Training the Trainers: Effects of STEM-Based Professional Development Training for SBAE Professionals in Louisiana

Introduction/Need for Research

Increased integration of STEM content in agriculture is a critical concern for the agricultural industry as well as agricultural education programs. Despite studies indicating the importance of STEM integration in agricultural education contexts (Parr et al., 2006), many agriculture teachers are not confident in integrating STEM content or activity-based STEM instruction as part of their regular teaching practice (Smith et al., 2015). The labor market in the 21st century has shifted to favor job seekers that are literate in science, math, and technology integration in traditionally single-discipline professions (Bunshaft et al., 2015). Further, the need to emphasize scientific concepts underlying agricultural processes grows more imperative as environmental issues intersect with agricultural interests in the form of climate change, coastal loss, saltwater inundation, and eutrophication (Dooley & Roberts, 2020).

For Louisiana, addressing changes in the demands placed on agricultural educators to prepare agriculturally and environmentally literate citizens through school-based agricultural education (SBAE) must be addressed. Louisiana has lacked comprehensive STEM standards within their SBAE curriculum, resulting in a lack of STEM integration. To first address the need for STEM integration in school-based agricultural education (SBAE), a new industry-based credential, called Agritechnology (Agritech) was introduced to Louisiana in 2017. However, SBAE professionals lacked a sufficiently robust companion curriculum and access to laboratory activities. To address the needs of agricultural educators following the introduction of this credential and supplement the existing learning standards, a USDA-NIFA grant was secured that (1) developed a STEM-forward curriculum and laboratory guide aimed to help students attain the Agritech credential, (2) created an Agritech Ambassador training program which would train a select group of SBAE teachers in STEM content and, 3) would provide materials and resources for those Agritech Ambassadors to facilitate trainings across Louisiana.

Theoretical Framework

This study was framed based on Donald Kirkpatrick's evaluation framework. Kirkpatrick's evaluation framework focuses on four levels of training outcomes: 1) participants' level of satisfaction with the training program; 2) changes in participants' knowledge, skills, and aspirations; 3) changes in participants' professional behavior and practices; and 4) organizational impacts of participants' practice changes (Kirkpatrick & Kirkpatrick, 2006) This project focused on the first three levels of outcomes specified within the evaluation framework.

Methodology

This evaluation study analyzed the effects of an intensive three-day STEM integration training program on a group of teachers (N = 8) selected to serve as Agritech Ambassadors for a STEM integration training program in Louisiana. From a population of over 250 agricultural educators in Louisiana, eight were selected via an application process. Applicants were selected primarily to ensure regional representation, but attributes such as gender, length of career, and age were

also considered. After selection, teachers participated in an intensive three-day training program which included STEM content as well as hands-on laboratories. Pre- and post-evaluation survey tools were utilized to measure Agritech Ambassador satisfaction following this initial training. Three outcomes were measured through paired surveys. The first outcome, participant satisfaction, was assessed using a post-training assessment consisting of 12 items with a five-point Likert scale ranging from 1 = *Not Satisfied* to 5 = *Very Satisfied*. The Cronbach's reliability alpha of this 12-item satisfaction scale was 0.87. The second outcome, a skill development assessment distributed both pre- and post-training, used an eight-item, five-point Likert scale ranging from 1 = *Not Confident* to 5 = *Very Confident* to determine participants overall confidence in implementing STEM content and laboratory activities within training programs as well as within their own classrooms. The Cronbach's reliability alpha of this 12-item satisfaction scale was 0.84. Lastly, Agritech Ambassadors were surveyed regarding their intentions to implement practices demonstrated in the training program in their own classrooms using a four-point Likert scale ranging from *No Intention to Implement* to *Already in Use.* Data collected were analyzed using the IBM-SPSS 26 program. Descriptive statistics were used to summarize data, while paired sample t-tests were used to compare Agritech Ambassador pre and post training outcomes.

Results/Findings

Quantitative data analysis reveals that participants' years of experience as an agriculture teacher ranged from 2 years to 25 years with a mean of 12.8 (SD = 8.2). The number of unduplicated students in training participants' SBAE programs ranged from 53 to 350 students with a mean of 147 students (SD = 92). Participants who have multi-teacher programs indicated their total number of students ranged from 108 to 530 students with a mean of 226 students (SD = 79). These teachers described their potential to impact 1322 students directly in their SBAE programs. Qualitative data analysis was collected through participants' responses to open-ended questions at the post- test further highlighted the outcomes of the Agritech ambassador-training program. These findings support that the training program was effective in preparing the Agritechnology Ambassadors to apply various hands-on experimental learning opportunities to teachers across the state as well as within their own SBAE programs.

Implications/Recommendations/Impact

Based on the results of this study, intensive professional development training provided a measurable increase in teacher perceptions and intention to increase STEM laboratory integration in their programs. This program utilized directed training not only in STEM theory, but also in laboratory application. This model provides a baseline for helping teachers better understand STEM content while also utilizing active experimentation. Participants indicated they were Satisfied (38%) or Very Satisfied (63%) with the training program and their knowledge of the subjects addressed in the training increased across all participants. Similarly, participants' confidence and overall skill increase as a result of this training program. This study recommends follow-up research be conducted to determine if intent to integrate STEM content increased the practice of STEM integration and that this model of training be replicated with larger groups to determine success within and outside of Louisiana.

References

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