Research

Agricultural mechanics education exposure levels of entry year, Texas, school-based Agriculture, Food, and Natural Resource teachers

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Introduction

Agriculture, food, and natural resources (AFNR) programs instruct students through three interdependent components that include classroom and laboratory instruction, leadership and personal growth (FFA), and supervised agricultural experiences (SAE) (National FFA, n.d.). Furthermore, agricultural mechanics is one of the curriculum areas taught in an AFNR program. According to the Texas Education Agency (n.d.), the wide range of knowledge and skills for agricultural mechanics courses include: electrical wiring, operating hand and power tools, plumbing, concrete, fencing, cold and hot metal techniques, surveying, power systems, and planning and constructing a project. Saucier and McKim (2011) found that it is crucial for AFNR teachers to be prepared to instruct safely and effectively teach all of the skills related to agricultural mechanics. Sorensen, Lambert, and McKim (2014) found that skilled teachers are crucial to achieving student success; therefore, it is imperative that teachers are prepared properly and participate in professional development opportunities. Additionally, a common problem concerning school-based agriculture education is a large number of teachers leave the profession prematurely (McIntosh, 2017). Blackburn and Robinson (2008) noted that almost half of all novice teachers would change professions during their first seven years of teaching. A review of literature has indicated a variety of research on what agricultural mechanics skills professional development should focus on; however, there is limited research on teacher confidence levels to teach agricultural mechanics curriculum.

Theoretical and Conceptual Framework

To guide this study, Ericsson's Theory of Expertise and Bandura's Theory of Self-efficacy were utilized. *Expertise* refers to the characteristics, skills, and knowledge that differentiates experts and those with less experience (Ericsson, Charness, Feltovich, & Hoffman, 2006). The Theory of Expertise focuses on the characteristics of expert performance and mastery knowledge (Ericsson & Charness, 1994). In almost every domain, including agriculture education, methods of effective training and instruction run parallel with relevant knowledge and techniques (Ericson & Charness). In order for expert performance to be accomplished, 10 years of intense, deliberate performance, initial motivation and interest, proper instruction, instructor feedback, and required resources must all be met (Ericsson, Krampe, & Tesch-Romer, 1993). Furthermore, in order to better teach a student, or an AFNR teacher to master a skill, it is important to understand the requirements that first must be met. Bandura defines self-efficacy as one's beliefs in their own ability to execute a task which impacts an individual's decisions, actions, reactions to complications, as well as their overall level of success (Bandura, 1986). According to Ross, Cousins, and Gadalla (1996), teacher efficacy encompasses an individual teacher's expectation that he, or she, will be able to convey student learning. Through experiences, teachers are better able to develop a stable belief about their own abilities (Ross, 1998) – thus improving confidence. Moreover, teachers who are satisfied that they are successfully teaching their students appear to stay in the profession longer (Blackburn & Robinson, 2008). Furthermore, ones confidence in their own abilities is extremely important

when teaching students how to perform tasks that could be potentially dangerous to themselves as well as others (McKim & Saucier, 2013). McKim and Saucier (2013) further noted that professional development can provide teachers with experiences and information that could in return improve one's self-efficacy in regards to teaching specific curriculum and skills.

Methods

The purpose of this quantitative census was to determine agricultural mechanics exposure levels of entry year, Texas, school-based AFNR teachers during their undergraduate education and to determine their personal, professional, and program demographics. The following research objectives guided this study: (1) Determine the agricultural mechanics exposure levels of entry year, Texas, school-based, AFNR teachers during their undergraduate programs and (2) Determine entry year, Texas, school-based, AFNR teachers personal, professional, and program demographics. The population for this study were all (N = 150) entry year, Texas, school-based, AFNR teachers who attended a three-hour new teacher meeting at the 2018 Texas AFNR teacher professional development conference. Based upon a review of literature, a paper questionnaire was developed, reviewed by a panel of experts (N = 5), and subsequently revised. A pilot test (N = 19) was then conducted with a similar population which resulted in a reliability estimate of .96 for the confidence scale (Cronbach's alpha coefficient). Usable data was collected from 143 teachers for a 95.33% response rate. Based upon the research objectives, data was analyzed using IBM SPSS Statistics 22.

Results

Entry year AFNR teachers in Texas were taught the following top three agricultural mechanics skill areas at their respective undergraduate institutions: *hand tools* (f = 116; 81.10%), *handheld power tools* (f = 116; 81.10%), and *stationary power tools* (f = 114; 79.70%). The least three agricultural mechanics skill areas taught to entry year AFNR teachers in Texas were: *hydraulics* (f = 43; 30.10 %), *modern machinery technology* (f = 38; 26.60%), and *pneumatics* (f = 24; 16.80). Entry year, Texas, school-based, AFNR teachers indicated that they were mostly female (n = 91; 63.6%), had an average age of 26 (M = 26.23; SD = 7.55), of white ethnicity (n = 120; 83.9%), unmarried (n = 87; 60.8%), who completed a Bachelor's degree (n = 126; 88.1%), and who completed a traditional teacher certification program (n = 96; 67.1%). These teachers teach in a rural community (n = 83; 58.0%), work in a two-teacher program (n = 54; 37.8%), completed 9 hours of agricultural mechanics coursework in college (M = 9.40; SD = 9.98), and completed a high school agricultural mechanics course as a student (n = 76; 53.1%). Results of this study should be limited to the responding population in attendance at this early career teacher meeting and do not reflect the entire population of all new AFNR teachers in Texas.

Conclusions, Implications, & Recommendations

Entry-year AFNR teachers had the highest exposure levels to agricultural mechanics skill areas that included hand and power tools and the least exposure to more technology rich agricultural power applications (hydraulics, modern machine technology, and pneumatics) during their undergraduate education. Numerous implicative questions arose from these results

that include: Why were entry level AFNR teachers minimally exposed to technology rich agricultural mechanics skill areas? With minimal exposure to advanced technologies, are teacher's confidence level to instruct these skill areas impacted? These results and others are grounds for more in-depth research in this area. Additionally, teacher educators and professional development providers should considering increasing education to remediate these results.

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