Iowa Agricultural Education Teachers' Capacity to Teach Agricultural Processing

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Introduction and Need for Research

As a content area driven by content and context (Roberts & Ball, 2009) school-based agricultural education (SBAE) looks different from state to state, and community to community across the nine pathways (Ortiz, 2023). The resources, challenges, and workforce needs from school to school vary tremendously, and provides educators with opportunities to utilize their talents and local resources to help meet the needs and goals of the local community (Croom, 2009; Krieg & Krieg, 2021). Providing students with experiences with quality and realistic facilities will assist in satisfying the demand for goods and services agricultural careers produce. The USDA shares 22.1 million jobs in the U.S. are connected to agriculture, and 70.1% of these jobs are connected specifically to agricultural processing, not including the 2.6 million farmers that grow and harvest raw agricultural products (USDA Economic Research Service, 2024). Learning occurs in facilities which help students develop industry-validated skills and experiences necessary to meet these needs and goals. On a national level, the National Quality Program Standards (NQPS) created by the National Council for Agricultural Education (2016) validates the importance of facilities SBAE, as they recognize "Program Design and Instruction - Facilities and Equipment" (p. 23) as its own standard; SBAE equipment and facilities should be industry-grade,safe, and include space for storage and organization. Common facilities used in SBAE include agricultural mechanics shops, kitchens, greenhouses, gardens, land laboratories, and meat processing facilities to name a few (Shoulders & Myers, 2012; Twenter & Edwards, 2017). The purpose of this study was to assess Iowa SBAE teachers' capacity to teach processing instruction, and was guided by 2 objectives: 1) to determine what agricultural processing facilities Iowa SBAE teachers have in their programs, and 2) to determine what agricultural processing topics they most desire to teach about. This work is needed to determine if programs have the capacity to provide students with hands-on experiences in facilities which prepare students to satisfy the career demands in agriculture (Hill et al., 2021).

Theoretical Framework

Ajzen's (1991) theory of planned behavior informed this study. Ajzen's (1991) theory includes an examination of one's attitudes, subjective norms, and perceived behavioral control (PBC). Attitude reflects one's level of agreement regarding a specific behavior or practice, shaping the subjective norms, or personal assumptions surrounding a behavior or practice (Ajzen, 1991). One's PBC takes into account the ease in which one will perform a learned action after reflecting on their learning while considering any challenges that may be presented in the future (Ajzen, 1991; Sands et al., 2019). The instrument aimed to understand educators' desires related to teaching specific agricultural processing topics (attitudes and subjective norms), while taking into account the limitations of the facilities they had within their programs (PBC). If additional resources or facilities were provided to these educators, it could influence their capacity (behavior) to teach about these important agricultural processing topics to meet workforce needs.

Methodology

An IRB-approved instrument was developed and reviewed by a panel of experts for content and face validity (Thyer, 2010) and piloted (Creswell & Creswell, 2018). The instrument consisted of 45 items, including Likert-type (1 to 5 scale), multiple choice, and demographic items. The instrument was distributed to a census of 248 Iowa SBAE teachers, and 175 responded (70.56%). Consistent with Dillman et al. (2014), educators were emailed the instrument up to three times to maximize response rates. Data were analyzed in RStudio. Comparisons between demographic groups were conducted using one-way ANOVAs, but no statistical differences were found.

Results and Findings

Objective 1 aimed to determine what agricultural processing facilities SBAE teachers have. Classrooms (n = 172; 98.85%) and greenhouses (n = 130; 74.41%) were the most common, with foods labs (n = 4; 2.30%), vineyards (n = 2; 1.15%) and meat processing labs (n = 1; 0.57%) being the least common. Despite this, results in a later question revealed meat processing was the most commonly taught topic within programs, with 109 (73.15%) teaching about it (Table 1).

Table 1: *Facilities of SBAE Programs (n = 174)*

Item	n	f	Item	n	f
Classroom	172	98.85%	Kitchen space	19	10.92%
Greenhouse	130	74.71%	Orchard	13	7.47%
Storage room	104	59.77%	Landscaping lab	11	6.32%
Ag mechanics lab	93	53.45%	Foods lab	4	2.30%
Test plot	63	36.21%	Vineyard	2	1.15%
Livestock lab or barn	21	12.07%	Meat processing lab	1	0.57%

Objective 2 determined types of agricultural processing topics participants expressed the most desire to teach. Desire was expressed using a scale from 1 to 5, with 1 as "strongly disagree" and 5 as "strongly agree." Teachers expressed the greatest desire to teach meat processing ($\bar{x}$ = 4.15; σ = 0.82) and grain processing ($\bar{x}$ = 3.72; σ = 0.98). A summary can be found in Table 2.

Table 2: *SBAE Teachers' Desire to Provide Instruction on Processing Topics*

Item	n	SD	Disagree	Neutral	Agree	SA	$\bar{x}$	σ
Meat processing	144	3	1	18	72	50	4.15	0.82
Grain processing	144	7	9	26	78	24	3.72	0.98
Vegetable processing	142	3	13	32	68	26	3.71	0.94
Dairy processing	144	7	10	34	64	29	3.68	1.03
Honey processing	144	6	16	34	57	31	3.63	1.07
Fruit processing	144	3	20	38	63	20	3.53	0.97

Conclusions and Recommendations

As seen by data for objective 2, participants expressed the most desire to teach about concepts such as meat processing ($\bar{x}$ = 4.15; σ = 0.82), grain processing ($\bar{x}$ = 3.72; σ = 0.98), vegetable processing ($\bar{x}$ = 3.71; σ = 0.94), and dairy processing ($\bar{x}$ = 3.68; σ = 1.03). Despite this, data from objective 1 revealed only 10.92% (n = 19) reported use of a kitchen to teach these food-centric topics. Even for programs that may have these facilities, less than 60% (n = 104) report having storage space for the necessary equipment needed for these supply-heavy topic areas, falling short of the recommendations of the National Council for Agricultural Education (2016).

The research reveals key recommendations for practice and research. First, if teachers have the desire to teach about these topics, and they lack the facilities to do so, additional equipment and facilities should be purchased. There may be administrative hesitation, so a best practices guide should be developed by state SBAE leaders to leverage administrative support and awareness. For research recommendations, this study should be conducted in other states to account for the diversity in SBAE topics taught across the nation. Additional research regarding the professional development needs of SBAE teachers could also examine ways to increase teachers' PBC (Ajzen, 1991) and likelihood to acquire necessary facilities and teach about these needed topics.

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