Evaluating the Preparation of Pre-Service School-Based Agricultural Education Teachers in Laboratory-Based Courses

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Introduction/Conceptual Framework

This study sought to examine laboratory-based instruction for pre-service school-based agricultural education (SBAE) teachers at various institutions across the nation. While research has indicated that laboratory-based instruction in SBAE programs is commonplace (Shoulders & Meyers, 2012), a myriad of literature has noted SBAE teachers are not adequately prepared to teach, manage, and facilitate learning activities in SBAE laboratories upon completing their teacher education programs (Burris et al., 2005; Hainline & Wells, 2019; Shoulders & Meyers, 2012). Wells et al. (2021) agricultural teacher education and agricultural industry partnership model served as a guide to examine technical and pedagogical course offerings at institutions across the nation.

Method and Procedures

This study sought to determine the laboratory-based courses offered at SBAE teacher education preparation institutions and determine SBAE teacher educators' perceptions regarding possible needs or changes regarding preparing pre-service teachers associated with laboratory competencies. A 25-item Qualtrics instrument was developed and sent to all teacher educators (N = 107) listed on the NAAE "find a college" map. A total of 33 (response rate = 30.8%) teacher educators, representing 33 unique institutions, responded to this survey instrument. Validity was established via a review from a panel of experts and reliability was assessed by way of a pilot study. Descriptive statistics were conducted using IBM® Statistical Package for the Social Sciences (SPSS©).

Findings

Of the Agricultural Education teacher educators which responded in this study, 15 (45.5%) were on faculty at Land-grant universities, 11 (33.3%) worked at regional (public) universities, four (12.1%) led the teacher education program at private universities, two (6.1%) were at 1890 (HBCU) universities, and one faculty member (3.0%) worked at a Hispanic serving institution. These institutions reported an average of 118.8 (SD = 23.9) credit hours for a bachelor's degree and an average of 53.5 (SD = 84.4) credit hours for a master's degree in Agricultural Education.

Objective two sought to identify the availability of laboratory-based courses offered at the SBAE teacher education preparation institutions and determine if each course was required and had a pedagogical focus. Concerning course offerings in agricultural mechanics, the courses which were most frequently offered as a stand-alone course for preservice teachers were general agricultural mechanics (n = 28; 84.8%) and welding/metal fabrication (n = 18; 56.3%). Agricultural mechanics was reported as a required course by 96.9 of the schools and over half (51.6%) of the respondents indicated this course had a pedagogy focus.

For plant science, the most common standalone courses at the universities were greenhouse management (64.5%), turf grass management (51.6%), and landscape design (38.7%). The greenhouse management course was the plant systems course that was most frequently required by universities (46.7%) and contained a pedagogical component (n = 6, 19.4%).

Livestock management (n = 25; 78.1%), equine science (n = 24; 75%), and wildlife management (n = 18; 56.3%) were the courses that were most commonly offered as stand-alone courses at the responding universities. Over 64% of the respondents indicated their school required teacher certification students to take livestock management, and it was also the course that most frequently had integrated pedagogy (9.4%).

Concerning food science coursework, a meat science course was offered as a stand-alone course for 71.9% of respondents, and a general food science class was offered as a stand-alone course by 56.6% of the universities surveyed. Around a quarter of the institutions required preservice teachers to take these courses (meat science, 29%; food science, 22.6%) and only one institution reported their meat/food science course had a pedagogy focus.

The third research objective was to determine the teacher educators' perceptions regarding possible needs or changes regarding laboratory-based training and related course offerings. For each laboratory-based course / content, the respondents were asked to gauge their perceptions for the need of expansion of instruction on each topic on a five-point scale (1 = *No Need* (*NN*), 2 = *Limited Need* (*LN*), 3 = *Moderate Need* (*MN*), 4 = *Significant Need (SN),* 5 = *Very Significant Need* (*VSN*)).

The course with the highest need for expansion was Metal / Welding Fabrication, which also had a split mode of five, *Very Significant Need* (*VSN*) and three, *Moderate Need* (*MN*). Following Metal / Welding Fabrication, Agricultural Mechanics, Poultry Science, and Carpentry were the other courses that teacher educators perceived the largest need for expansion.

A total of seven courses/areas of content (i.e., Nursery / Orchard / Grove Management; Viticulture; Turf Grass Management; Apiculture (Beekeeping); Livestock Management; Forestry; Farm Power) had a mode of two, which indicated the teacher educators perceived a *Limited Need* for expansion on these topics.

Conclusions/Recommendations/Implications

This study produced an extensive list of laboratory-based courses that were offered to prepare pre-service SBAE teachers to teach, manage and facilitate learning activities in secondary agricultural education laboratories. The most commonly offered laboratory-based coursework for preservice teachers were Agricultural mechanics (*n* = 33, %) Livestock Management (*n* = 20, 64.5%). The teacher educators' responses regarding the laboratory-based course offerings and degree requirements for preservice teachers coincide with the laboratories which are most commonly found in SBAE programs (Franklin, 2008; Phipps et al., 2008; Shoulders & Myers, 2012; Twenter & Edwards, 2017).

While all teacher education programs in this study offered an agricultural mechanics course, and 96.9% of the programs required preservice teachers to take these courses as part of their certification requirements, the teacher educators still noted the need for expansion associated with agricultural mechanics training. In fact, 23.3% of the teacher educators signified there was a *Very Significant Need* to expand instruction in Welding / Metal Fabrication. This notion for the need of the expansion of agricultural mechanics courses reverberates findings and recommendations from former studies (Burris et al., 2005; Ford et al., 2008). Aside from agricultural mechanics training, the teacher educators also expressed a need for expansion on preservice preparation in greenhouse management. Over a quarter of the respondents noted there was a *Very Significant Need* for expansion. Franklin (2008) recommended that the training on greenhouse management should focus on the components and operation of a greenhouse along with pedagogical aspects.

We recommend that teacher education programs use this list of laboratory-based courses as a guide to reframe their curriculum to help close the gap in laboratory deficiencies found in their pre-service teachers. We further recommend that this study be conducted using a probabilistic sample so the results can be made generalizable and inferred upon the population.

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