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Agricultural Educators' Adoption of Inquiry-Based Learning (IBL): Effects of Beliefs

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Abstract

Agricultural education is responsible for preparing future generations to advance agriculture in a rapidly changing world. How can agricultural education best prepare students to be innovative problem-solvers who can keep up with these changes? Perhaps educators can create learning experiences that allow students to uncover material through their own questioning and experimentation using inquiry-based learning (IBL). The purpose of this study was to examine the effects personal agricultural educators' beliefs about agricultural education, self-efficacy, and context have on adopting IBL. Agricultural educators' adoption of IBL was significantly affected by degree obtained and the agricultural pathway in which they taught. A positive relationship was demonstrated between both IBL adoption and the orientation to teach substantive and procedural knowledge, with the higher correlation between procedural knowledge and the adoption of IBL. A positive relationship existed between agricultural educators' perceived ability to implement IBL and the perceived abilities of their students to complete IBL activities. More than 26 percent of the variance in the adoption of IBL among agricultural educators was explained by variables in the structural equation model of this study. Adoption of IBL by agricultural educators needs further research. However, this study indicates beliefs about education, self, and context do affect the adoption of IBL by agricultural educators. Agricultural educators with higher self-efficacy in creating IBL lessons and greater orientation toward teaching procedural knowledge are more likely to adopt IBL in their classrooms. Programming should be developed that impacts beliefs in a way to encourage adoption of IBL.

Keywords: Inquiry-based learning; agricultural educators' beliefs; agricultural education

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Introduction

In a rapidly changing and growing world, agricultural education has a responsibility to prepare future generations of progressive agriculturists (NRC, 2009). To do this, agricultural educators motivate students to be innovative problem-solvers in order to keep up with the ever-advancing agricultural fields. Inquiry-based learning (IBL) is one method agricultural educators can use to improve students' learning and motivation (Thoron & Burleson, 2014). Across United States educational policy, organizations are encouraging schools to use teaching methods that will encourage students to learn by engaging them in the processes of inquiry used by today's scientists (American Association for the Advancement of Science, 1993; Mullis et al., 2009; National Research Council, 2011). Inquiry-based learning is a student-centered teaching method, widely used in science, that has been shown to have benefits across multiple domains including agriculture, English, history, and science (Levyet al., 2013; Thoron & Myers, 2012). Using inquiry-based learning allows students to make connections across disciplines due to the nature of problem-solving involving science, mathematics, reading, writing, and social studies concepts (Carin & Bass, 2001). With IBL, teachers become the facilitators of learning, allowing students to take responsibility for their own learning outcomes (Donner & Bickley, 1993). The National Research Council (2000) considers IBL to be the optimal teaching method to provide students with opportunities to apply their knowledge in real-world applications.

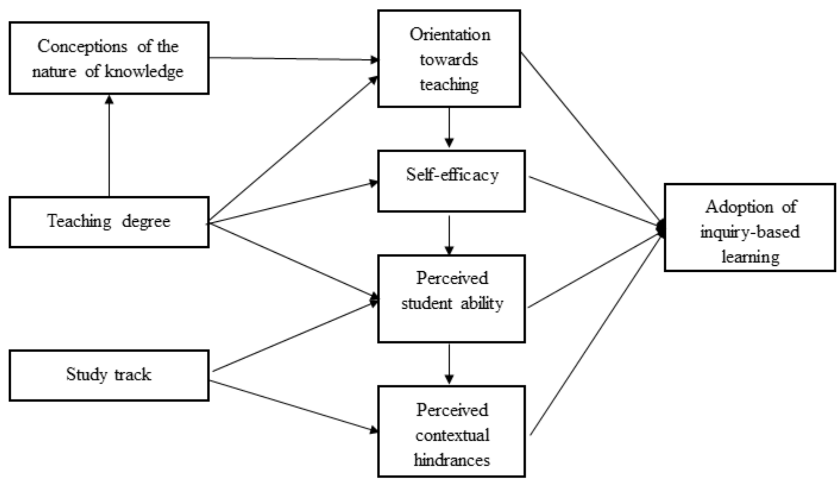
Inquiry-based learning is not new to agricultural education, as components and principles of it have been used through project-based learning, problem-solving, and experiential learning for decades in agricultural classrooms (Baker, et al., 2012; Dyer & Osborne, 1996; Moore, 1988; Phipps, et al., 2008). Even with the plethora of knowledge about the benefits of IBL, many agricultural educators do not incorporate this learning/teaching method into their classrooms (Loucks-Horsley et al., 1998; Voet & De Wever, 2017; Yilmas, 2008). One of the main factors for educators not incorporating IBL is thought to be a lack of familiarity with the procedures involved in inquiry and IBL (Loucks-Horsley et al., 1998; Voet & DeWever, 2017; Yilmas, 2008). According to Voet and De Wever (2019), five activities to familiarize teachers with IBL exist: immersion, explicit-reflective instruction, development of lesson plans, reflection, and extended support. The actions educators take in their classrooms are guided by the educators' beliefs and assumptions (Kagan, 1992; Pajares, 1992; Woofolk Hoy et al., 2006). Further, an educator's beliefs about education mold the decision-making and outcomes in the classroom (Pajares, 1992). Successfully implementing inquiry-based activities in the classroom requires educators to see the value of inquiry, receive encouragement to implement inquiry, and possess the skills necessary to help others understand inquiry as a way of gaining understanding (Welch, et al., 1981). Gaining a better understanding of the variables that can impact agricultural educators' adoption of inquiry-based learning can aid in the development of professional development and pre-service teacher preparation that will better prepare agricultural educators to use IBL in their classrooms. The purpose of this study was to examine the effects personal agricultural educators' beliefs about agricultural education, self-efficacy, and context have on adopting IBL.

Conceptual Framework and Literature Review

The conceptual framework for this study was based on the work of Voet and De Wever (2019) regarding teacher adoption of IBL. Voet and De Wever (2019) developed an explanatory model (Figure 1) that suggests history teachers' adoption of IBL is dependent on their beliefs about education, self-efficacy, and the context in which they teach. This model can be used to investigate the adoption of IBL in other domains, such as agriculture. This study sought to use this framework to determine how agricultural educators' beliefs about education, self-efficacy, and context affect their adoption of IBL.

Figure 1.

Theoretical Framework



Note. Adapted from "Teachers' Adoption of Inquiry-Based learning Activities: The Importance of Beliefs about Education, the Self, and the Context," by M Voet and B. De Wever, 2019, *Journal of Teacher Education, 70*(5), 423-440.

Schoenfeld (1983) suggested a person's behavior is dependent on their beliefs about the task, oneself, and the environment. A person's beliefs were further broken into the dimensions of education, self, and context by Op 't Eynde, et al. (2002). Teaching practices, according to Fang (1996), are influenced by teachers' beliefs about the subject they teach, their students, and their responsibilities as teachers–which influence their teaching practices. Further, researchers have implied teachers' beliefs act as a tool to evaluate decisions made about their teaching methods (Fang, 1996; Shavelson, 1983; Shavelson & Stern, 1981). Pajares (1992) argued teachers' beliefs are an important area for future research for improving teaching methods. Voet and DeWever (2019) suggested the teacher belief systems is further divided into five categories: (a) conceptions of the nature of knowledge; (b) orientation toward teaching; (c) self-efficacy; (d) contextual hindrances; and (e) perceived student abilities.

Purpose

The purpose of this study was to examine the effects personal agricultural educators' beliefs about agricultural education, self-efficacy, and context have on adopting IBL.

Methods

Population and Sample

The target population of this study was agricultural educators who are active members of the National Association of Agricultural Educators (NAAE) (*N*=7800). The National Association of Agricultural Educators is composed of members from six regions across the United States. Members of NAAE are involved in agricultural education at many levels, from middle school through post-secondary, and some serve as state and national agricultural education leaders (National Association of Agricultural Educators, n.d.). The purpose of this organization is to "advocate for agricultural education, provide professional development and work to recruit and retain agricultural educators" (National Association of Agricultural Educators, n.d.).

Based on the research of Krejcie and Morgan (1970), we determined a sample size of 367 teachers was appropriate for this study. A random sample of 600 was selected by staff members of NAAE and represented members of all six of NAAE regions. An initial recruitment email containing a link to a Qualtrics-based questionnarie was sent to each of these 600 members, with 110 usable responses received. As this number was lower than the target sample size, an additional 1200 association members were randomly selected by NAAE staff and sent the same recruitment email to generate the 367 responses needed. Of the 1800 recruitment emails sent, 127 emails were undeliverable. Consequently, 1673 recruitment emails were successfully sent out. A response rate of 24.5 percent yielded 410 usable responses.

Instrumentation and Procedures

Determining the dimensions of belief systems of agricultural educators that explain their adoption of IBL required the identification or development of an instrument. A review of literature led to the discovery of an instrument developed by Voet and De Wever (2019) that was used to capture history teachers' beliefs about education, self, and context, and how it affected their adoption of IBL. Internal consistencies of this instrument's scales were reported as Cronbach's α:Nature of Knowledge = .71, Substantive knowledge = .73, Procedural knowledge= .80, Self-efficacy = .78, Perceived student ability = .72, Perceived contextual hindrances = .83, Adoption of inquiry-based learning = .69 (Voet & De Wever, 2019). Voet gave permission to modify this instrument to address agricultural educators' belief systems about education, self, and context.

The modified instrument addressed the framework items as follows: conceptions of nature of knowledge (4 items), substantive knowledge (3 items), procedural knowledge (3 items), self-efficacy (4 items), perceived student ability (3 items), perceived contextual hindrances (4 items), and adoption of IBL (4 items). Each of these items employed a six-point Likert scale. The nature of knowledge, perceived student abilities (reverse-coded), and perceived contextual hindrances had Likert scale choices ranging from 1 = *completely disagree* to 6 = *completely agree*. Substantive and procedural knowledge had Likert scale choices ranging from 1 = *very unimportant* to 6 = *very important*. Self-efficacy items had Likert scale choices ranging from 1 = *completely unable* to 6 = *completely able*. Finally, the adoption of inquiry-based learning had Likert scale choices ranging from 1 = *never* to 6 = *very often*.

A pilot test of 35 pre-service agricultural educators from Texas Tech University and New Mexico State University was conducted to determine the readability and perceived appropriateness of the modified instrument. Based on the lack of questions or concerns about the instrument and the completion rate, we determined the instrument had acceptable readability. Internal consistencies of this instrument were reported from the pilot study as Cronbach's α, Nature of Knowledge = .50, Substantive knowledge = .53, Procedural knowledge= .77, Self-efficacy = .81, Perceived student ability = .74, Perceived contextual hindrances = .67, Adoption of inquiry-based learning = .96. Kline (1999) stated Cronbach's α below .70 are acceptable when dealing with psychological constructs. Nunnally (1978) suggested values even as low as .50 are acceptable in the beginning of research; therefore, it was determined that the modified instrument was sufficiently reliable in this study.

Data Collection

Data were collected from members of the NAAE, inclusive of both secondary and post-secondary agricultural educators. A link to the questionnaire was distributed via email to participants between November 1, 2018, and January 31, 2019. A five-contact e-mail strategy, as suggested by Dillman et al. (2014) was utilized. Early morning has been identified by Dillman et al. (2014) as the best time to distribute emails; therefore, emails were sent in the early morning. The participants' routines were also considered when selecting days for distribution because no day of the week has been determined to elicit a significantly greater response rate (Dillman et al., 2014; Shinn et al., 2007). Therefore, links to the questionnaire were sent out at 6:00 am MST on various days of the week. Individuals who completed the questionnaire but did not respond to questions imperative to the study were removed and were not a part of the 410 surveys analyzed. Non-response errors were handled using a method recommended by Lindner, et al. (2001). Early respondents were compared to late respondents, defined as those who responded to the survey after the third or fourth reminder. Nature of knowledge (NKO), orientation toward teaching substantial (OTS) and orientation toward teaching procedural (OTP), self-efficacy, perceived student ability, perceived conceptual hindrances (PCH), and adoption of IBL were compared based on early or late response using an independent t-test; no significant differences were found.

Instrument Validation

The quality of the questionnaire was determined through factor analysis and subsequent measures of internal consistency of the resulting scales. To accomplish this, objective data were subjected to an exploratory factor analysis (EFA) and confirmatory factor analysis (CFA).

Exploratory factor analysis was carried out utilizing SPSS 24 with maximum-likelihood estimation and rotation through oblique Promax as recommended by Costello and Osborne (2005) and Fields (2013). The Kaiser-Meyer-Olkin test indicated the sample was adequate for conducting an EFA (KMO = .87). Fields (2013) indicated KMO values closer to 1.00 indicate a compact pattern of correlations; therefore, a factor analysis should yield reliable factors. Barlett's test confirmed the relationship of the items being investigated ($\chi^2 = 4041.27$, $df = 300$, $p < .001$). Fields (2013) cautioned that the Barlett test is likely to be significant due to the large sample size of factor analysis; however, it should be checked in the unlikely event that it is non-significant. The number of factors to be retained was determined by identifying Kaiser's eigenvalues greater than 1.00 and

Catrell's Scree test as recommended by Courtney (2013). The eigenvalues pointed to a six-factor structure, which was confirmed by the Catrell's Scree test.

Confirmatory factor analysis was conducted using SPSS AMOS 24 to determine if the data had a good fit index. According to Hu and Bentler (1999), the criteria for a good fit are CFI and TLI ≥.95, and RMSEA ≤ .06. The results indicated a good fit (comparative fit index [CFI] = .96; Tucker-Lewis index [TLI] = .95; root mean square error of approximation [RMSEA] = .040. The CFA yielded a six-factor structure instead of the seven-factor structure used by Voet and DeWever (2019) with history teachers. This six-factor structure arose by combining perceived contextual hindrances and perceived student abilities. For the purposes of this study, we decided to keep the seven factors of the original instrument to compare our results directly with those of Voet and DeWever.

For each scale, the data were used to calculate Cronbach's α Table 1 presents the internal consistency of the scales for the original Voet and DeWever (2019) data and for the data for this study. Data from this study yielded a Cronbach's α for nature of knowledge scale of .63 that could be considered low; however, Kline (1999) suggested lower numbers can be accepted if items are not dealing with abilities, but psychological constructs. Further, Nunnally (1978) suggested when first beginning research, numbers as low as .5 are acceptable. The survey instrument was deemed acceptable as the coefficient *alpha* numbers were also similar to those reported for the seven scales of the original instrument. It is recognized that the current study resulted in three constructs with lower Cronbach's α than the orginal Voet and DeWever (2019) instrument, the interpretation of these results should be approached with caution.

Table 1.

Internal Consistency of the Scales Measured by the Survey Instrument.

Scale	Items	Cronbach's α Voet & DeWever (2019)	Cronbach's α Current Study
Nature of knowledge	4	.71	.63
Orientation to teaching substantive	3	.73	.71
Orientation to teaching procedural	3	.80	.76
Self-efficacy	4	.78	.85
Perceived student ability	3	.72	.77
Perceived contextual hindrances	4	.83	.85
Adoption of inquiry-based learning	4	.69	.85

Note. Cronbach's α values of .7 to .8 are generally acceptable; however, for psychological constructs, values as low as .5 are acceptable (Nunnally, 1978).

Analysis Leading to Structural Equation Model

Likert-type scales were used to measure teachers' beliefs and examine how teachers' beliefs influenced the adoption of IBL. Pearson's product moment correlations were used to describe relationships 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 sample of school-based agricultural educators ($n = 410$), SPSS AMOS 24 was used to produce a structural equation model. Structural equation modeling consists of: (a) model identification, (b) model estimation, and (c) model evaluation (Ullman, 2013). Discovering if the number of distinct elements is exceeded by the number of estimated parameters in the model is model identification (Ullman, 2013). The number of distinct elements is calculated by using $p[p + 1]/2$, with p representing the measured variables. Structural equation models account for the observed variable and the latent variable (unobserved variables); however, there are still structural errors (Bowen & Guo, 2012). Structural errors are the variance in the variable that is not explained by the predictor variables (Bowen & Guo, 2012). Missing values were handled using full-information maximum likelihood, which Bowen and Guo (2012) recommend.

Twenty-five measured variables were represented in the model. Specifically, four items for nature of knowledge, three items for orientation toward teaching substantive knowledge, three items for orientation toward teaching procedural knowledge, four items for self-efficacy, three items for perceived student ability, four items for perceived contextual hindrances, and four items for adoption of inquiry-based knowledge with 325 distinct elements. The model contained 44 distinct sample moments, 28 distinct parameters for estimation, creating 16 degrees of freedom that met the requirements for SEM (Bowen & Guo, 2012; Ullman, 2013). Following the cutoff criteria recommended by Hu and Bentler (1999), 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]).

Results

Profile of Respondents

Respondents for this study were secondary and post-secondary agricultural educators who were members of National Association of Agricultural Educators (NAAE). A large majority of respondents ($f = 381$: 93.2%) taught at the secondary level, with 6.8% ($f = 28$) of the responses from agricultural educators at the post-secondary level. Those teaching at secondary schools were divided into two Groups: those who taught grades 9-12 and those who taught grades lower than ninth. These data are displayed in Table 2.

Table 2.

Grade Levels Taught by Respondents.

Grades/Level Taught	Frequency	Percent
Below 9	130	31.7
9-12	251	61.2
Post-Secondary	28	6.8

Note. $N = 409$. One respondent did not submit a response to this item.

All six regions of NAAE were represented, and a description of the sample by region is shared in Table 3. Based on the presence of responses from each region, agricultural educators from across the United States were represented in this study.

Table 3.

Respondent Frequencies by NAAE Region.

NAAE Region	*f*	Percent
1	96	23.4
2	80	19.5
3	60	14.6
4	58	14.1
5	83	20.2
6	33	8.0

Agricultural educators with bachelor's, master's, and doctoral degrees were represented among the respondents. Most respondents had a master's degree (*f* = 227: 55.4 %), with 40.7% (*f* = 168) possessing a bachelor's degree, and 3.7% (*f* = 15) possessing a doctorate. Experience teaching ranged from 1 to 43 years.

Goals of Agricultural Educators

We asked respondents to rank four learning outcomes for their students from most to least important to determine goals agricultural educators find most important for their students. Table 4 presents the study's findings regarding teachers' goals for their agricultural education students. For this section of the questionnaire, *N* = 362 due to missing data from 48 respondents. For a plurality of agricultural educators in this study, the primary goal was for all students to be able to demonstrate a balanced development of knowledge and skills and the ability to identify, analyze and critique information sources. Agriculture students' ability to tackle new content (i.e., answering a research question based on an analysis of information sources), drawing on facts from agricultural lessons was ranked second by a plurality. Developing a technical skill which can be utilized in the agricultural workforce was most often ranked as third, while knowing history and facts about FFA and agricultural industries and being able to relate changes within the industry to common events in history was overwhelmingly ranked fourth.

Table 4.

Respondents Rankings of Four Goals Related to Teaching Agriculture.

	Number of instructors ranking			
Description of goal	1	2	3	4
Students are able to demonstrate a balanced development of knowledge and skills, and are able to identify, analyze, and criticize information from sources.	189	105	62	6
Students are able to tackle new content which means answering a research question based on an analysis of information sources, drawing on facts from agricultural lessons.	70	124	110	58
Students develop a technical skill which can be used in the agricultural workforce.	84	105	131	42
Student knows the history and facts about FFA and agricultural industries and is able to relate changes within the industry to common events in history.	19	28	59	256

Note. *N* = 362. Ranking was not provided by 48 respondents.

Agricultural educators were asked to identify what approach they found most effective taking time and student abilities into consideration. Table 5 displays findings for agricultural educators' identification of the approach they believe to be most important for effective teaching. There were 403 responses for this item, with 7 respondents not answering. Agricultural educators were asked to choose the statement that most closely represented their belief about teaching effectively, taking available time and student ability into account. Most instructors (68.7%) indicated teaching effectively required giving students ample time and opportunities to observe, discover, and ask questions about important facts, concepts, and skills. Students must apply, experiment with, and compare what they observe with facts and concepts to achieve understanding. Twenty-two percent of surveyed instructors also indicated in order to teach effectively, it is necessary to provide sufficient support for learning by effectively alternating between an analysis of information sources and plenary sessions, reciprocal teaching, and feedback. Finally, 9.2% believed the most logical and effective approach was to explain the most important facts, concepts, and skills in a clear and structured way and to ensure that underlying relationships are clear.

Table 5.

Agricultural educators' Selections for Approaches to Teaching Effectively.

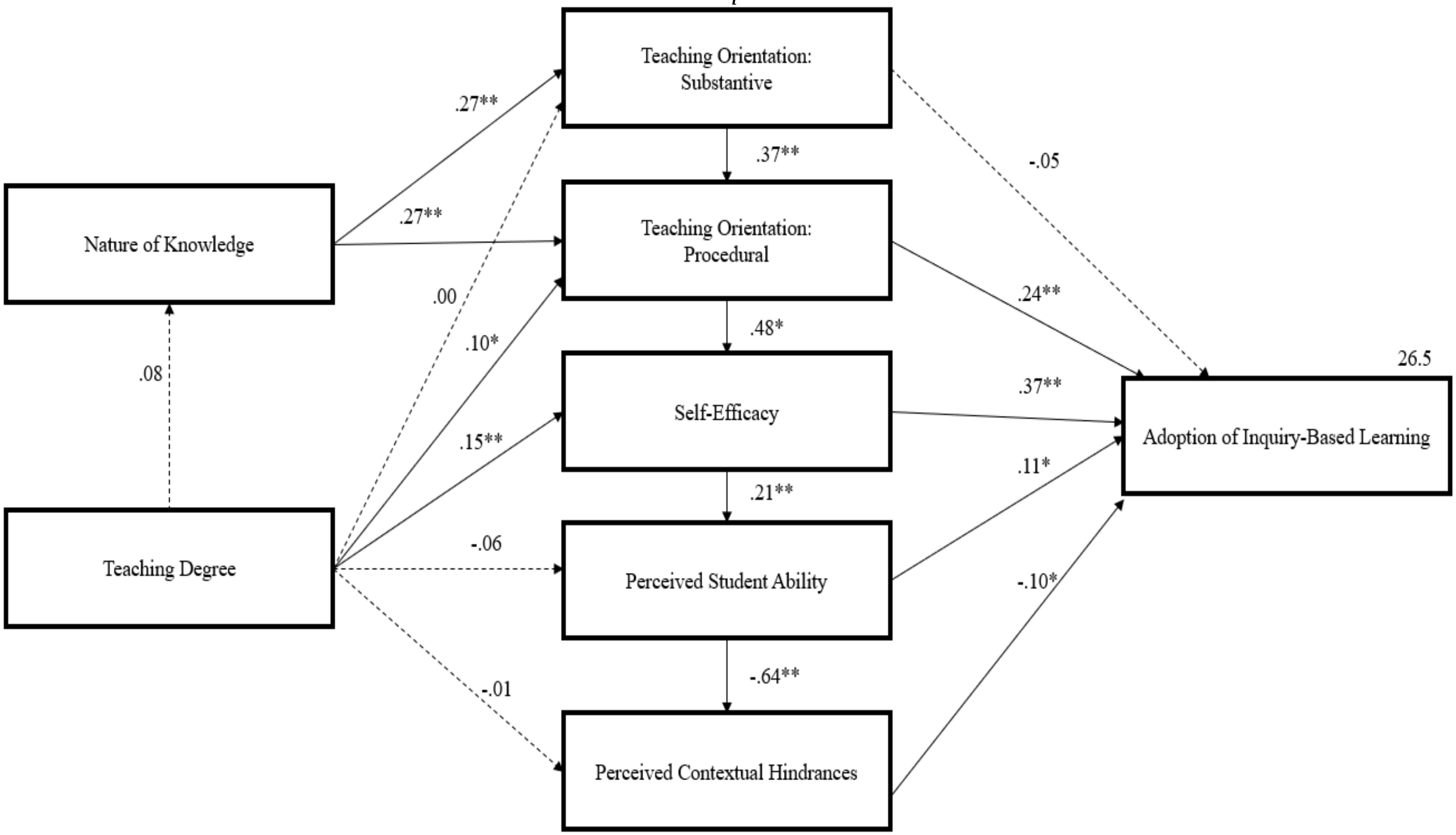
Statement About Teaching Effectively	*f*	Relative %
It is necessary to give students time and opportunities to observe, discover, and ask questions about important facts, concepts, and skills. Students have to apply, experiment with, and compare them to achieve understanding.	277	68.7
It is important to provide sufficient support for the learning of facts, concepts, and skills, by effectively alternating between an analysis of information sources and plenary sessions, reciprocal teaching, and feedback.	89	22.1
The most logical and effective approach is to explain the most important facts, concepts, and skills in a clear and structured way and to ensure that underlying relationships are clear.	37	9.2

Note. *N* = 403. Seven respondents did not answer this item.

Influence of Agricultural Educators Beliefs on IBL Adoption

Findings for the correlations among the scales further encouraged the use of the conceptual model of Voet and DeWever (2019). The Voet and DeWever (2019) model was utilized for creation of the structural equation model (SEM) for this study, and the SEM is presented in Figure 3. The absolute fit of the model was statistically significant (χ^2 = 31.28, df = 11, p = .001), which means these data did not have absolute fit for the model. Therefore, researchers utilized the relative fit of the model that 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 et al., 2008; Hu & Bentler, 1999).

Figure 3.
Structural Equation Model.



Note: Dashed lines indicate nonsignificant effects; *p < .05; ** p < .001

Together, the six predictors explained 26.5 percent of the variance in the adoption of IBL. They were nature of knowledge (NKO), orientation to teach substantive knowledge (OTS), orientation to teach procedural knowledge (OTP), self-efficacy (SEF), perceived student ability, (PSA) and perceived contextual hindrances (PCH). 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 in this model and had a positive effect on their adoption of IBL ($\beta = .37$, $p < .001$). The importance of procedural knowledge goals of agricultural educators (learning about the foundations and reasoning) also had a positive effect on agricultural educators' adoption of IBL ($\beta = .24$, $p < .001$). Orientation to teach substantive knowledge, perceived student ability, and perceived contextual hindrances had no significant effects on agricultural educators' adoption of IBL. Perceived student ability ($\beta = -.09$, $p = .06$) and perceived contextual hindrances ($\beta = -.09$, $p = .06$) were negatively related (descriptively) to agricultural educators' adoption of IBL; however, the relationships were not statistically significant.

Agricultural educators' value of substantive and value of procedural knowledge were significantly influenced by their ideas about the nature of knowledge (respectively, $\beta = .27$, $p < .001$ and $\beta = .37$, $p < .001$). The level of education of agricultural educator had significant effects on their self-efficacy ($\beta = .15$, $p < .001$) and on their orientation toward 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 perceptions of student abilities ($\beta = .22$, $p < .001$). Teachers' perceptions of student abilities were negatively related to their perceived contextual hindrances ($\beta = -.64$, $p < .001$).

Conclusions, Discussion, and Recommendations

The number one goal of agricultural education teachers is to provide students with a balanced education including both knowledge and skills that allow the students to solve problems. Further, agricultural educators recognize the value of giving students the opportunity to observe, discover, and ask questions on their own. However, agricultural educators provide these opportunities to their students only sporadically.

The structural equation model created through this research explained 26.5% of the variance in NAAE agricultural educators' adoption of IBL. The strongest predictors of adoption were agricultural educators' beliefs about their self-efficacy, procedural knowledge, student abilities, and contextual hindrances. When analyzed together these findings lead to some important implications for practicing agricultural educators' professional development, as well as agricultural education research on implementing IBL.

Teacher self-efficacy is the teachers' belief in their capability to reach certain goals (Tschannen-Moran & Hoy, 2001). Self-efficacy has been postulated to be the determining factor in the environment created by a person (Lent, et al., 1994). The most influential predictor of IBL adoption in this study was self-efficacy. Beliefs of an agricultural educator about self-efficacy regarding IBL will in turn affect the classroom environment they create. Bandura's social cognitive theory postulates a strong sense of self-efficacy is necessary to effectively complete difficult or challenging tasks (Bandura, 1991). Teachers with higher self-efficacy have a more positive attitude toward utilizing inquiry in their classrooms (Silm, et al., 2017). Increasing agricultural educators' self-efficacy with utilizing IBL can lead to increased adoption of IBL in agricultural classrooms. McKim, et al. (2017) suggested that agricultural educators' self-efficacy could be improved by observing another educator successfully implementing the strategy. There is a need for further research to determine if professional development centered around successful modeling of IBL in the classroom could improve agricultural educators' self-efficacy when implementing IBL.

Epistemological beliefs are important to academic experiences because they influence the reasoning and judgment of both students and educators (Hofer, 2001). Husbands (2011) suggested that instructors who placed a higher priority on procedural knowledge would be more likely to engage their students in reasoning activities. Procedural knowledge in this context refers to students understanding the concepts that allow them to participate in inquiry about agricultural topics. Professional development focused on the benefits of procedural knowledge over substantive knowledge could improve adoption of IBL in agricultural classrooms.

Teachers' beliefs about their self-efficacy in teaching students is positively linked to their perception of students' abilities (Ashton & Webb, 1986). Therefore, it is understandable that an agricultural educator's beliefs about self-efficacy and student abilities both affect the adoption of IBL. Teachers' perceptions of students' abilities have been found to be one of the major barriers to IBL activities (Van Hover & Yeager, 2003). Teachers often hold certain beliefs about their students which influence the teaching methods that are utilized in the classroom (Fang, 1996), affecting their instructional practices and expectations of the students (Good & Brophy, 2003; Woolfolk, 2004). The way teachers perceive their students' abilities impacts their self-efficacy; more research is needed in this area.

Incorporating inquiry-based instruction into the agricultural classroom brings with it many challenges for both teachers and learners (Edelson, et al., 1999; Luft & Roehrig, 2007; Quigley, et al., 2011), as implementing IBL does not happen without teachers developing their own beliefs about hindrances. When implementing IBL into the agricultural classroom, teachers adapt their current content to the new methodology (Blythe et al., 2015). However, agricultural teachers reported that IBL opportunities took longer to plan and prepare than traditional teaching methodologies (Blythe et al., 2015). Dorier and Garcia (2013) found teachers' self-perceived role in the classroom and the training they received could be a hindrance to implementing IBL in the mathematics classroom. DiBaise and McDonald (2015) found that science teachers believed class size, accountability, curricular demands, and lack of support from their administration were the biggest hindrances to implementing IBL. Furthermore, Edelson et al. (1999) found five common hindrances to IBL: motivation, accessibility, background knowledge, practical constraints, and organizing and managing open-ended inquiry. Gaining a more thorough understanding of how teachers' beliefs about hindrances affect their adoption of IBL in the agricultural classroom allows for the creation of professional development and pre-service trainings. There is a need to understand the intricacies of the hindrances to utilizing IBL as a teaching strategy that have been identified in order to effectively address them. Future research opportunities exist to explore these hindrances and aid in the development of appropriate resources to assist agricultural educators.

Understanding how beliefs of agricultural educators guide their use of IBL provides us with a framework for developing valuable professional development and pre-service agricultural teacher education courses. If we want agricultural educators to utilize IBL in their classrooms, we must give them the necessary tools, training, and confidence.

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