnicity: ___Alaska Native
 ___American Indian
 ___Asian
 ___Black or African American
 ___Hispanic or Latino
 ___Native Hawaiian or Other Pacific Islander
 ___White or Caucasian
 Other (please list)_____

4. Highest Level of Education:
 ___Doctoral
 ___Master's Degree
 ___Bachelor's Degree
 ___Technical Degree
 ___Associate's Degree
 ___High School Diploma
 Other (please list)_____

5. Current Occupation (please list):_____

6. Occupational Description (please provide description of your job):_____

*Thank you for your time and consideration to the research study!
Once you are satisfied with your responses, please click the submit button located at the bottom.*

Thank You!

Appendix N

Round Two Technical and Nontechnical Skills Questionnaire

Oklahoma State University

440 Agricultural Hall

Stillwater, Oklahoma 74078

(405) 744-3094

wendy.slusher@okstate.edu

Round Two: Technical and Nontechnical Skills for the Animal Science Sector

*Directions: Each section of the questionnaire will provide you with directions for completing that specific section. This questionnaire has two sections. After you have responded to all questions please click the **submit button** located at the bottom of your screen. If you have any questions regarding this study please e-mail me at wendy.slusher@okstate.edu.*

Please read each statement in the left hand column. After reading the statement, determine if this statement represents a skill needed by high school graduates for entry-level employment in your respected field of the agriculture industry. Please check only one box to express your level of importance. You may choose from: Strongly Disagree; Disagree; Agree; or Strongly Agree.

| | Statement | Strongly Disagree | Disagree | Agree | Strongly Agree |
|---|--|-------------------|----------|-------|----------------|
| <i>Animal Handling/Husbandry</i> | | | | | |
| 1. | Understand animal needs (e.g., shelter, feed/water, bedding, compassion) | | | | |
| 2. | Break/train livestock/equine (e.g., halter, saddle, lead) | | | | |
| 3. | Brand/tag livestock/equine in a safe manner | | | | |
| 4. | Understand livestock/equine "point of balance" and behaviors when handling | | | | |
| 5. | Transport livestock/equine (e.g., loading/unloading, | | | | |

| | | | | | |
|--|---|--|--|--|--|
| | sorting, restraining) | | | | |
| <i>Animal Selection and Evaluation</i> | | | | | |
| 6. | Understand male and female anatomy of specific livestock/equine | | | | |
| 7. | Evaluate livestock/equine based on composition | | | | |
| 8. | Evaluate and comprehend carcass data | | | | |
| 9. | Describe significant livestock/equine breeds and their relation to industry | | | | |
| <i>Business, Marketing, and Data Management</i> | | | | | |
| 10. | Record and maintain relevant data | | | | |
| 11. | Create and send emails | | | | |
| 12. | Operate Microsoft Office (e.g., Word, PowerPoint, Excel) or Mac programs | | | | |
| 13. | Create career development documents (e.g., resumes, applications) | | | | |
| 14. | Understand commodity markets | | | | |

| | | | | | |
|------------------------------------|---|--|--|--|--|
| 15. | Understand available markets for specific livestock segments (e.g., buying and selling) | | | | |
| 16. | Perform basic marketing skills (e.g., target markets, advertising, product placement) | | | | |
| 17. | Use basic math skills (e.g., add, subtract, divide, multiply) | | | | |
| 18. | Use basic accounting skills (e.g., balance sheets, income statements, credit/debit entries, business terminology) | | | | |
| 19. | Perform a cost/benefit analysis to determine potential costs, profits, and losses | | | | |
| 20. | Follow basic business policies, laws and legalities | | | | |
| <i>Health and Nutrition</i> | | | | | |
| 21. | Understand livestock/equine nutrition | | | | |
| 22. | Feed livestock (e.g., loading/unloading feeds, mixing rations) | | | | |
| 23. | Understand various feed intakes (e.g., vitamin/mineral supplements, forage, energy) | | | | |
| 24. | Recognize nutritional needs | | | | |

| | | | | | |
|--|---|--|--|--|--|
| | pre/post breeding | | | | |
| 25. | Value general animal health | | | | |
| 26. | Identify unhealthy animals | | | | |
| 27. | Identify causes of animal illnesses/diseases and parasites | | | | |
| 28. | Understand proper use of antibiotics, vaccinations, other medicinal remedies | | | | |
| 29. | Administer antibiotics and vaccinations (e.g., injections points, subcutaneous vs. intramuscular) | | | | |
| 30. | Monitor an unhealthy animal (e.g., check eyes, take temperature, knowledge to consult veterinarian) | | | | |
| <i>Operation and Maintenance of Tools and Machinery</i> | | | | | |
| 31. | Execute general farm safety practices | | | | |
| 32. | Operate farm equipment in a safe manner | | | | |
| 33. | Use basic mechanical tools | | | | |
| 34. | Perform general welding | | | | |

| | | | | | |
|--|---|--|--|--|--|
| | practices | | | | |
| 35. | Read and interpret equipment operating procedures | | | | |
| <i>Policies and Food Safety</i> | | | | | |
| 36. | Understand bio-security spreads in the agriculture industry | | | | |
| 37. | Prevent bio-security risks (e.g., wash hands, wear hairnets and plastic booties) | | | | |
| 38. | Identify prevalent agricultural policies at the state and national level | | | | |
| 39. | Understand agricultural politics generally | | | | |
| <i>Production Agriculture</i> | | | | | |
| 40. | Understand selected aspects of production agriculture (e.g., terminology, traditions, history) | | | | |
| 41. | Understand basic elements of plant and soil sciences (e.g., recognizing poisonous plants) | | | | |
| 42. | Demonstrate work experience in the livestock industry (e.g., production, food processing, agricultural sales) | | | | |
| | | | | | |

| <i>Reproduction and Genetics</i> | | | | | |
|---|---|--|--|--|--|
| 43. | Understand basic animal reproduction (e.g., estrus synchronization, birthing assistance) | | | | |
| 44. | Recognize gestation periods for various livestock/equine | | | | |
| 45. | Understand the estrus cycles of various species | | | | |
| 46. | Understand the strengths and weaknesses of artificial insemination versus natural service breeding programs | | | | |
| 47. | Identify the strengths and weaknesses of individual pedigrees | | | | |
| 48. | Interpret expected progeny differences (EPD data) | | | | |

**Round Two: Technical and Nontechnical Skills for the Animal Science Sector
(Continued)**

Please read each statement in the left hand column. After reading the statement, determine if this statement represent a skills needed by high school graduates for entry-level employment in your respected field of the agriculture industry. Please check only one box to express your level of importance. You may choose from: Strongly Disagree; Disagree; Agree; or Strongly Agree.

| | Statement | Strongly Disagree | Disagree | Agree | Strongly Agree |
|----------------------------------|---|-------------------|----------|-------|----------------|
| <i>Personal Strengths</i> | | | | | |
| 1. | Demonstrate a strong work ethic (e.g., responsible, accountable, dependable) | | | | |
| 2. | Motivate to perform at an optimal level Utilize resources to overcome personal weaknesses | | | | |
| 3. | Perform tasks independently | | | | |
| 4. | Maintain a positive attitude | | | | |
| 5. | Demonstrate leadership attributes | | | | |
| 6. | Respond positively to constructive criticism | | | | |
| 7. | Exhibit a professional appearance (e.g., appropriate attire, physical appearance, personal hygiene) | | | | |
| 8. | Display passion for the job being performed | | | | |
| <i>Decision Making</i> | | | | | |
| 9. | Understand ethical implications of decisions made | | | | |

| | | | | | |
|---|--|--|--|--|--|
| 10. | Be honest | | | | |
| 11. | Gain trust of employer | | | | |
| 12. | Realize the success of the enterprise | | | | |
| <i>Personal Organization and Time Management</i> | | | | | |
| 13. | Demonstrate punctuality (e.g., arrive on time for work/meetings) | | | | |
| 14. | Adhere to deadlines (e.g., accomplish tasks on time) | | | | |
| 15. | Maintain organization of task/work responsibilities | | | | |
| 16. | Practice efficiency while on the job | | | | |
| 17. | Maintain attention to detail | | | | |
| <i>Lifelong Learning</i> | | | | | |
| 18. | Apply knowledge gained through past work experience(s) to future task(s) | | | | |
| 19. | Display a desire to learn new skills/information | | | | |
| 20. | Demonstrate a desire to progress forward in his or her career | | | | |
| 21. | Acquire new knowledge on-the-job efficiently | | | | |
| <i>Problem Solving</i> | | | | | |
| 22. | Identify problems | | | | |
| 23. | Recognize possible solutions to problems | | | | |
| 24. | Apply best solutions | | | | |
| <i>Communication</i> | | | | | |
| 25. | Listen to the views of fellow co-workers and supervisors | | | | |

| | | | | | |
|-----|---|--|--|--|--|
| | | | | | |
| 26. | Recognize the needs of co-workers and supervisors | | | | |
| 27. | Function as a team member | | | | |
| 28. | Practice strong public relation skills | | | | |
| 29. | Follow instructions | | | | |
| 30. | Be attentive | | | | |
| 31. | Respond verbally to customers, co-workers, and supervisors appropriately | | | | |
| 32. | Correspond in writing to customers, co-workers, and supervisors appropriately | | | | |

Appendix O
Round Three Technical Skills Questionnaire

Oklahoma State University
440 Agricultural Hall
Stillwater, Oklahoma 74078
(405) 744-3094
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Round Three: Technical Skills for the Animal Science Sector

*Directions: Below is a list of statements regarding **technical competencies** in the animal science sector of the agriculture industry for high school agricultural education graduates pertaining to entry-level employment. Please read each statement and determine if you **AGREE** or **DISAGREE** with the statement. If you select **DISAGREE**, please rewrite the sentence so that you would **AGREE**. If the statement cannot be rewritten to a satisfactory level of agreement, please place an **X** in the space provided.*

If you have any question regarding this study, please e-mail me at wendy.slusher@okstate.edu.

| | Statement | Agree | Disagree | Rewritten Statement |
|---|---|--------------|-----------------|----------------------------|
| <i>Animal Handling/Husbandry</i> | | | | |
| 1. | Break/train livestock/equine (e.g., halter, saddle, lead) | | | |
| 2. | Brand/tag livestock/equine in a safe manner | | | |
| <i>Animal Selection and Evaluation</i> | | | | |
| 3. | Evaluate livestock/equine based on composition | | | |
| 4. | Evaluate and comprehend carcass data | | | |
| 5. | Describe significant livestock/equine breeds and their relation to industry | | | |

| | | | | |
|--|---|--|--|--|
| | | | | |
| <i>Business, Marketing, and Data Management</i> | | | | |
| 6. | Understand commodity markets | | | |
| 7. | Perform basic marketing skills (e.g., target markets, advertising, product placement) | | | |
| 9. | Perform a cost/benefit analysis to determine potential costs, profits, and losses | | | |
| <i>Health and Nutrition</i> | | | | |
| 10. | Feed livestock (e.g., loading/unloading feeds, mixing rations) | | | |
| 11. | Understand various feed intakes (e.g., vitamin/mineral supplements, forage, energy) | | | |
| 12. | Recognize nutritional needs pre/post breeding | | | |
| 13. | Identify causes of animal illnesses/diseases and parasites | | | |
| <i>Operation and Maintenance of Tools and Machinery</i> | | | | |
| 14. | Perform general welding practices | | | |
| <i>Policies and Food Safety</i> | | | | |

| | | | | |
|---|---|--|--|--|
| 15. | Identify prevalent agricultural policies at the state and national level | | | |
| 16. | Understand agricultural politics generally | | | |
| <i>Production Agriculture</i> | | | | |
| 17. | Understand basic elements of plant and soil sciences (e.g., recognizing poisonous plants) | | | |
| 18. | Demonstrate work experience in the livestock industry (e.g., production, food processing, agricultural sales) | | | |
| <i>Reproduction and Genetics</i> | | | | |
| 19. | Understand the estrus cycles of various species | | | |
| 20. | Identify the strengths and weaknesses of individual pedigrees | | | |
| 21. | Interpret expected progeny differences (EPD data) | | | |

Appendix P

Round Two Technical Statements

Animal Handling/Husbandry

1. Understand animal needs (e.g., shelter, feed/water, bedding, compassion)
2. Break/train livestock/equine (e.g., halter, saddle, lead)
3. Brand/tag livestock/equine in a safe manner
4. Understand livestock/equine “point of balance” and behaviors when handling
5. Transport livestock/equine (e.g., loading/unloading, sorting, restraining)

Animal Selection and Evaluation

6. Understand male and female anatomy of specific livestock/equine
7. Evaluate livestock/equine based on composition
8. Evaluate and comprehend carcass data
9. Describe significant livestock/equine breeds and their relation to industry

Business, Marketing, and Data Management

10. Record and maintain relevant data
11. Create and send emails
12. Operate Microsoft Office (e.g., Word, PowerPoint, Excel) or Mac programs
13. Create career development documents (e.g., resumes, applications)
14. Understand commodity markets
15. Understand available markets for specific livestock segments (e.g., buying and selling)
16. Perform basic marketing skills (e.g., target markets, advertising, product placement)
17. Use basic math skills (e.g., add, subtract, divide, multiply)
18. Use basic accounting skills (e.g., balance sheets, income statements, credit/debit entries, business terminology)
19. Perform a cost/benefit analysis to determine potential costs, profits, and losses
20. Follow basic business policies, laws and legalities

Health and Nutrition

21. Understand livestock/equine nutrition
22. Feed livestock (e.g., loading/unloading feeds, mixing rations)
23. Understand various feed intakes (e.g., vitamin/mineral supplements, forage, energy)
24. Recognize nutritional needs pre/post breeding
25. Value general animal health
26. Identify unhealthy animals
27. Identify causes of animal illnesses/diseases and parasites
28. Understand proper use of antibiotics, vaccinations, other medicinal remedies
29. Administer antibiotics and vaccinations (e.g., injections points, subcutaneous vs. intramuscular)

30. Monitor an unhealthy animal (e.g., check eyes, take temperature, knowledge to consult veterinarian)

Operation and Maintenance of Tools and Machinery

31. Execute general farm safety practices
32. Operate farm equipment in a safe manner
33. Use basic mechanical tools
34. Perform general welding practices
35. Read and interpret equipment operating procedures

Policies and Food Safety

36. Understand bio-security spreads in the agriculture industry
37. Prevent bio-security risks (e.g., wash hands, wear hairnets and plastic booties)
38. Identify prevalent agricultural policies at the state and national level
39. Understand agricultural politics generally

Production Agriculture

40. Understand selected aspects of production agriculture (e.g., terminology, traditions, history)
41. Understand basic elements of plant and soil sciences (e.g., recognizing poisonous plants)
42. Demonstrate work experience in the livestock industry (e.g., production, food processing, agricultural sales)

Reproduction and Genetics

43. Understand basic animal reproduction (e.g., estrus synchronization, birthing assistance)
44. Recognize gestation periods for various livestock/equine
45. Understand the estrus cycles of various species
46. Understand the strengths and weaknesses of artificial insemination versus natural service breeding programs
47. Identify the strengths and weaknesses of individual pedigrees
48. Interpret expected progeny differences (EPD data)

Appendix Q

Round Three Technical Skills that Reached Consensus from Panel Members

Animal Handling/Husbandry

1. Break/train livestock/equine (e.g., halter, saddle, lead)
2. Brand/tag livestock/equine in a safe manner

Animal Selection and Evaluation

3. Evaluate livestock/equine based on composition
4. Evaluate and comprehend carcass data
5. Describe significant livestock/equine breeds and their relation to industry

Business, Marketing, and Data Management

6. Understand commodity markets
7. Perform basic marketing skills (e.g., target markets, advertising, product placement)
8. Perform a cost/benefit analysis to determine potential costs, profits, and losses

Health and Nutrition

9. Feed livestock (e.g., loading/unloading feeds, mixing rations)
10. Understand various feed intakes (e.g., vitamin/mineral supplements, forage, energy)
11. Recognize nutritional needs pre/post breeding
12. Identify causes of animal illnesses/diseases and parasites

Operation and Maintenance of Tools and Machinery

13. Perform general welding practices

Policies and Food Safety

14. Understand agricultural politics generally

Production Agriculture

15. Understand basic elements of plant and soil sciences (e.g., recognizing poisonous plants)
16. Demonstrate work experience in the livestock industry (e.g., production, food processing, agricultural sales)

Reproduction and Genetics

17. Understand the estrus cycles of various species
18. Identify the strengths and weaknesses of individual pedigrees
19. Interpret expected progeny differences (EPD data)

Appendix R

Round Two Nontechnical Statements

Personal Strengths

1. Demonstrate a strong work ethic (e.g., responsible, accountable, dependable)
2. Motivate to perform at an optimal level
3. Utilize resources to overcome personal weaknesses
4. Perform tasks independently
5. Maintain a positive attitude
6. Demonstrate leadership attributes
7. Respond positively to constructive criticism
8. Exhibit a professional appearance (e.g., appropriate attire, physical appearance, personal hygiene)
9. Display passion for the job being performed

Decision Making

10. Understand ethical implications of decisions made
11. Be honest
12. Gain trust of employer
13. Realize the success of the enterprise

Personal Organization and Time Management

14. Demonstrate punctuality (e.g., arrive on time for work/meetings)
15. Adhere to deadlines (e.g., accomplish tasks on time)
16. Maintain organization of task/work responsibilities
17. Practice efficiency while on the job
18. Maintain attention to detail

Lifelong Learning

19. Apply knowledge gained through past work experience(s) to future task(s)
20. Display a desire to learn new skills/information
21. Demonstrate a desire to progress forward in his or her career
22. Acquire new knowledge on-the-job efficiently

Problem Solving

23. Identify problems
24. Recognize possible solutions to problems
25. Apply best solutions

Communication

26. Listen to the views of fellow co-workers and supervisors
27. Recognize the needs of co-workers and supervisors.
28. Function as a team member
29. Practice strong public relation skills
30. Follow instructions
31. Be attentive
32. Respond verbally to customers, co-workers, and supervisors appropriately
33. Correspond in writing to customers, co-workers, and supervisors appropriately

VITA

Wendy Lee Slusher

Candidate for the Degree of

Master of Science

Thesis: COMPETENCIES NEEDED BY GRADUATES OF
SECONDARY AGRICULTURAL EDUCATION IN THE ANIMAL SYSTEMS
CAREER PATHWAY FOR ENTRY-LEVEL EMPLOYMENT: A DELPHI STUDY
OF INDUSTRY EXPERTS IN OKLAHOMA

Major Field: Agricultural Education

Biographical:

Personal Date: Born in Charles Town, West Virginia, on May 16, 1984, the daughter of Judy L. Slusher, of Weyers Cave, Virginia, and Herb L. Slusher of Mount Sidney, Virginia.

Education: Graduated from Fort Defiance High School, Fort Defiance, Virginia in May 2002; received Associate of Arts and Sciences degree from Blue Ridge Community College, Weyers Cave, Virginia in August 2005; received Bachelor of Science degree in Agricultural and Applied Economics from Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, Virginia in May 2007. Completed the requirements for the Master of Science degree with a major in Agricultural Education at Oklahoma State University in June, 2009.

Experience: Employed by Virginia Tech as a governor school leader for the Virginia Governor's School for Agriculture as an undergraduate; employed by the Oklahoma State University's Parent and Family Relations Office as a graduate student assistant; student-taught during the Spring of 2009 at Kingfisher High School, Kingfisher, Oklahoma. Currently employed by Prague Public Schools as an agricultural education instructor.

Professional Membership: National Association of Agricultural Educators, Sigma Alpha Professional Agriculture Sorority, Alpha Zeta Honor Fraternity.

Name: Wendy Lee Slusher

Date of Degree: December, 2009

Institution: Oklahoma State University

Location: Stillwater, Oklahoma

Title of Study: COMPETENCIES NEEDED BY GRADUATES OF
SECONDARY AGRICULTURAL EDUCATION IN THE
ANIMAL SYSTEMS CAREER PATHWAY FOR ENTRY-
LEVEL EMPLOYMENT: A DELPHI STUDY OF INDUSTRY
EXPERTS IN OKLAHOMA

Pages in Study: 132

Candidate for the Degree of Master of Science

Major Field: Agricultural Education

Scope and Method of Study:

The purpose of this study was to describe the perceptions of Oklahoma animal science industry leaders as it related to competencies necessary for the entry-level employment of high school graduates who had completed coursework in the Oklahoma Agricultural, Food and Natural Resources, animal systems career cluster. The theoretical framework for this study was based on the Theodore Shultz and Howard Beck human capital theory. The study was characterized as descriptive and employed the Delphi methodology, which allows the research to gather responses from an expert panel and utilize these responses to create useful statements (Stitt-Gohdes & Crews, 2002). The opening questionnaire included two open-ended questions and a demographics section that was developed by the researcher. The remaining two rounds of the Delphi questionnaire were based on panel members' responses.

Findings and Conclusions:

The panel members found consensus on 27 technical competencies and 33 non-technical competencies that high school graduates of the animal systems career pathway should have to gain entry-level employment in the animal science industry in Oklahoma.

Advisor's Approval: Dr. J. Shane Robinson .