Preservice Agriculture Education Majors' Perceptions of Science Integration: Pilot Test

Kasey Trocke, South Dakota State University
Laura Hasselquist, South Dakota State University

1145 Medary Ave.
Brookings, SD 57006
605-949-2154
kasey.trocke@sdstate.edu
laura.hasselquist@sdstate.edu

Preservice Agriculture Education Majors' Perceptions of Science Integration: Pilot Test

Introduction

Agriculture science or agriscience has seen a rise in agriculture education and many studies have done regarding integration of agriscience (Wilson & Curry, 2011). Conroy and Walker (1998) defined agriscience as "identifying and using concepts of biological, chemical, and physical science in the teaching of agriculture, and using agriculture examples to related these concepts to the student" (pg. 12). Studies have included preservice agriculture teachers' and teachers' perceptions, but a common theme appears for recommendations: better preparation for preservice agriculture educators to integrate science into agriculture (Wilson & Curry, 2011). While preservice agriculture teachers could take more science courses or be offered professional development, the intentions of the preservice agriculture teacher are not determined. "Intentions are assumed to capture the motivational factors that influence a behavior" (Ajzen, 1991). Preservice agriculture teachers' intentions have an influence on the future of agriscience.

Conceptual Framework

When *Understanding Agriculture,* a book that suggested changes to be made in agricultural education that came out in 1988, agriculture classrooms began to shift from vocational practice to a science focus which lead to more integration (Warnick & Thompson, 2007). Scales, Terry, and Torres (2009) noted that while agriculture teachers did feel competent in teaching science in their classrooms, they lacked the needed skills. They suggested teacher preparation programs need to examine the science coursework that preservice agriculture teachers take. Rice and Kitchel (2015) also stated that knowledge limitations include: acquiring content knowledge from college courses for preservice agriculture teachers, applying content to teaching, and how knowledge was acquired. With inservice agriculture teachers feeling the need to integrate more science into their lessons (Rice & Kitchel, 2017) and finding that it takes more time to integrate (Myers & Washburn, 2008), figuring out what can ease the transition for preservice agriculture teachers remains the question. The theory of planned behavior (Ajzen) extends on three items (prior background, social norm, and perceived control) that influence a person's behavior to act. Warnick and Thompson (2007) found the theory of planned behavior had influence with integrating science into agriculture for current teachers. While prior background, social norm, and perceived control determine intentions, all these items have not been assessed with preservice agriculture teachers' intentions to integrate science in one study. Preservice agriculture teachers have been shown to study what they enjoy and want to learn about a science emphasis in agriculture (Rice & Kitchel, 2015). Self-efficacy has been improved for preservice agriculture teachers through mastery and vicarious experiences intentions to integrate science into the classroom (McKim & Velez, 2017). Preservice agriculture teachers also felt that an emphasis in science in agriculture could benefit them (Rice & Kitchel, 2015).

Purpose and Objectives

The purpose of this pilot test is to assess preservice agriculture teachers' perceptions of integrating science concepts into agriculture based on the theory of planned behavior. Data collected through an online survey included: prior background, social norm, and perceived behavioral control. The specific study objectives were: 1. Determine what prior background preservice teachers have with science and agriculture science; 2. Determine the level social norm and perceived control of preservice teachers to integrate science into future lessons.

Methodology

An online survey was administered to preservice agriculture teachers from South Dakota State University. A list of potential participants was obtained from educational experts. An initial email and five follow-ups yielded a response rate of 66.6% (n = 12). Prior background was collected with a checklist of high school and collegiate courses. Social norm and perceived control both used a 6-point Likert scale. Social norm questions were modified from Myers and Washburn's (2008) study looking at science integration in agriculture. An example item was : *I believe agriculture is an applied science* and perceived control used a modified version of the Science Teaching Efficacy Belief Instrument by Riggs and Enoch (1990), with items such as: *I understand science concepts well enough to be effective in teaching secondary science* and *I believe I am able to answer students' science questions*. Face and content validity were done by educational experts at South Dakota State University and students not related to the major and had minor wording changes. Data was analyzed through SPSS from the online survey. Since this was a pilot test, reliability was calculated post-hoc. Cronbach's Alpha for social norm and perceived control were 0.88 and 0.90 respectively.

Results

Table 1

Construct Results	*M*	*SD*
Number of High School Science Courses	4.58	1.16
Number of Collegiate Science/Agriscience Courses	15.58	1.78
Social Norm	4.90	0.60
Perceived Control	4.16	0.81

Note. Items were on a 6-point Likert scale.

Conclusions/Implications/Recommendations

Due to manuscript submission limitations, only the constructs, not individual items, are listed. Since it is a pilot test, the results are not generalizable. Objective 1 focused on prior background preservice agriculture teachers had with science and agriculture science. Students had an average of four science courses in high school and had taken the required science and agriculture courses needed for college graduation. Suggestions for future research include seeking information on how many agriculture courses students took prior to college. Objective 2 focused on determining the social norm and perceived control of preservice teachers to integrate science into future lessons. Social norm was positive with science integration into agriculture, stemming from the belief that agriculture is an applied science and important in classrooms (Rice &Kitchel, 2017). Preservice agriculture teachers' perceived control reported slightly lower on the positive scale, with participants recognizing they were not science integration experts. Future research should include assessing what preservice agriculture teachers need are to improve perceived control beliefs. Finally, future research should use this instrument to assess all agricultural education majors' perceptions of integrating science into agriculture and factors of influence.

References

Ajzen, I. (1991). The theory of planned behavior: Organizational behavior and human decision processes. *Science Direct, 50(*2), 179-211. doi:10.1016/0749-5978(91)90020-t

Conroy, C., & Walker, N. (1999), National Aquaculture Curriculum Evaluation Phase II Final Report. *Journal of Agricultural Education, 40(*3), 1-10.

McKim, A. J., & Velez, J. J., (2017). Developing self-efficacy: exploring preservice coursework, student teaching, and professional development experiences. *Journal of Agricultural Education, 58(*1), 172-185.

Myers, B. E., & Washburn, S. G., (2008). Integrating science in the agriculture curriculum: agriculture teacher perceptions of the opportunities, barriers, and impact on student enrollment. *Journal of Agricultural Education, 49*(2), 27-37.

National Research Council (1998) *Understanding agriculture: New directions for education*. Washington, DC: National Academy Press.

Rice, A. H., & Kitchel, T., (2015). Preservice agricultural education teachers' experiences in and anticipation of content knowledge preparation. *Journal of Agricultural Education,56*(3), 94-104.

Rice, A. H., & Kitchel, T., (2017). Agriculture teachers' integrated belief systems and its influence on their pedagogical content knowledge. *Journal of Agricultural Education, 59*(1), 51-69.

Riggs, I., & Knochs, L. (1990). Towards the development of an elementary teacher's science teaching efficacy belief instrument. *Science Education, 74,* 625-637.

Scales, J., Terry, R. Jr., & Torres, R. M. (2009). Are teachers ready to integrate science concepts into secondary agriculture programs?. *Journal of Agricultural Education, 50*(2), 100-107.

Warnick, B., & Thompson, G. (2007). Barriers, Support, And Collaboration: A Comparison Of Science And Agriculture Teachers' Perceptions Regarding Integration Of Science Into The Agricultural Education Curriculum. *Journal of Agricultural Education, 48*(1), 75-85. doi:10.5032/jae.2007.01075

Wilson, E., & Curry, K. (2011). Outcomes of Integrated Agriscience Processes: A Synthesis of Research. *Journal of Agricultural Education, 52*(3), 136-147. doi:10.5032/jae.2011.03136