Research

Teaching Enhancement through Agricultural Laboratories Workshop: Effects on Self-Efficacy and Intent to Teach Agricultural Sciences

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Introduction

Many secondary students incorrectly perceive agriculture as being a production-oriented, labor-intensive industry, offering few opportunities for science, technology, engineering, and math (STEM) careers (National Research Council, 2009; STEM Food and Ag. Council, 2014). Thus, students interested in STEM often do not consider agriculture as a viable career option (Smith, Rayfield, & McKim, 2015). Infusing STEM instruction into school-based agricultural education (SBAE) programs is both a national priority (Stripling & Ricketts, 2016) and an effective method of countering misperceptions by teaching students about cutting-edge science applications and related career opportunities in the agricultural sciences (Stubbs & Myers, 2015). However, the very nature of rapidly occurring advances in the agricultural sciences, coupled with an aging teacher workforce, limits agriculture teachers' direct experience with and knowledge of modern agricultural sciences (Boone & Boone, 2007). Educators cannot teach what they do not know.

In the context of curricula, the theory of planned behavior (Ajzen, 1991) posits teachers' decisions about whether to teach particular topics (in this case, agricultural sciences and associated careers) are dependent on their attitudes toward the topics, their perceived control over teaching the topics, and their subjective norms regarding these topics. Researchers (Johnson & Wardlow, 2017; Paulsen, Han, Humke, & Olde, 2014) have found teacher workshops are effective in enhancing self-efficacy in teaching STEM topics, making teachers more likely to incorporate these topics into the curriculum. The purpose of this study was to determine the effects of a two-week, immersive workshop on teachers' self-efficacy and intent to teach agricultural sciences and agricultural science careers.

Methods

The population for this study included Arkansas and Missouri agriculture and science teachers ($N = 12$) participating in a two-week inservice workshop in summer 2017. Participants spent approximately 70% of their time in university agricultural science labs learning from and working with faculty researchers on cutting-edge science related to avian immunology, animal health, biosecurity, reproductive physiology, and genetics. Teachers spent the remainder of their time working with university teacher educators to design related lessons and laboratory activities appropriate for use in high school agriculture classes. One the final day of the workshop, teacher teams presented their lessons and activities to other participants and project staff for constructive criticism and feedback. At the conclusion of the workshop, teachers completed two instruments (based on the Science Teaching Efficacy Beliefs Instrument [Enochs & Riggs, 1989]) measuring their perceptions of and intent to teach about agricultural sciences and agricultural science careers. Each instrument contained 10 Likert-type items with a retrospective pretest (Gouldthorpe and Israel, 2013) and a traditional post-test. Nine summated items measured pre- and post-workshop self-efficacy toward teaching agricultural sciences (or agricultural science careers) and one stand-alone item measured teachers' intent to teach agricultural sciences (or agricultural science careers) in the next school year. Summated scale reliabilities ranged from .74 to .80. Eleven participants (92%) completed the evaluation instruments; one participant left early due to a family emergency. Data were analyzed using descriptive statistics; Cohen's *d* (Cohen, 1988) was used to describe the magnitude of changes in self-efficacy or intent to teach agricultural sciences and agricultural science careers.

Results

Workshop participants developed increased levels of self-efficacy toward teaching both agricultural sciences and agricultural science careers because of workshop participation (Table 1). Mean scores for self-efficacy in teaching agricultural sciences moved from essentially neutral on the four-point scale to positive, while self-efficacy in teaching agricultural science careers moved from neutral to somewhat positive. The Cohen's *d* for each indicated a large effect (Cohen 1988) for workshop participation on teacher self-efficacy.

Table 1. *Effects of Workshop Participation on Teachers' Self-Efficacy in Teaching Agricultural Sciences and Agricultural Science Careers*

	Pretest		Posttest		
Attitude toward teaching:	*M*	*SD*	*M*	*SD*	Cohen's *d*
Agricultural sciences	2.58	0.36	3.02	0.34	2.31
Agricultural science careers	2.52	0.38	2.85	0.41	1.67

Note. Based on a four-point (1 = strongly disagree and 4 = strongly agree) Likert-type scale.

Participants expressed a somewhat increased intent to teach both agricultural sciences and agricultural science careers because of the workshop (Table 2). However, the pretest means indicated teachers strongly agreed they would teach both topics prior to completing the workshop; workshop participation only slightly increased their level of agreement. The Cohen's *d* for each indicated a small to medium effect (Cohen, 1988) for workshop participation.

Table 2. *Effects of Workshop Participation on Teachers' Intent to Teach Agricultural Sciences and Agricultural Science Careers*

	Pretest		Posttest		
Intent to teach:	*M*	*SD*	*M*	*SD*	Cohen's *d*
Agricultural sciences	3.55	0.52	3.80	0.42	0.47
Agricultural science careers	3.70	0.48	3.80	0.42	0.32

Note. Based on a four-point (1 = strongly disagree and 4 = strongly agree) Likert-type scale.

Conclusions

The two-week intensive workshop was effective in enhancing participants' self-efficacy and intent to teach both agricultural sciences and agricultural science careers. This is consistent with the theory of planned behavior (Ajzen, 1991) in that experiences designed to enhance teachers' attitudes, perceived control, and subjective norms toward new curricular topics increase self-efficacy, which in turn, increases the likelihood of incorporating new topics into the curriculum. These findings are consistent those of Johnson & Wardlow (2017) and Paulsen et al. (2014).

Implications/Recommendations/Impact on the Profession

In addition to increased self-efficacy and intent to teach agricultural sciences and agricultural science careers, this workshop also provided participants with both instructional materials and a professional network to assist in STEM integration. Workshops such as this provide agricultural educators with an effective and proven model for stimulating curricular change in SBAE programs. Future research will follow-up with participants to determine the extent to which they have incorporated agricultural science and agricultural science career topics into their local programs.

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