Exploring the Impact of an Electricity Workshop on SBAE Teachers Ability to Perform Electrical Skills

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Introduction

Agricultural mechanics encompasses a wide range of topics and skills, necessitating a high degree of technical expertise for effective instruction (Albritton & Roberts, 2020; Jenkins et al., 2010; Roberts et al., 2007; Robert & Dyer, 2004). Despite this need, preservice teachers often report feeling uncomfortable or inadequately prepared to perform essential agricultural mechanics skills taught in their courses (Burris et al., 2010; Wells et al., 2021). Research indicates that these feelings of inadequacy may stem from a limited number of required agricultural mechanics courses within agriculture education preparation programs (Granberry, 2023; Hubert & Leising, 2000; Burris et al., 2010). Consequently, this gap in training can hinder the development of confidence and competence among future educators, which is crucial for fostering the next generation of skilled agricultural professionals.

Theoretical Framework

The overarching framework of this study is guided by the skill acquisition theory. This theory explains that the development of skills occurs in three stages: declarative knowledge, procedural actions, and automaticity (DeKeyser, 2020). During the declarative stage, learners begin understanding the skills and steps required to complete a task, also called declarative knowledge (Wells & Miller, 2020). Next, the learner transforms their declarative knowledge into procedural knowledge by applying their basic understanding of a concept into action. This is through means of practice, targeting increased accuracy and time efficiency. With adequate practice, the learner is guided into the automaticity stage. A learner has reached automaticity when they are able to alter their focus as they complete a task.

Purpose and Objectives

The purpose of this study is to explore the impact of an electricity workshop on SBAE teachers' perceived ability to perform electrical skills. 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 impact of an electrical professional development workshop through the lens of performing these essential skills when demonstrating to current and future SBAE students. Our objectives are to evaluate how the electricity workshop influences SBAE teachers' perceptions of their ability to perform electrical skills 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 ability to perform electricity skills (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 their ability to perform 29 electrical skills from the four electricity constructs.

Results

Table 1 illustrates the change in perceptions of the SBAE teachers' ability to perform the skills in all four electrical constructs. The participants reported significant positive changes in mean score for all four constructs. The participants had the highest ability to perform *Electrical Safety and Tools Skills* both before (M = 2.34; SD = 0.97) and after (M = 4.04; SD 0.66). The participants had the lowest ability to perform *Electrical Testing* both before (M = 1.53; SD = 0.77) and after (M = 3.26; SD 1.73) but saw the second largest change in mean scores.

Table 1
Grand Means Scores of SBAE Teachers' Ability to Perform Electricity Skills

	Pre-Workshop		Post-Workshop		
Electrical Construct	M	SD	M	SD	MD
Electrical Safety and Tools	2.34	0.97	4.04	0.66	1.70
Switches and Receptacles	1.98	0.98	3.91	0.76	1.93
Making Electrical Connections	1.81	0.88	3.49	0.86	1.68
Electrical Testing	1.53	0.77	3.26	1.16	1.73

1 = No Ability; 2 = Somewhat Ability; 3 = Moderately Ability; 4 = Very Ability; 5 = Extremely Ability

Conclusions and Recommendations

The data collected from the pre-survey indicated that the participants were in the declarative stage of the skills acquisition theory and progressed to the procedural knowledge stage by the end of the workshop. The workshop provided the participants with the ability to apply their basic understanding of electricity by completing the hands-on electrical activities. We recommend that SBAE teachers who lack the ability to perform the electrical skills in this study seek the training they need to improve their and ultimately their students' skillsets. We recognize that electrical testing is the lowest rated construct and recommend that electrical tool manufacturers create short tutorial videos and step-by-step application activities to better prepare teachers to perform electrical tests. We also recommend professional development providers and teacher preparation programs spend more time covering electrical testing when training teachers. We recommend future research be conducted on the actual ability of the participants to complete a skills-based electrical practicum at the end of the professional development to identify where the participants fall on the Dunning-Kruger effect curve.

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