

**Effects of a Professional Development Session on Career and Technical Education  
Teachers' Perceptions of Importance, Competence, Curriculum Availability, and Ability to  
Teach Two-Stroke Engine Theory and Safety**

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### **Introduction**

Shultz, Anderson, Shultz and Paulsen (2014) investigated the perceived capabilities and perceived importance of skills within the mechanic's laboratory setting. One such content area that [STATE] career and technical education teachers need more professional development is small engines (Shultz et al., 2014). The small engine safety content area within small engines was rated as one of the top ten important skills to learn. The recommendations called for an in-depth look at each of the topics to locate specific areas of need. Other studies regarding agricultural education teachers and their professional development needs have been conducted and illustrate the need to offer more opportunities for agricultural mechanics professional development (Byrd, Anderson, Paulsen, & Shultz, 2015b; McKim, Saucier, & Reynolds, 2010; Peake, Duncan, Ricketts, 2007; and Saucier & McKim, 2010;). Byrd et al. (2015b) found that agricultural education teachers needed more time in their teacher preparation program in order to gain sufficient competence in small engines to feel effective in the classroom.

### **Theoretical Framework**

This research was guided by the Concerns-Based Adoption Model (CBAM) (Hall & Hord, 2006). See Figure 1 below. The model is designed to describe, measure, and explain the change process that teachers experience when attempting to implement new curriculum materials and instructional processes (Anderson, 1997). Utilizing CBAM allows researchers to gather two types of data that relates to the concerns of the teacher about new programs, products, or ideas that are newly implemented or offered and the teacher's knowledge of the new curriculum or idea and how they implement it (Chumbley, 2016).

### **Purpose and Objectives**

As the present study was part of a larger study related to the teaching and learning of two-stroke engines, its purpose was multi-faceted. The first purpose was to create and validate a new instrument related to understanding the teaching of two-stroke engines content within secondary career and technical education coursework, while the second purpose was to assess the effectiveness of an industry-led two-stroke engines instructional workshop. The purpose of the present study was to evaluate perceived importance to teach, perceived competence to perform, perception of the curriculum available to teach, and perceived ability to teach selected skill areas related to two-stroke engine theory and safety prior to and after attending a two-day intensive professional development session.

### **Methods**

The population of this study consisted of 20 ( $N = 20$ ) career and technical education teachers from across the United States. These teachers participated in an intensive two-day, two-stroke engines training workshop held at the [UNIVERSITY] agricultural mechanics-teaching laboratory. The focus of the workshop was instruction related to a wide variety of areas related to two-stroke engines, service, testing, repair, etc. Prior to the workshop activities, we developed a research instrument designed to gather data related to two-stroke engines instruction conducted within secondary schools. This instrument, using a Likert-type scale, addressed a variety of

areas, including curriculum availability, skill performance competency, teaching competency, etc., and as designed to be used to collect pre- and post-workshop data. A panel of 10 experts with varying backgrounds that included agricultural education teacher educators with experience teaching agricultural systems technology-related courses and industry representatives were consulted as the instrument was constructed. These experts identified 51 different skill areas commonly taught within two-stroke engines instruction. The panel of experts also served to review the instrument for face and content validity.

### Results

Data displayed in Table 1 details the grand means and standard deviations of the responses given pre- and post- workshop from teachers in each of the four categories. The largest increase from the pre-workshop to post-workshop perceptions were found in the two-stroke engine competence construct with a pre-workshop  $M = 3.18$  and a post-workshop  $M = 3.91$ . Participant overall abilities also increased when you compare the pre-workshop  $M = 2.89$  to their post-workshop  $M = 3.52$ . Participants did exhibit a slight decrease in their level of importance of the two-stroke engines workshop from their pre-workshop  $M = 4.39$  to their post-workshop  $M = 4.31$ .

Table 1

*Grand Mean Construct Scores for Two-Stroke Engine Workshop Participants.*

Construct	Pre ( $n = 20$ )	Post ( $n = 20$ )
Importance	4.39; SD = .618	4.31; SD = .603
Competence	3.18; SD = .738	3.91; SD = .697
Curriculum	2.32; SD = 1.039	2.87; SD = .878
Ability	2.89; SD = .748	3.52; SD = .740

### Conclusions, Discussion, & Recommendations

There are several conclusions that come from the results of this study; however, it should be reiterated that due to the small nature of this study that these conclusions not be generalized beyond this population. It can be concluded that career and technical education teachers that participated in the workshop had a high perception of importance of teaching two-stroke engine concepts. This is evident with their decision to attend a professional development activity on this topic. This coincides with the conclusions found by Shultz et al. (2014) where teachers identified small engines as an important content area to teach. According to the Concerns-Based Adoption Model (SEDL, 2018), the participants would have progressed to the Informational stage because they have sought out an opportunity to learn more about two-stroke engines.

Teachers also exhibited an increase in their competence to perform two-stroke engine theory and safety skills after taking part in the two-day workshop. This conclusion reinforces Byrd et al. (2015a) findings that teachers need more time to become competent with small engine content. Participant competence increased the most in the areas of theory of operation and troubleshooting & failure analysis. With such large increases in these areas and the initial high levels of perceived importance of the content, these areas could be the specific topics that participants wanted to learn about prior to taking the workshop. To continue to enhance teacher competence in two-stroke small engines, it is recommended to provide additional professional development opportunities that continue to build upon the knowledge gained in the workshop.

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