

**Teacher-perceived Adequacy of Tools and Equipment Available to Teach Agricultural
Mechanics to Teach Electricity**

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Introduction

School-Based Agricultural Education (SBAE) teachers face many obstacles providing thorough lessons when having a shortage of material (McCubbins et al., 2016). Maintaining proper equipment and tools for all curriculum components is critical for students' learning process throughout agricultural mechanics courses (McCubbins et al., 2016). Agricultural mechanics has several different areas of content, maintaining correct equipment for all lessons can be difficult for secondary institutions (McCubbins et al., 2017). Specifically, when teaching electricity, the SBAE teachers' ability to maintain correct tools and knowledge of each element is essential for students to gain a well-rounded education in the course. (Slusher et al., 2011). SBAE teachers may gain confidence in providing and maintaining correct tools in certain areas of the course with proper training. (Darling-Hammond, 2000). The lack of tools to prepare and teach students leads to decreased basic knowledge gained from the course (McCubbins et al., 2016). Providing teaching materials with proper training, including workshops, will allow SBAE teachers to establish a better understanding of the tools and equipment needed for the curriculum taught.

Theoretical Framework

Bandura's theory of self-efficacy served as the theoretical framework for this study (Bandura, 1997). Self-efficacy is thinking about one's ability to complete a task and goals. This study evaluated SBAE teachers' perceived tools and equipment available to teach electricity. Self-efficacy in teachers can influence what they choose to include in lessons due to not being confident in the area for various reasons such as lack of tools. Teachers who lack self-efficacy in the concept of electricity may believe they lack the necessary tools to be efficient in the given subject.

Purpose and Objectives

This study was part of a more extensive study related to the teaching and learning of electricity; its purpose was multifaceted, and the purpose of this part of the study was to develop an understanding of the participating teachers' perception of tools and equipment available to teach electricity. To accomplish and guide this purpose, the following objectives were established: 1.) Identify teachers' availability of tools and equipment used to teach electrical safety and tool usage. 2.) Identify teachers' availability of tools and equipment used to teach electrical switches and receptacles. 3.) Identify teachers' availability of tools and equipment used to teach making electrical connections. 4.) Identify teachers' availability of tools and equipment used to teach electrical testing.

Methods

A 12-hour electricity workshop was held at Texas State University with 80 SBAE teachers in attendance. The workshop comprised one and a half days of electrical training led by an agricultural education professor who specializes in agricultural mechanics. Researchers determined that a pre-test vs post-test would effectively determine the impacts of this educational training. Respondents who attended the workshop were asked about their perceived perception of the tools and equipment available at their secondary institution to teach specific electrical skills. These electrical skills included safety organization and tools, receptacles and switches, making electrical connections, and electrical testing.

Results

Upon workshop completion, our participants' perceptions of the adequacy of tools and equipment at their respective schools increased in all four constructs (see Table 1). Receptacles & Switches saw the greatest increase in score for tools and equipment to teach electricity (MD=1.53) while Making Electrical Connections saw the lowest increase (MD=1.37).

Table 1

Grand Mean Construct Scores for tools and equipment available to teach electricity

Construct	Pre ($n = 20$)	Post ($n = 19$)	MD
Safety Organization & Tools	2.14; SD = 1.08	3.65; SD = 1.16	1.51
Receptacles & Switches	1.94; SD = 1.06	3.47; SD = 1.29	1.53
Making Electrical Connections	1.85; SD = 1.06	3.22; SD = 1.26	1.37
Electrical Testing	1.79; SD = 1.07	3.20; SD = 1.36	1.41

1 = None/ Very Poor; 2 = Little; 3 = Good; 4 = Above Average; 5 = Excellent.

Conclusions and Recommendations

Our results were similar to the findings of McCubbins et al. (2017), who recommended that SBAE teachers heavily benefited from attending a professional development workshop, which aided the perception of tools and equipment available in secondary institutions to teach electricity. Our results also supported Bandura's theory of self-efficacy through the idea that if educators do not possess positive self-efficacy in a particular area, they will typically avoid the subject when teaching; our SBAE participants used this workshop to continue their education and knowledge throughout the electricity subject area. The knowledge gained through our workshop can be used long-term to progress their knowledge and lessons in electricity, which will positively impact the student's education.

We recommend that SBAE teachers continue attending professional development workshops to maintain content knowledge and improving self-efficacy in their lessons. We also recommend future research conducting a pre-test prior to attending the workshop and a post-post survey when the SBAE teachers have direct access to their laboratories to gain more accurate evaluation of tool and equipment availability.

References

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