Evaluating the Impact of an Electricity Workshop on SBAE Teachers Knowledge to Teach

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Introduction

The primary goal of School-Based Agricultural Education (SBAE) teacher preparation programs is to develop competent and well-prepared SBAE teachers; this leads to teachers acquiring a diverse range of knowledge and skills, especially in agricultural mechanics (Wells et al., 2021). To effectively acquire this knowledge, SBAE teachers must demonstrate essential characteristics to teach agricultural mechanics successfully, including dedication, pedagogical knowledge, and a knowledge of agriculture (Eck et al., 2019; Robert & Dyer, 2004; Wells et al., 2021). To gain these characteristics, agricultural education programs should offer opportunities for developing subject knowledge and skills through various methods (Wells et al., 2018; Whittington, 2005). Despite these programs, concerns about teaching agricultural mechanics courses, particularly in relation to technical subject matter knowledge, persist (Tummons et al., 2017). One effective way to address these concerns is through professional development workshops and specialized trainings that incorporate hands-on activities and lectures to enhance knowledge and teaching abilities (McKim & Saucier, 2013).

Theoretical Framework

Ericsson's Expertise Theory suggests that a key factor in developing an expertise domain is not through the amount of practice but the quality of practice, involving the focused effort on challenging tasks with targeted feedback and adjustments (Ericcson & Smith, 1991). In the context of this study, this theory is what the electricity workshop is meant for: enhance and foster electricity skills to further the SBAE teacher's skill development to reach the expertise domain. Ericsson's Expertise Theory is based on three construct areas: experiential learning/practice, knowledge/content, and skills (Ericsson & Smith, 1991). By attending this electricity training, SBAE teachers will nourish and develop these skills that will lead them toward the expertise domain within electricity skills.

Purpose and Objectives

This study aims to assess the impact of an electricity workshop on SBAE teachers' perceived knowledge to teach electricity. This research aligns with the American Association of *Agricultural Education's National Research Values* related to advancing public knowledge of Agriculture, Food, and Natural Resources (AFNR) systems (AAAE, 2023). By connecting to this value, we seek to enhance our understanding of the quality and impact of electrical professional development workshop through the lens of teaching these essential skills to current and future SBAE students. Our objectives are to evaluate how the electricity workshop influences SBAE teachers' perceptions of their knowledge in four key areas: *1) electrical safety and tools, 2) switches and receptacles, 3) making electrical connections,* and 4) *electrical testing*.

Methods

This study sought to determine the impact of an electricity workshop on SBAE teachers perceived knowledge to teach electricity (i.e., electrical safety and tools, switches, and receptacles, making electrical connections, and electrical testing). Before and following a ten-day intensive Agricultural Mechanics Academy (AMA) attendance, one-and-a-half days were dedicated to electricity. A paper questionnaire was developed and reviewed by a panel of experts

consisting of five individuals with SBAE experience and five with industry training experience, then revised accordingly. SBAE teachers (n=80) who attended the electricity training were asked to rate the knowledge to teach 29 electrical skills from the four electricity constructs.

Results

Table 1 illustrates the change in perceptions of the SBAE teachers within the grand mean score of all four electrical constructs. Initially, the least knowledgeable electrical construct was identified as *Electrical Testing* (M = 1.51; SD = 0.83), while the highest knowledgeable construct was *Electrical Safety and Tools* (M = 2.31; SD = 0.97). However, at the end of AMA, the lowest mean knowledge score was identified as *Making Electrical Connections,* with a mean score of 3.56 (SD = 0.76), while the highest mean knowledge score was *Electrical Testing,* with a mean score of 4.54 (SD = 0.74). Interestingly, compared to the beginning of AMA, the rankings of the highest and lowest electrical skill construct have reversed; the SBAE teachers showed the greatest improvement in their knowledge in *Electrical Testing,* with a mean difference of +3.03, while the reported increase in knowledge in *Electrical Safety and Tools* was the smallest, with a mean difference of +1.67.

Table 1
Grand Means Scores of the Knowledge to Teach Electricity Skills

	Pre-Workshop		Post-Workshop		
Electrical Construct	M	SD	M	SD	MD
Electrical Safety and Tools	2.31	0.97	3.98	0.66	1.67
Switches and Receptacles	1.88	0.99	3.92	0.76	2.04
Making Electrical Connections	1.84	0.92	3.56	0.82	1.72
Electrical Testing	1.51	0.83	4.54	0.74	3.03

Note. 1 = No Knowledgeable; 2 = Somewhat Knowledgeable; 3 = Moderately Knowledgeable; 4 = Very Knowledgeable; 5 = Extremely Knowledgeable

Conclusions and Recommendations

Our findings suggest that SBAE teachers acquired important knowledge and skills from the electricity training, notably affecting their perceptions of the competencies required for teaching electricity. This is consistent with the findings of Wells et al. (2021), which emphasized that electrical skills are among the most critical competencies for SBAE teachers in the realm of technical agricultural mechanics. We conclude that the electricity training significantly changed how teachers viewed their knowledge of electrical skills. This transformation seems to stem from the program's comprehensive hands-on training and resources, coupled with the teachers' proactive efforts to seek additional knowledge to enhance their expertise.

We recommend that post-secondary institutions review their electricity courses to ensure that their teacher education programs equip SBAE teachers with the necessary and up-to-date skills and knowledge for their careers. Additionally, we suggest conducting further research to determine the retention period for the knowledge gained in electricity training. This will help identify whether a refresher professional development course is needed and, if so, how often it should be offered.

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