

Undergraduate Students Self-Efficacy Related to the Performance of Animal Handling and Management Techniques: Implications for Pre-service Teachers

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Abstract

This study examined a census of students enrolled in a junior level undergraduate animal science course at Oklahoma State University during the spring of 2013. This course was designed to address the “skill gap” of pre-vet and pre-service agricultural education majors in the area of animal handling and management. The course focuses on the identification and acquisition of basic animal handling and management techniques in the context of beef, dairy, sheep, goat, horse, swine and poultry. Data were collected at two points during the semester, the initial data collection occurred on the first day of the course. All ($n = 39$) students completed the instrument resulting in a 100% response rate. The second data collection occurred on the last day of the course. Thirty-six (three students dropped the course during the semester) of the 39 students completed the instrument resulting in a response rate of 92%. Findings from this study revealed an increased self-efficacy for undergraduate students after taking the undergraduate Animal Science course. Findings also revealed undergraduate students believe identifying proper injection sites and overall animal health are important. These results indicate student performance and acquisition of technical skills should inform curriculum development in Colleges of Agriculture.

Introduction

Animal agriculture and the skills needed to facilitate experiential learning opportunities in the context of Supervised Agricultural Experience (SAE) programs continues to be an important component of the agricultural education teacher’s job (Retallick, 2010; Walker et al., 2004). Historically, students have embraced the opportunity to raise and exhibit livestock projects (Nash, 2007). A positive livestock experience can serve as a context for the development of employability skills as well as the technical skills needed for the animal industry (Boleman et al., 2004; Ramsey and Edwards, 2011). In

addition, students involved with animal agriculture SAEs are exposed to opportunities to receive awards and recognition through FFA and earn scholarships. Such awards can assist with post-secondary education that may lead to careers in the agricultural industry (Talbert and Balschweid, 2004).

In school-based agricultural education programs across Oklahoma, one of the primary career pathways is Animal Science (Oklahoma Department of Career and Technology Education, 2013). As teachers representing the Baby Boomer generation retire, new teachers will be needed to lead these programs. These new teachers must be competent to teach the animal science curriculum, and also facilitate SAE programs focused on animal agriculture.

Skill development of pre-service agricultural education teachers is important for college curriculum committees to consider when developing new courses. According to Irving et al. (1999), “*the need to improve teachers’ content knowledge in the sciences and their ability to communicate that knowledge to students must be moved to the forefront of the national educational agenda*” (p. 410). In addition, researchers have reported “*teachers who do not have a strong content knowledge base tend to teach didactically, relying on ‘expert’ sources such as textbooks and content lectures to transmit information to their students*” (Stofflett and Stoddart, 1994, p. 34).

In the context of animal science, Slusher (2009) reported the third most important entry-level technical skill needed in the animal science sector was to “understand animal needs” in the context of animal handling/husbandry (p. 4). Industry professionals reported administering medications, livestock selection and disease identification (animal) as the three most important entry-level technical skills for students (Ramsey and Edwards, 2011). Training the next generation of teachers to have the requisite skills needed to facilitate these programs is the focus of a collaborative effort between two depart-

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ments in the College of Agricultural Science and Natural Resources at Oklahoma State University. The undergraduate Animal Science course provides an overview of animal management and handling techniques used with beef, dairy, sheep, goat, horse, swine and poultry. The primary objective of the course is to aid students in the acquisition of basic skills associated with livestock production and handling.

Theoretical Framework

This study is framed in Bandura's associated theory of self-efficacy (Bandura, 1997). Bandura (1997) described self-efficacy as "*the belief in one's capabilities to organize and execute courses of action required to produce given attainments*" (p.3). Individual self-efficacy is derived from four main sources: mastery experiences, physiological and emotional states, vicarious experiences and social persuasion (Bandura, 1994). Mastery experiences are considered to be "the most effective way of creating a strong sense of efficacy" (Bandura, 1995, p. 3). Physiological and emotional arousal also affects the sense of self-efficacy. A person's sense of self-efficacy increases when they can reduce their stress reactions and alter negative tendencies in the face of adversity. Vicarious experiences are the "second influential way of creating and strengthening efficacy beliefs" (Bandura, 1995, p. 3). Seeing people similar to themselves succeed by perseverant effort raises observers' beliefs that they, too, possess the capabilities to master comparable activities (Bandura, 1986; Schunk 1987). Social persuasion is the final main source with which individuals derive self-efficacy. People who are persuaded verbally that they possess the capabilities to master given activities are likely to mobilize greater effort and sustain it than if they harbor self-doubts and dwell on personal deficiencies when problems arise (Litt, 1988; Schunk, 1989). The animal science course meets twice a week, one meeting is a 50-minute lecture and the second meeting is a four-hour lab, adequate time for demonstration and practice to occur. One lab is designated for pre-service agricultural education students, this allows for multiple opportunities for practice and observation providing potential for impacting students' self-efficacy (Bandura, 1994).

Purpose and Objectives of the Study

The purpose of this study was to determine the self-efficacy of undergraduate students enrolled in an animal management course at Oklahoma State University. Specifically, their ability to identify and perform selected skills associated with livestock handling and management. In addition, the undergraduate students' perceived level of importance of animal management techniques was of interest to the researchers. The following research objectives guided the study:

1. Describe the perceived level of undergraduate students' self-efficacy to perform animal management techniques.
2. Describe the level of importance of animal management techniques as perceived by students enrolled in an Animal Management course at Oklahoma State University.
3. Describe changes in students' self-efficacy to perform animal management techniques, as measured at the beginning and end of the spring semester 2013.
4. Describe changes in the level of importance of animal management techniques, as measured at the beginning and end of the spring semester 2013.

Research Design and Methods

The design of this study was descriptive in nature. This study focused on a census of students enrolled in a junior level undergraduate animal science course at Oklahoma State University during the spring of 2013. This new course was designed to address the "skill gap" of pre-vet and pre-service agricultural education majors. The course focuses on the identification and acquisition of basic animal handling and management techniques in the context of beef, dairy, sheep, goat, horse, swine and poultry. Data were collected at two points during the semester, the initial data collection occurred on the first day of the course. All (n = 39) students completed the instrument resulting in a 100% response rate. The second data collection occurred on the last day of the course. Thirty-six (three students dropped the course during the semester) of the 39 students completed the instrument resulting in a response rate of 92%.

A modified version of the instrument utilized by Hartfield (2011) was used for this study. The instrument gauged students' capability (ability to perform the skill) and perceived degree of importance on 42 items identified from the course syllabus designed by the instructor. The 42 items reflected the skills identified as objectives for the course. A panel of experts consisting of five Oklahoma State University professors and four graduate students were consulted to determine the face and content validity of the instrument. Cronbach's alpha was calculated to identify the reliability of the capability ($\alpha = 0.98$) and importance ($\alpha = 0.95$) scales. The 42 items on the instrument were arranged on two Likert-type scales. For self-efficacy, a nine-point scale was employed where 1 indicated No Capability, and 9 indicated A Great Deal of Capability. For importance, a nine-point scale was used where 1 indicated No Importance and 9 indicated A Great Deal of Importance. So, these scales measured students' perceptions of capability along with their perceptions of importance.

Data were analyzed using PASW Statistics Student Version 18.0 (SPSS). According to Creswell (2012), for a census survey, "researchers simply report descriptive statistics about the entire population" (p. 382). The mean and standard deviation were calculated to determine the perceived self-efficacy related to the capability and importance of each item at the beginning and end of the spring semester 2013.

Findings/Results

Objective #1

All 42 skills related to livestock handling and management were perceived by students as capable of performing in the animal science course (see Table 1). According to posttest scores, the skill or competency students' perceived to be most competent at was injection site selection (Post-M = 8.35, Post-SD = 1.07). Other skills and competencies students' perceived themselves to be competent at included animal identification (Post-M = 8.33, Post-SD = 1.05), livestock transportation (Post-M = 8.18, Post-SD = 1.06), movement of livestock (Post-M = 8.15, Post-SD = 1.35), handling of livestock (Post-M = 8.15, Post-SD = 1.21), administering health care products (Post-M = 8.15, Post-SD = 1.13), and animal reproduction techniques (Post-M = 8.15, Post-SD = 1.02). The students considered themselves to be the least competent at ovine breed knowledge (Post-M = 6.35, Post-SD = 2.14), ovine breed identification (Post-M = 6.41, Post-SD = 2.27), identifying caprine breeds (Post-M = 6.44, Post-SD = 2.25)

and caprine breed knowledge (Post-M = 6.44, Post-SD = 2.20) (Table 1).

Objective #2

Students perceived all 42 competencies to be important to livestock handling and management as identified in the animal science course. According to students' posttest scores, the most important competency was movement of livestock (Post-M = 8.65, Post-SD = 0.65), followed by management of health care products (Post-M = 8.62, Post-SD = 0.74), handling of livestock (Post-M = 8.59, Post-SD = 0.70) and administering a bolus (Post-M = 8.56, Post-SD = 0.66). Storage of health care products (Post-M = 8.56, Post-SD = 0.79) completes the top five most important competencies perceived by students' (Table 2).

Objective #3

Regarding the change in students' self-efficacy from the beginning to the end of the semester, the top ten items are identified (Table 3). Change in students' self-

Table 1. Students Perceived Level of Self-efficacy Regarding Animal Handling and Management Skill or Competency as Reported by a Pre and Post Test

Item	Pre-M	Pre-SD	Post-M	Post-SD
Injection Site Selection	6.84	1.87	8.35	1.07
Animal I.D.	6.45	1.69	8.33	1.05
Livestock Transportation	6.73	1.73	8.18	1.06
Movement of Livestock	7.03	1.64	8.15	1.35
Handling of Livestock	7.13	1.61	8.15	1.21
Administering a Health Mgt Plan	6.26	2.00	8.15	1.13
Animal Reproduction Techniques	6.39	2.01	8.15	1.02
Unloading Livestock	6.82	1.81	8.12	1.09
Processing Pig Litters	5.24	2.54	8.03	1.40
Loading Livestock	6.87	1.74	8.03	1.27
Symptoms of Illness	6.89	2.00	8.03	1.06
Castration	6.11	1.90	8.00	1.10
Vision of Livestock	6.24	1.55	7.99	1.24
Flight Zones of Livestock	6.74	1.35	7.97	1.36
Health Management	6.18	2.19	7.88	1.17
Record Keeping	6.58	1.88	7.85	1.21
Bovine Breed I.D.	7.33	1.58	7.79	1.32
Hearing of Livestock	6.08	1.55	7.79	1.27
Milking Cows	5.32	2.22	7.74	1.60
Administering a Bolus	5.47	2.72	7.74	1.31
Bovine Breed Knowledge	7.41	1.48	7.68	1.65
Restraint Sizes/Species	5.89	1.61	7.58	1.28
Dairy Mgt. Production	4.37	2.15	7.56	1.48
Anatomy of Livestock	6.13	1.74	7.53	1.60
Obtaining Blood Samples	5.92	2.12	7.47	1.56
Processing Lambs	4.34	2.30	7.41	1.71
Restraining Animals by Species	5.76	1.53	7.39	1.46
Porcine Breed I.D.	6.03	2.51	7.35	2.10
Dehorning	5.26	2.13	7.29	1.43
Porcine Breed Knowledge	6.21	2.35	7.21	2.11
Use of Ropes	5.47	2.14	7.12	1.72
Storage of Health Care Products	6.21	2.23	7.12	1.11
Tying Knots	5.16	2.03	6.97	1.98
Tie Ropes	5.26	2.09	6.85	1.97
Using Knots	5.03	1.82	6.82	1.85
Equine Breed I.D.	5.67	2.44	6.68	2.38
Equine Breed Knowledge	5.69	2.23	6.53	2.51
Caprine Breed I.D.	4.62	2.31	6.44	2.25
Caprine Breed Knowledge	4.59	2.12	6.44	2.20
Ovine Breed I.D.	4.82	2.10	6.41	2.27
Ovine Breed Knowledge	5.10	2.05	6.35	2.14

Note. A nine point scale was used to measure self-efficacy 1 = No Capability, 3 = Very Little Capability, 5 = Some Capability, 7 = Quite a Bit of Capability, 9 = A Great Deal of Capability.

Table 2. Students Perceived Level of Importance of Animal Handling and Management Skill or Competency as Reported by a Pre and Post Test

Item	Pre-M	Pre-SD	Post-M	Post-SD
Movement of Livestock	8.38	1.14	8.65	0.65
Mgt of Health Care Products	8.36	1.18	8.62	0.74
Handling of Livestock	8.44	1.10	8.59	0.70
Administering a Bolus	8.05	1.26	8.56	0.66
Storage of Health Care Products	8.31	1.15	8.56	0.79
Castration	8.28	1.21	8.53	0.93
Unloading Livestock	8.33	0.98	8.53	0.75
Livestock Transportation	8.41	0.82	8.53	0.71
Symptoms of Illness	8.63	0.71	8.53	0.66
Record Keeping	8.26	1.29	8.50	0.99
Animal Reproduction Techniques	8.26	1.04	8.50	0.71
Handling of Health Care Products	8.36	1.16	8.50	0.86
Injection Site Selection	8.56	0.68	8.47	0.86
Obtaining Blood Samples	8.31	0.86	8.44	0.79
Administering a Health Mgt Plan	8.49	1.10	8.44	1.02
Animal ID	8.15	0.99	8.41	0.96
Dehorning	8.00	1.32	8.38	0.92
Flight Zones of Livestock	8.10	1.31	8.38	1.01
Vision of Livestock	7.56	1.67	8.35	1.07
Hearing of Livestock	7.62	1.63	8.24	1.09
Processing Pig Litters	7.69	1.72	8.21	1.34
Bovine Breed Knowledge	8.05	1.09	8.20	0.88
Loading Livestock	8.42	0.89	8.20	0.95
Processing Lambs	7.46	1.82	8.18	1.37
Restraining Animals by Specie	7.87	1.55	8.18	1.17
Restraint Sizes/Specie	7.95	1.36	8.18	1.18
Anatomy of Livestock	8.15	1.01	8.12	1.17
Dairy Management Production	7.26	2.71	8.00	1.35
Bovine Breed I.D.	8.11	1.13	7.94	1.15
Milking Cows	7.31	1.91	7.82	1.59
Porcine Breed I.D.	7.24	1.91	7.74	1.42
Using Knots	7.13	1.72	7.68	1.51
Tying Knots	7.05	1.62	7.65	1.63
Caprine Breed Knowledge	6.76	2.02	7.62	1.52
Use of Ropes	7.31	1.67	7.59	1.52
Equine Breed Knowledge	7.16	2.06	7.55	1.37
Ovine Breed Knowledge	6.79	2.11	7.53	1.42
Porcine Breed Knowledge	7.16	1.82	7.52	1.72
Equine Breed I.D.	7.29	2.09	7.47	1.58
Tie Ropes	7.18	1.54	7.44	1.58
Ovine Breed I.D.	6.97	2.06	7.41	1.58
Caprine Breed I.D.	6.87	2.16	7.36	1.67

Note. A nine point scale was used to measure perceived level of importance 1 = No Importance, 3 = Very Little Importance, 5 = Some Importance, 7 = Quite a Bit of Importance, 9 = A Great Deal of Importance.

efficacy is reported by using the difference between the pre and posttest scores. The greatest difference in students perceived level of self-efficacy was on the item dairy management production (3.19). Processing lambs and processing litters of pigs showed positive gains in students' self-efficacy (3.07; 2.79) respectively. Milking cows (2.42) and administering a bolus (2.27) completed the top five items that saw a positive change in students' self-efficacy of performing livestock handling and management techniques as identified in the animal science course. The tenth item that received the greatest change was caprine breed knowledge, an item students' identified as being the least efficacious (posttest 6.44) was an item that saw a positive gain at the end of the semester (Table 3).

Objective #4

As indicated in Table 4, livestock handling and management skills and competencies increased from the beginning to the end of the semester. Change in students' perceived level of importance was reported by using the difference between the pre and posttest scores. The item caprine breed knowledge showed a gain of 0.86 from the beginning of the semester, an increase of almost one full point on the posttest. Vision of livestock gained over three fourths of a point at 0.79 and ovine breed knowledge increased at the same level.

Students reported an increase in self-efficacy and importance on the following items, dairy management production (3.19; 0.74), caprine breed knowledge (1.85; 0.86), administering a bolus (2.27; 0.51), processing pig litters (2.79; 0.52) and processing lambs (3.07; 0.72). Other items students perceived level of importance increased during the course of the semester included, livestock hearing (0.62), tying knots (0.60) and using knots (0.55) (Table 4).

Conclusions and Implications

Students considered all 42 skills related to livestock handling and management identified for the undergraduate animal science course that they were capable of performing. The skills students' considered themselves to have the most capability included selecting proper injection sites. Injection site selection and the skill of administering injections is a common skill that is highlighted in many programs focused on quality care standards for livestock. The personal characteristics of the students in the class were not an objective for this study, determining students' prior exposure to livestock handling and management skills would be valuable information to. Skills students reported as having the least capability of performing included ovine breed knowledge, identifying ovine breeds, caprine breed knowledge, and caprine breed identification. This finding is representative of school-based agricultural education pro-

grams and the animal agriculture industry in Oklahoma. As of January 1, 2011 Oklahoma sheep and goat producers had 75,000 head of sheep on hand and 91,000 head of goats as compared to 5.10 million head of cattle (Oklahoma Agriculture Blog, 2011, January 1). These numbers highlight the importance of beef cattle in Oklahoma. This emphasis is transferred to the curriculum school-based agricultural education programs utilize and the number of livestock oriented SAE's exhibited by Oklahoma FFA members. The lack of emphasis on sheep and goat SAEs may contribute to the limited exposure or vicarious experiences needed for students to have a high degree of self-efficacy in the livestock handling and management techniques associated with ovine and caprine.

Students became more efficacious after completing a sixteen-week animal science course. Ten selected items that the mean difference between the pre and posttest scores showed a positive increase included; dairy management production, processing lambs, processing pig litters, milking cows, administering a bolus, dehorning, administering a health plan, castration, animal identification and caprine breed knowledge. These livestock handling and management skills can be identified as units of instruction in the Introduction to Animal Science Curriculum found in Oklahoma's school-based agricultural programs i.e., Dairy Industry, Goat Industry and Animal Health and Management (Oklahoma Department of Career and Technology Education, 2013). These foundational units are introduced to all students so it is important for teachers to have a degree of confidence when preparing to plan and deliver lessons focused on these topics. The increase in students' efficacy to perform these skills suggest a sixteen-week

Table 3. Top Ten Animal Handling and Management Skills or Competencies Reporting a Gain in Student Self-efficacy from Beginning to End of the Spring 2013 Semester

Animal Husbandry Item	Pre-M	Pre-SD	Post-M	Post-SD	Mean Difference Post-Pre
Dairy Management Production	4.37	2.15	7.56	1.48	3.19
Processing Lambs	4.34	2.30	7.41	1.71	3.07
Processing Pig Litters	5.24	2.54	8.03	1.40	2.79
Milking Cows	5.32	2.22	7.74	1.60	2.42
Administering a Bolus	5.47	2.72	7.74	1.31	2.27
Dehorning	5.26	2.13	7.29	1.43	2.03
Administering a Health Mgt Plan	6.26	2.00	8.15	1.13	1.89
Castration	6.11	1.90	8.00	1.10	1.89
Animal I.D.	6.45	1.69	8.33	1.05	1.88
Caprine Breed Knowledge	4.59	2.12	6.44	2.20	1.85

Table 4. Top Ten Animal Handling and Management Skills or Competencies Perceived Level of Importance as Reported from Beginning to End of the Spring 2013 Semester

Animal Husbandry Item	Pre- M	Pre- SD	Post- M	Post-SD	Mean Difference Post-Pre
Caprine Breed Knowledge	6.76	2.02	7.62	1.52	0.86
Vision of Livestock	7.56	1.67	8.35	1.07	0.79
Ovine Breed Knowledge	6.79	2.11	7.53	1.42	0.74
Dairy Management Production	7.26	2.71	8.00	1.35	0.74
Processing Lambs	7.46	1.82	8.18	1.37	0.72
Hearing of Livestock	7.62	1.63	8.24	1.09	0.62
Tying Knots	7.05	1.62	7.65	1.63	0.60
Using Knots	7.13	1.72	7.68	1.51	0.55
Processing Pig Litters	7.69	1.72	8.21	1.34	0.52
Administering a Bolus	8.05	1.26	8.56	0.66	0.51

Undergraduate Students Self-Efficacy

course focused on the identification and acquisition of livestock handling and management skills can be an effective way to prepare pre-service teachers to deliver the animal science curriculum in Oklahoma.

Quite a bit of importance was placed on the movement of livestock, management of health products, handling of livestock, storage of health care products and administering a bolus. All 42 skills were perceived to have some importance by participants, which is encouraging given the potential for these students to be in positions of influence as school-based agriculture education teachers. Agriculture teachers must be content experts in a variety of disciplines. In the context of animal science, these livestock handling and management skills represent “technical” knowledge needed to deliver the curriculum associated with the animal science pathway (Ramsey and Edwards, 2011; Slusher, 2009).

The importance of selected skills increased over the course of a sixteen-week semester. Of particular interest is the reported increase in self-efficacy and importance on the following items; dairy management production, caprine breed knowledge, administering a bolus, processing pig litters and processing lambs. Items reflecting students perceived level of importance increased during the course of the semester were also included; livestock hearing, tying knots and using knots (see Table 4). These skills or competencies were impacted the most by the course. The scope of this study did not include an examination of the pedagogical practices of the instructor, however, the cohort nature of the lab sections implies that a communities of practice approach may be developing within the labs. According to Lave and Wenger (1991), communities of practice are everywhere and students are generally involved in a number of them, this involvement could lead to social persuasion. Social persuasion is the final main source with which individuals derive self-efficacy. People who are persuaded verbally that they possess the capabilities to master given activities are likely to mobilize greater effort and sustain it than if they harbor self-doubts and dwell on personal deficiencies when problems arise (Litt, 1988; Schunk, 1989).

Recommendations for Research and Additional Practice

Research

Future research should identify the experiences students had with each of the 42 skills, along with the demographics of students enrolled in the course. Research should also address whether students had the knowledge of how to work ‘real-world’ problems related to each skill. Longitudinal research should be conducted to determine the impact of a series of courses and experiences and how they impact students’ ability to identify and perform the requisite skills needed for animal science professionals and school-based agriculture education teachers in the 21st Century. An examination of the professional development needs for

in-service school-based agricultural education teachers within the first five years of service should be conducted to inform departments of animal science, faculty and state program leaders of agricultural education of the “skill gaps” that may need to be addressed.

Much has been reported concerning agricultural literacy and the reality that undergraduate students enrolled in colleges of agriculture represent families that have not had direct ties to agricultural production for multiple generations (Frick et al., 1991; Leising et al., 1998; Powell and Agnew, 2011). Research focused on student’s actual ability to perform animal management skills versus their perceived ability to perform said skills could inform faculty charged with developing curriculum for “post agrarian society” students. This “beginning with the end in mind” approach supports Talbert et al., (2007) assertion that teachers must “stay current in the technical content of the profession i.e., the agricultural industry” (p. 57).

Practice

Industry professionals should validate skills and objectives for courses designed to provide technical skills needed for successful entry and performance in an industry. To that end, department chairs, faculty and instructors should form industry based advisory committees that can provide insight into the technical needs required in the industry. The relationship formed between post-secondary institutions and industry professionals can extend beyond the classroom.

The pre-service teachers enrolled in the course could enhance their competence through a lesson-planning requirement. A microteaching requirement designed to allow students to not only practice the technical skill but also practice the planning, delivery and implementation of the skill could reflect the type of mastery experience described by Bandura (1995).

Colleges of Agriculture should consider developing similar courses in each of the disciplines reflecting the food, fiber and natural resource industries. School-based agriculture educators are required to have a broad set of skills representing a very diverse agricultural industry. Courses like this support the National Research Agenda for Agricultural Education Priority Area #4 Meaningful, Engaged Learning in All Environment

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