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Factors Influencing the Teaching of Livestock Production within Arizona School-Based Agricultural Education

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The purpose of this study was to determine the factors that influence the teaching of production livestock agriculture content to high school students enrolled in secondary agriscience programs in Arizona. Arizona agricultural educators completed a questionnaire about decision making when incorporating livestock production into their yearly curriculums. This questionnaire was derived from the Arizona Agriscience Program Technical Content Standards (Arizona Department of Education, 2018) and Social Cognitive Theory (SCT) (Bandura, 1989).

Key Findings

Objective one sought to describe the characteristics of the respondents: years spent teaching, type and geographic location of the program, subjects taught, education, and gender identity. From this objective, it was noted that Arizona has a wide range of educators from being first year to having 42 years of education and teaching in both rural and urban areas. These educators also teach various classes from intro to agriculture to aquaculture, indicated in the table below.

Classes Taught by Respondents (n = 45)

Classes Taught	# of respondents teaching
Applied biological systems	36
Introduction to Agriculture/Agriscience	40
Agriculture Biology	15
Animal Science	35
Plant Science/Horticulture	31
Plants, Animals, and Leadership	18
Agricultural Mechanics/Engineering	22
Agricultural Chemistry	1
Agricultural Leadership	11
Agricultural Communications	4
Agricultural Business	23
Veterinary Science	8
Environmental Science	1
Physical Education	1
Meat Processing	1
Aquaculture	1

Objective two sought to evaluate the livestock production technical content standards utilized by Arizona school-based agricultural education (SBAE) teachers. It was noted the 9.0 standards are more heavily used than the 10.0 standards. In the table below, the averages of frequency are indicated.

Individual Frequency of Teaching Livestock Production Standards (n = 45)

Arizona Standard Used	*M*	*SD*
Standard 9.0- Analyze Animal Science Principles		
9.1- Common terminology	4.41	0.80
9.2-Animal taxonomic classification	4.36	0.98
9.4- Basic Anatomy of external parts	4.32	0.86
9.5- Comparative anatomy and physiology	4.24	1.00
9.6- Digestive Systems	4.40	0.96
9.7- Animal welfare	3.96	0.91
Standard 10.0- Demonstrate Concepts of Animal Management		
10.1- Safely working with animals	3.92	1.03
10.2- Properties of food, fiber, and by-products	3.84	0.79
10.5- Analyze nutritional roles and needs	3.88	0.96
10.6- Analyze nutritional needs for rations	3.62	1.04
10.7- Plan to treat animal ailments	3.61	1.24
10.8- Differentiate animal selection	3.81	0.89
10.9- Animal selection for reproduction with their genetics	3.36	1.21
10.10- Evaluate animals for breeding soundness and readiness	2.73	1.27
10.11- Sustainable reproduction management program	3.11	1.24
10.12- Proper methods of disinfecting facilities and equipment	3.29	1.25
10.13- Proper use of livestock medications	3.60	1.26

Scale: 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = Always

Objective three sought to describe the factors that influence livestock production content incorporation for Arizona SBAE teachers using SCT personal/ cognitive and environmental factors. From the respondents, content knowledge was seen as the most influential sub-factor for personal/cognitive and facilities available was seen as the most influential sub-factor for environmental, see tables below.

Individual Frequency of Personal/Cognitive Factors (n = 45)

Sub- Factors	*M*	*SD*
Content Knowledge	3.73	1.10
Ethical Obligation	3.71	1.27
Confidence	3.67	1.13
Personal Beliefs	3.58	1.32
Background	3.56	1.13
Moral Obligation	3.53	1.36
Previous or Current Employment	3.29	1.60
Professional Development	3.07	1.45
Collegiate Coursework	2.93	1.34

Scale: 1 = No Influence, 2 = Somewhat Influential, 3 = Moderately Influential, 4 = Very Influential, 5 = Extremely Influential

Individual Frequency of Environmental Factors (n = 45)

Sub- Factors	*M*	*SD*
Facilities Available	3.44	1.46
Resources/Equipment Available	3.42	1.36
Student Interest	3.42	1.25
Livestock Production Career Opportunities in Area	3.24	1.21
Time to Prepare Curricula	3.11	1.47
Funding Available	3.04	1.45
Community Support	3.04	1.40
Livestock Production Prevalence	3.04	1.38
Student Certifications	2.91	1.46
Curriculum Packages/ Lessons Available	2.87	1.31
Parent/Guardian Support	2.82	1.37
Administrative Support	2.58	1.45
Peer Teacher Support	2.31	1.41

Scale: 1 = No Influence, 2 = Somewhat Influential, 3 = Moderately Influential, 4 = Very Influential, 5 = Extremely Influential

Objective four sought to determine the relationship between the SCT personal/ cognitive and environmental factors that influence the incorporation of livestock production content and technical content standards utilized by Arizona SBAE teachers. As seen in the table below, there is a positive, substantial correlational relationship between the standards and personal/cognitive factors, and a positive, moderate correlation between the standards and environmental factors.

Correlation of Personal/Cognitive and Environmental Factors with Overall Standards

Variables	Personal/Cognitive Factors	Environmental Factors
Overall Standards	r^2 = 0.57	r^2 = 0.35

Scale: Perfect = 1.00, Very High = 0.70 - 0.99, Substantial = 0.50 - 0.69, Moderate = 0.30 - 0.49, Low = 0.10 - 0.29, Negligible = 0.10 - 0.09 (Davis, 1971)

Discussion

1. Not all livestock production standards are taught to the same depth.

Standards that incorporate basic anatomy, physiology, and terminology are taught at a high frequency. Standards that incorporate nutrition, breeding, and properties of food, fiber, and by-products are not taught at the same frequency. This has been seen in previous research as the various components of livestock production associated with commercial production were not utilized as heavily in teaching setting within 4-H (Jarvis, 2019).

2. Arizona educators utilize their personal beliefs and background knowledge when making decisions to teach livestock production.

Specifically, content knowledge and ethical obligation were the most influential in the respondent sample. Educators having content knowledge about the subject is critical as it contributes to their confidence in teaching that content to their students (Ball et al., 2008). Additionally, respondents generally use ethical obligation as a factor of content incorporation as they value their students' understanding of the proper management and care of livestock.

3. Environmental factors do impact educators decision making when presented with the resources to teach livestock production.

Having the facilities and resources to educate students about livestock production was very influential for respondents. This mirrors previous research that indicated educators need proper resources to educate students about various industries (Easterly & Simpson, 2020; Schumacher & Fuhrman, 2012).

4. There is a low utilization of various areas of livestock production content creating a potential gap in student education.

The relationship between the factors of influence and the state standards indicates there is a positive relationship; however, one that is moderately positive shows room for improvement in educating students about all factors of livestock production.

Recommendations for Practice

- Reevaluating the Arizona state standards to fit livestock production topics into more program curriculums.
- Reimplementing more traditional practice in teaching the application of livestock production.
- Creating classes around livestock production and adding it more into introductory classes.
- Further educational opportunities for educators in livestock production in the form of professional development.
- Collecting data similar to this study to compare with other states.