

**Agricultural Educators' Adoption of Inquiry-Based Learning:
The Effect of Beliefs about Education, Self, and Context**

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Introduction

Agricultural education courses offer the opportunity for enhanced science learning (Theriot & Kotlik, 2009). Inquiry-based learning (IBL) has the ability to further increase students' research skills, scientific thinking, and reasoning abilities (Batdi, Semerci, & Aslan, 2018; Gormally, Brickman, Hallar, & Armstrong, 2009). However, the adoption of IBL in the agricultural classroom has not been widely researched. Priority area four of the National Research Agenda for the American Association for Agricultural Education states, "Enhanced understanding of learning and teaching environments could result in the development of present-day best practices and research-based pedagogies and technologies that not only meet the goal of agricultural education but also society's greatest challenges" (Roberts, Harder, & Brashears, 2016, p. 39).

Examination of literature demonstrated need for further research to be conducted to determine hindrances to adopting inquiry-based learning in the agricultural classroom. One hindrance to IBL is teachers' need for support and mentorship when implementing IBL (Liu, Lee, & Linn, 2010). Gaining a better understanding of the variables that can impact agricultural educators' adoption of IBL can improve professional development. Voet and De Wever (2018) developed a framework of beliefs concerning the adoption of IBL in regard to history teachers. Their framework posits that teachers' beliefs about education, self, and context impact their adoption of IBL in the classroom. The authors posited that their framework could be utilized in additional domains and thus, the framework was adapted as the theoretical basis for this study.

Purpose and Methods

The purpose was to examine the belief system of agricultural educators about agricultural education, self, and context in regard to their adoption of IBL. The objective addressed was to determine how agricultural educators' beliefs about agricultural education, self, and context of agricultural education influenced their adoption of IBL. The target population was agricultural educators who were active members of the National Association of Agricultural Educators (N=7800) in 2018. Based on the research of Krejcie and Morgan (1970), we determined a sample size of 367 teachers would be appropriate. Recruitment emails were sent to 1673 members, representing the six NAAE regions. The final number of useable respondents was 410.

The instrument developed by Voet and De Wever (2018) was adapted for this study. Data were collected from members of the NAAE using a five-contact e-mail strategy, as suggested by Dillman, Smyth, and Christian (2014). Non-response errors were handled according to the method recommended by Lindner, Murphy, and Briers (2001) with no significant differences found. The quality of the questionnaire was determined through factor analysis and subsequent measures of internal consistency of the resulting scales. Likert scales were used to examine how teachers' beliefs influence the adoption of IBL. Pearson's product moment correlations were used to derive coefficients to describe the relationship between the adoption of IBL, nature of knowledge, orientation to teach substantive knowledge, orientation to teach procedural knowledge, self-efficacy, perceived student ability, and perceived contextual hindrances. Further, based on the entire sample ($n = 410$), SPSS AMOS 24 was used to estimate a structural equation model (SEM). The model contained 44 distinct sample moments, 28 distinct parameters for estimation creating 16 degrees of freedom which met the requirements for SEM (Bowen & Guo,

2012; Ullman, 2013). Following the cutoff criteria by Hu and Bentler (1999), the results of the analysis indicate a good fit: CFI = .97. The root mean square error of approximation indicated a reasonable fit (RMSEA = .07, CI [.04, .09]).

Findings

Respondents represented all six NAAE regions. The absolute fit of the model was statistically significant ($\chi^2 = 31.28$, $df = 11$, $p = .001$), which means these data did not have absolute fit for the model. Therefore, researchers used the relative fit of the model which was acceptable (Hu & Bentler, 1999). The fit indices (CFI = .97; RMSEA = .07) indicated the final model met the criteria for model evaluation (Blunch, 2013; Hooper, Coughlan, & Mullen, 2008; Hu & Bentler, 1999). Together, the six predictors (nature of knowledge (NKO), orientation to teach substantive knowledge (OTS), procedural knowledge (OTP), self-efficacy (SEF), perceived student ability, (PSA) and perceived contextual hindrances (PCH)) accounted for 26.5 percent of the variance in the adoption of IBL. Orientation to teaching procedural knowledge and self-efficacy had significant effects on agricultural educators' adoption of IBL. Teachers' self-efficacy in regard to utilizing IBL was most influential and had a positive effect on their adoption of IBL ($\beta = .37$, $p < .001$). The importance of procedural knowledge goals of agricultural educators also had a positive effect on agricultural educators' adoption of IBL ($\beta = .24$, $p < .001$). The level of education an agricultural educator has obtained had significant effects on their self-efficacy ($\beta = .15$, $p < .001$) and their orientation towards teaching procedural knowledge ($\beta = .10$, $p = .02$). Education level of the agricultural educators had no effect on their orientation to teaching substantive knowledge, perceived student abilities, or perceived contextual hindrances. Further, agricultural educators' self-efficacy had significant effects on their perceived student abilities ($\beta = .22$, $p < .001$). Teachers' perceived student abilities was negatively related to their perceived contextual hindrances ($\beta = -.64$, $p < .001$).

Conclusions, Implications, & Recommendations

Determining how agricultural educators' beliefs about agricultural education, self, and context of agricultural education influenced their adoption of IBL provides valuable input for those who provide programming for teachers. Two factors were found to be predictors of agricultural educators' IBL decision-making: the value of teaching procedural knowledge and their self-perception of competence in implementing IBL activities. Self-efficacy and the inclination to teach procedural knowledge were also found to be connected. These two may be connected as an agricultural educator who is confident in organizing IBL activities would be more likely to spend a greater amount of instructional time with these activities.

Lotter, Rushton, and Singer (2013) discovered that professional development often fails when the beliefs of the teachers are not considered. Past research has documented that, in regard to IBL, professional development has neglected to assess the beliefs of teachers (Capps et al., 2012). Knowing agricultural instructors are more likely to adopt IBL if they feel confident in their abilities to organize IBL activities suggests a need for professional development (Silm, Tiitsaar, Pedaste, Zacharia, & Papaevripidou, 2017). Those who plan and facilitate IBL professional development for agricultural educators should incorporate activities that enhance their knowledge of IBL, give them experience with IBL, and allow time for them to practice adapting their lessons to IBL. By increasing teachers' self-efficacy in creating IBL lessons through professional development, more agricultural educators may begin adopting IBL as a regular part of their instructional practices.

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