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Assessing the Animal Science Technical Skills Needed by Secondary Agricultural Education Graduates for Employment in the Animal Industries: A Modified Delphi Study

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Career and technical education courses, such as agricultural education, exist, in part, to assist students in acquiring the competencies needed to achieve employability. However, whether the current secondary agricultural education curriculum meets the needs of industry leaders who employ high school graduates of agricultural education programs is unclear. Therefore, this Delphi study sought to identify the technical competencies deemed necessary for entry–level employment of high school graduates in the animal industries on their successful completion of coursework in the animal systems career pathway. Forty–two experts, representing the animal industries in Oklahoma, participated in the study. In all, 133 statements were yielded, revealing 48 different competencies, of which 27 (56%) reached consensus of agreement per Round 2. Specifically, panelists "strongly agreed" that graduates should be able to "use basic math," "practice farm safety," and "understand animal needs." Ultimately, all 48 competencies met the "real limits" of "agreement" (M = 2.50 – 3.49). So, these skills should be included in the curriculum designed for the animal systems pathway, and cross–walked with the current Oklahoma secondary animal systems career pathway to ensure that students enrolled in animal science are provided opportunities to learn the skills employers seek in entry–level workers.

Keywords: entry-level employability, technical competencies in animal science, career pathways

Introduction

Our nation is facing a dilemma. An "unprecedented shortage of skilled workers" (Gray & Herr, 2006, p. 17) is projected to lead to a 5% decrease in our nation's gross domestic product. 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 Enrollment and Work, 2008). Even though 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 Enrollment and Work, 2008).

Additional changes in the employment sector are occurring simultaneously. "Baby boomers" (those who were born between 1946 and 1964 [Easterlin, Schaeffer, & Macunovich, 1993]) are retiring at an alarming rate. This condition creates a rapid depletion of employees in the job market, thus, prompting a massive need to fill these vacated positions (Carnevale, 2003). These changes include jobs which require at least some technical training or post–secondary education (Carnevale, 2003). In fact, Carnevale projected that an increase of at least 20 million workers will be needed in the U.S. job market during the next 20 years.

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, according to Gray and Herr (2006) controversial legislative acts, such as No Child Left Behind (NCLB),

> seem most likely to ignore these kids, i.e., those 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. (p. 12)

Further, Castellano, Stringfield, and Stone III (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). 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, including agriculture.

To an extent, CTE courses, such as agricultural education exist to help prepare individuals for careers (Castellano et al., 2003). Findlay (1993) surmised that regardless of the profession, "competence in one's professional work role is important in the overall learning process" (p. 46). Therefore, providing a curriculum in which students can acquire technical skills is essential and should be initiated during high school (Lynch, 2000).

Efforts have been made to reform CTE curriculum to include more "rigorous industry standards, and higher academic standards and related general education knowledge" (Lynch, 2000, p. 3). The purpose of the *Carl D. Perkins Career and Technical Education Improvement Act of 2006* (Perkins IV) was 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). Accordingly, it allows students enrolled in CTE the opportunity to train for the workforce and prepare for college simultaneously (Roberts & Ball, 2009). Additionally, Perkins IV parallels 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, it strengthens 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 a set of course offerings in which students can declare a major and specialize in a specific area (Oklahoma Career Clusters Initiative, n.d.) manifested by career pathways, which 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 from both academia and industry while encompassing curricula changes and tools for measuring assessments of the program concurrently (Ruffing, 2006).

Oklahoma agricultural education implemented curriculum standards into its programs in 2006. This inclusion sought to ensure that students in agricultural education programs in Oklahoma would be competent in securing employment or succeeding in postsecondary education (Oklahoma Agricultural Education, 2007). Seven total career pathways were created for the Agricultural, Food, and Natural Resource career cluster consisting of agribusiness systems; animal systems; environmental service systems; food products and processing systems; natural resource systems; plant systems; and power, structural and technical systems.

This study was undergirded conceptually by the Human Capital Theory (HCT). Human capital is *created* as an individual's likelihood of employability is increased due to investments in increased education, training, and skill

development are made in that person by his or her society (Becker, 1964; Little, 2003; Shultz, 1971; Smith, 2010). Schultz stated, "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" (p. 56). Becker explained further 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). Smith (2010) posited that it is important to assist individuals in acquiring skills that are "sector specific, i.e., sector–specific human capital" (p. 42) in an effort to prepare people for specific jobs.

Complementary to HCT, Roberts and Ball (2009) developed a conceptual model highlighting the role of the agricultural industry in informing agricultural education curricula and educators in the 21st century (Figure 1). Based on the model, agricultural education curricula should reflect the needs of industry regarding the induction of skilled workers. Therefore, agriculture teachers must "stay current in the technical content of the profession" (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).

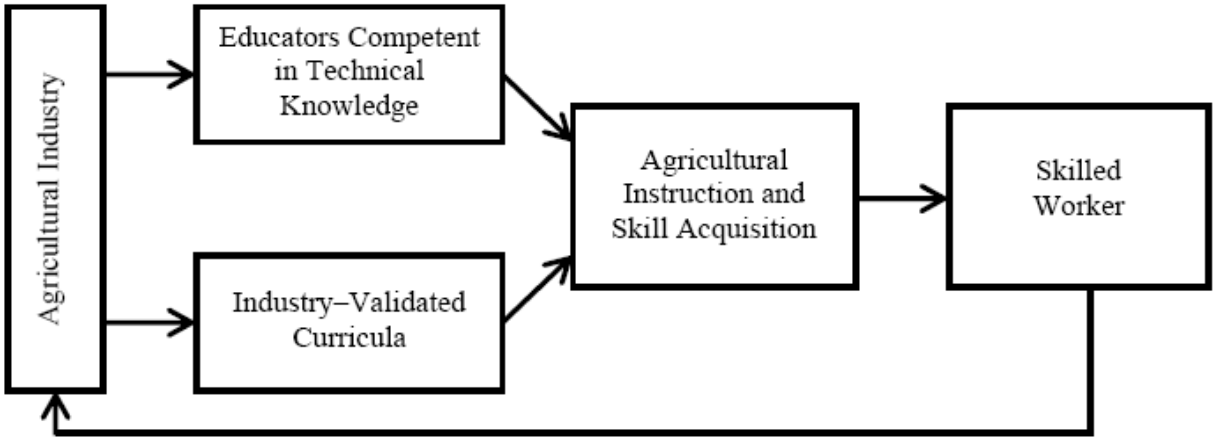

Figure 1. A content–based model for teaching agriculture (Used with permission from Roberts & Ball, 2009).

Moreover, instructors should "provide industry–relevant instruction that results in observable skill acquisition" (Roberts & Ball, 2009, p. 83) so that students acquire skills and competencies which enable them to gain successful employment.

Although it preceded the Roberts and Ball (2009) model, the National Association of State Directors for Career Technical Education Consortium (NASDCTEC) (2008) created the 16 Career Clusters to assist students in acquiring skills needed for employability in specific career areas. 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 the animal industries. Further, the career pathway serves as a vehicle for curriculum delivery that should include competencies necessary for entry–level employment of high school graduates in this industry.

Purpose/Objective

The purpose of this study was to describe the perceptions of Oklahoma animal industries experts regarding competencies needed by high

school graduates for entry–level employment. Therefore, the objective of this Delphi study was to identify the technical competencies deemed necessary for entry–level employment of high school graduates in the animal industries on their successful completion of courses in the animal systems career pathway in Oklahoma.

Methods

Although a traditional questionnaire could have been implemented in this study, the Delphi technique has been deemed "a stronger methodology for a rigorous query of experts and stakeholders" (Okoli & Pawlowski, 2004, p. 18). Specifically, the Delphi technique accumulates responses from a panel of experts within a given content specialization area until consensus is reached (Delp, Thesen, Motiwalla, & Seshadri, 1977; Stitt–Gohdes & Crews, 2002). Further, "the Delphi technique is a method of eliciting and redefining group judgments" (Dalkey, 1969, p. V) in which anonymity, controlled feedback, and statistical group response are the norm. Stewart (2001) stated that the knowledge gained from professionals using the Delphi technique is extremely useful in uncovering information often not verbalized.

Stitt–Gohdes and Crews (2002) stated that, "careful selection of the panel of experts is the keystone to a successful Delphi study" (p. 60). Panel members were selected using a purposive sampling technique, which "is the process of selecting a sample that is believed to be representative of a given population" (Gay, Mills, & Airasian, 2006, p. 113).

The population for this study was Oklahoma animal industries experts from nine areas of specialization: beef cattle; dairy cattle; equine; goat; implements/miscellaneous; poultry; sheep; swine; and veterinarians, which resonated with national data describing Oklahoma's rank in the United States (Table 1). A sample (n = 42) was obtained for the study. The researchers used national data to determine the areas of specialization for inclusion in the study (Slusher, 2009).

Table 1
Oklahoma Equine, Livestock, and Poultry: Estimated Number of Head Produced Per Annum

Livestock	Quantity	U.S. Rank
Broilers and other meat–type chickens[a]	44,314,617	13
Cattle and calves[b]	5,400,000	4
Layers[a]	3,323,802	26
Hogs and Pig[b]	2,340,000	7
Equine[c]	326,000	4
Goats (meat and other types)[b]	115,000	3
Sheep[b]	80,000	18
Dairy Cattle[a]	64,000	– – –

Note. [a]2008 State Agriculture Overview – Oklahoma; [b]January 2009 National Agricultural Statistics Services; [c]2005 American Horse Council; – – – no data existed

Oklahoma ranks third nationally in goats, fourth in cattle and equine, seventh in hogs, thirteenth in poultry, and eighteenth in sheep.

To determine panel membership, a professor of animal science at Oklahoma State University was asked to consult with colleagues in the Department of Animal Science to determine potential experts to be included in the study. The criterion used for selecting individuals was based on their prior experience and knowledge of the industries as it pertained to employing workers, including entry–level employees. Specifically, this professor and his colleagues were asked to supply names of only those individuals who they knew had hired or would consider hiring high school graduates for entry–level positions. The numbers of panelists considered for this study, per their areas of specialization, were compared to the U.S. rank of livestock, equine, and poultry raised in Oklahoma (Table 1).

In addition, all experts who served on the panel were affiliated with the animal industries in Oklahoma. Finally, 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. According to Turoff and Linstone (2000), a computer version of the Delphi technique "has the advantage of eliminating the delay caused in summarizing each round of Delphi" (p. 5). It should be noted that adherence to these criteria delimited potential panelists and thus was a limitation of the study.

Dalkey (1969) stated that when a Delphi group is larger than 13 members, a reliability of at least .80 can be achieved. Although attrition is usually low in Delphi studies (Okoli & Pawlowski, 2004), the researchers did experience dropouts each round. The researchers attempted to limit attrition by sending a follow–up e–mail notification during each round of the study. Therefore, all experts received one e–mail per round for a total of three. If they did not participate in each round by the stated deadline, the panelists received another e–mail reminder. So, a maximum of two e–mail reminders per round for a total of six reminders sent, which met Dillman's (2000) recommendation for multiple e–mail contacts to increase participation and response rate.

Of the 42 participants selected to participate, 32 responded in Round One for a 76.2% response rate, 26 participants responded in Round Two for a 61.9% response rate, and 24 participants responded in Round Three for a 57.1% response rate. As such, reliability was maintained throughout the study (Dalkey, 1969). Agricultural Education faculty at Oklahoma State University ensured face and content validity of the instrument by round prior to corresponding with the panelists.

The Delphi method intends for the researcher to submit multiple rounds of questions (or items) to the experts until consensus is reached regarding the object(s) of interest (Okoli & Pawlowski, 2004). This study reached a satisfactory level of consensus in three rounds. As such, a three–round, Web–based procedure was followed. The initial instrument was created by the researcher with the assistance of graduate committee members. It contained the study's objective and solicited the panelists' responses. Statements acquired in Round One were analyzed and categorized into eight technical themes by three independent coders (Montgomery & Crittenden, 1977).

Panelists were asked to rate 48 technical statements using a four–point summated–rating scale in Round Two: 1 = Strongly Disagree; 2 = Disagree; 3 = Agree; 4 = Strongly Agree. Based on panelists' responses, statements that received a mean rating of 3.00 or higher were considered to have reached consensus by the researchers; 27 technical statements reached consensus. Further, statements that received a mean rating of less than 3.00 were re–submitted to panel members via Round Three for additional assessment. In Round Three, panelists were asked to agree or disagree with the statement. If they did not agree with the statement, panelists were encouraged to re–write the statement so they would agree. Of the 21 statements re–submitted to panelists in Round Three, 20 statements were agreed to by two–thirds of the panelists, thus reaching consensus, as determine a priori by the researchers.

Findings

This study's objective was to identify technical competencies deemed necessary for students' entry–level employment in the animal industries following high school graduation. After the initial distribution of the Round One questionnaire, 133 statements were collected from the 32 respondents, which produced 48 technical competency statements for Round Two. The statements were organized into eight thematic categories: 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) (Slusher, 2009).

Based on panelists' responses, 27 of the 48 statements (56%) reached consensus of agreement by receiving a mean rating score of 3.00 or higher (Table 2) during Round Two. Of those, seven (25.9%) statements were from Business, Marketing and Data Management; six (22.2%) statements were from Health and Nutrition; four (14.8%) statements came from

Operation and Maintenance of Tools and Machinery; four (14.8%) statements emerged from Reproduction and Genetics; three (11.1%) statements represented Animal Handling/Animal Husbandry; two (7.4%) statements derived from Policies and Food Safety. Animal Selection and Evaluation yielded one (3.7%) statement, and Production Agriculture provided one (3.7%) statement. The remaining 21 statements that did not reach consensus (i.e., $M = 2.99$ or less) were returned to panel members in Round Three of the study.

The three statements on which participants strongly agreed high school graduates of the animal systems pathway 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 2). Participants also reached agreement ($M \geq 3.00$) on 24 statements ranging from "identify unhealthy animals" ($M = 3.46$; $SD = 0.58$) to "operate Microsoft Office" ($M = 3.04$; $SD = 0.87$) (Table 2).

Table 2
Agreement Levels for Entry–level Technical Skills Needed in the Animal Industries According to Animal Industry Experts per Round Two of the Delphi Procedure ($N = 26$)

	Statement	Topic Theme[a]	*M*	*SD*	% Agreement (marked 3 or 4)[b]
1.	Use basic math skills	BMDM	3.54	0.51	100.00
2.	Execute general farm safety practices	OMTM	3.54	0.65	92.30
3.	Understand animal needs	AH/H	3.54	0.65	92.30
4.	Identify unhealthy animals	H&N	3.46	0.58	96.15
5.	Operate farm equipment in a safe manner	OMTM	3.42	0.64	92.30
6.	Value general animal health	H&N	3.35	0.63	92.30
7.	Read and interpret equipment operating procedures	OMTM	3.27	0.53	96.15
8.	Understand male and female anatomy of specific livestock/equine	ASE	3.27	0.67	88.46
9.	Record and maintain relevant data	BMDM	3.23	0.65	88.46
10.	Understand basic animal reproduction	R&G	3.19	0.63	88.46
11.	Use basic accounting skills	BMDM	3.19	0.69	84.61
12.	Monitor an unhealthy animal	H&N	3.15	0.61	88.46
13.	Understand strengths and weaknesses of artificial insemination versus natural service breeding programs	R&G	3.12	0.65	84.61
14.	Follow basic business policies, laws, and legalities	BMDM	3.12	0.86	92.00
15.	Understand livestock/equine 'point of balance' and behaviors when handling	AH/H	3.08	0.63	84.61
16.	Transport livestock/equine	AH/H	3.08	0.63	84.61
17.	Create career development documents	BMDM	3.08	0.69	80.76
18.	Understand livestock/equine nutrition	H&N	3.08	0.69	80.76
19.	Understand proper use of antibiotics, vaccinations, other medical remedies	H&N	3.08	0.74	76.92

Table 2 (Continued)

	Statement	Topic Theme[a]	*M*	*SD*	% Agreement (marked 3 or 4)[b]
20.	Identify prevalent agricultural policies at the state and national level	P&FS	3.08	0.74	53.84
21.	Administer antibiotics and vaccinations	H&N	3.07	0.74	76.92
22.	Understand selected aspects of production agriculture	PA	3.04	0.53	88.46
23.	Understand available markets for specific livestock segments	BMDM	3.04	0.66	80.76
24.	Create and send emails	BMDM	3.04	0.72	76.92
25.	Understand bio–security threats in the agriculture industry	P&FS	3.04	0.77	80.76
26.	Recognize gestation periods for various livestock/equine	R&G	3.04	0.77	73.07
27.	Operate Microsoft Office	BMDM	3.04	0.87	84.00
28.	Use basic mechanical tools	OMTM	2.99	0.49	88.46
29.	Prevent bio–security risks	P&FS	2.99	0.75	80.76
30.	Feed livestock	H&N	2.96	0.66	84.61
31.	Brand/tag livestock/equine in a safe manner	AH/H	2.92	0.63	76.92
32.	Demonstrate work experience in the livestock industry	PA	2.88	0.59	76.92
33.	Describe significant livestock/equine breeds and their relation to industry	ASE	2.88	0.77	65.38
34.	Recognize nutritional needs pre/post breeding	H&N	2.88	0.86	65.38
35.	Evaluate livestock/equine based on composition	ASE	2.85	0.67	69.23
36.	Understand basic elements of plant and soil sciences	PA	2.81	0.63	69.23
37.	Identify the strengths and weaknesses of individual pedigrees	R&G	2.81	0.63	69.23
38.	Break/train livestock/equine	AH/H	2.81	0.63	65.38
39.	Identify causes of animal illnesses/diseases and parasites	H&N	2.81	0.75	61.53
40.	Understand the estrus cycles of various species	R&G	2.81	0.94	68.00
41.	Understand various feed intakes	H&N	2.77	0.71	69.23
42.	Perform basic marketing skills	BMDM	2.77	0.82	53.84
43.	Perform a cost/benefit analysis to determine potential costs, profit, and losses	BMDM	2.77	1.03	56.00
44.	Perform general welding practices	OMTM	2.69	0.68	65.38
45.	Understand general agricultural politics	P&FS	2.62	0.57	57.69
46.	Understand commodity markets	BMDM	2.62	0.70	57.69

Table 2 (Continued)

	Statement	Topic Theme[a]	*M*	*SD*	% Agreement (marked 3 or 4)[b]
47.	Interpret expected progeny differences	R&G	2.62	0.90	56.00
48.	Evaluate and comprehend carcass data	ASE	2.50	0.86	42.30

Note. [a]AH/H = Animal Handling/Husbandry; ASE = Animal Selection and Evaluation; BMDM = Business, Marketing, and Data Management; H&N = Health and Nutrition; OMTM = Operation and Maintenance of Tools and Machinery; PA = Production Agriculture; P&FS = Policies and Food Safety; R&G = Reproduction and Genetics
[b]Scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Agree; 4 = Strongly Agree

The bottom five statements on which participants agreed least were "perform general welding practices" (*M* = 2.69; *SD* = 0.68), "understand general agricultural politics" (*M* = 2.62; *SD* = 0.57), "understand commodity markets" (*M* = 2.69; *SD* = 0.70), "interpret expected progeny differences" (*M* = 2.62; *SD* = 0.90), and "evaluate and comprehend carcass data" (*M* = 2.50; *SD* = 0.86).

Conclusions

Curriculum should reflect the needs of industry (Roberts & Ball, 2009). Therefore, this Delphi study sought to identify the technical competencies deemed necessary for entry–level employment of high school graduates in the animal industries. All 48 statements originated by panelists reached the "real limits" of "consensus of agreement" (i.e., *M* = 2.50 – 3.49). As such, it was concluded that these statements are important skills for high school graduates to acquire prior to entering employment in the animal industries.

Based on the major finding, "use basic math skills," the researchers concluded that the panelists perceived high school graduates are either reluctant or unable to use basic math to solve problems in the animal industries. Panelists also "strongly agreed" that entry–level employees should be able to "practice farm safety" and "understand animal needs" to be employable. The theme areas "Business, Marketing, and Data Management" and "Health and Nutrition" represented the largest number of statements that reached consensus. Based on the findings of this study, it was concluded that the current animal systems career pathway needs to be enhanced in an effort to prepare high school graduates for entry–level employment (Roberts & Ball, 2009).

Recommendations for Practice

It is recommended that secondary agricultural education instructors integrate the findings of this research into their existing animal science curriculum to ensure their graduates are more employable in the animal industries. Specifically, instructors should seek out opportunities to integrate basic math into their existing animal science lessons per courses supporting the animal systems pathway. Professional development and in–service workshops should focus on helping agricultural education instructors recognize where math exists "naturally" 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 taught predominantly in agricultural power and technology courses. Because it was an important finding in this study, instructors should seek ways to highlight safety in their 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 industries. By focusing on these skills derived from the study's panel of experts, graduates will be more technically competent through an industry–validated curriculum (Roberts & Ball, 2009) and employable in the animal industries, which is supported by the central premise of HCT (Becker, 1964; Little, 2003; Shultz, 1971; Smith 2010).

In addition, the findings of this study should be cross–walked with the current Oklahoma curricula for the 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, revisions should be made to ensure the 27 technical competencies, on which industry experts agreed ($M \geq 3.00$), are evident.

The Agricultural, Food and Natural Resources career cluster in Oklahoma provides students the opportunity to complete competency examinations on their completion of a pathway. So, it is recommended that the statements agreed to by the Delphi panelists be compared to competency examination test items 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 sufficiently.

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 skills preferred by employers in their respective states. If so, adjustments to curriculum should be made to meet the needs of employers to ensure that high school graduates of agricultural education receive appropriate instruction preparing them for future employment in the animal industries. This line of inquiry would help ensure that future graduates are better prepared for work and/or college (Roberts & Ball, 2009) by improving the human capital graduating from secondary agricultural education programs (Becker, 1964; Shultz, 1971).

Further research should be conducted to determine the mathematics competencies graduates need prior to entering the workforce. A follow–up study with this panel should be conducted to clarify the mathematics skills entry–level employees use on the job in the various animal industries. Those results could be checked against the current state–approved curriculum and state end of instruction test for animal science in Oklahoma to determine if these competencies are being taught and learned at the secondary level. If sufficient congruence is found, then, perhaps students are not making the cognitive transfer from school to industry (Parr et al., 2006) and follow–up training is needed. On the other hand, if the alignment is found to be sufficient, then opportunities exist to enrich the curriculum to better reflect the needs of industry in the 21st century. Finally, although this study sought to determine the skills high school graduates should possess on entrance into the animal industries, it is recommended that future studies involving other career pathways of secondary agricultural education be pursued.

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