Journal of Agricultural Education, 61(1), 235-246
https://doi.org/10.5032/jae.2020.01235

Secondary Students' Perceptions of Inquiry-based Learning in the Agriculture Classroom

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Abstract

Inquiry-based learning supports constructivism theory and has been used by both Comenius (1592-1670) and Dewey (1859-1952) in early educational settings. Incorporating inquiry-based instruction into the agriculture classroom, while beneficial, brings with it challenges for teachers and learners. Numerous studies have been conducted to examine teachers' perceptions of inquiry-based instruction and its benefits. However, limited research has investigated agriculture students' perceptions about inquiry-based learning on their educational growth. The purpose of this study was to explore the perceptions of secondary students transitioning to and using inquiry-based instruction in their agriculture classes. A phenomenological approach was employed to examine the lived experiences of secondary agriculture students' who had utilized inquiry-based instruction. The phenomenon under investigation was inquiry-based instruction. We conducted qualitative interviews with a convenience sample of 24 secondary agriculture students to explore their perceptions of the inquiry approach. Findings revealed students describe inquiry as "hands on," a method requiring they work by themselves, and activities involving questions. Students indicated a preference for inquiry-based learning opportunities and expressed awareness of the potential for inquiry-based learning opportunities to improve their critical thinking skills. Documentation of secondary students' perceptions about inquiry-based learning opportunities provide instructors insight to guide instruction within the agriculture classroom.

Keywords: inquiry-based learning; agriculture; science; student perceptions; secondary students

Introduction

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" (Edgar, Retallick, & Jones, 2016, p. 39). Knowing how students perceive their learning environments when teachers use inquiry-based activities can aide in developing effective instruction within agriculture classrooms. If students perceive their learning environment as conducive to learning and supportive to their learning needs, they can experience an increase in achievement in a course (Baek & Choi, 2002; Boz, Yerdelen-Damar, & Belge-Can, 2018; Kingir, Tas, Gok & Vural, 2013) and are more likely to employ higher-order learning strategies (Dart et al., 1999; Eley, 1992; Entwistle & Tait, 1990; Karagianopoulon & Christodoulides, 2005; Ozkal, Tekkaya, Cakiroglu, & Sungur, 2009).

Inquiry-based instruction, while reported as valuable, has also been found to be accompanied by challenges (Edelson, Gordin, & Pea, 1999). Maaß and Artigue (2013) reported that the way

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inquiry-based learning is disseminated and implemented will ultimately impact learning. Scientific inquiry, according to the National Research Council (1996), encompasses the ways scientists study the phenomena of the natural world in order to put forward explanations for the phenomena based on the evidence they have collected and analyzed. Further, the National Research Council (1996) describes an inquiry-based learning opportunity as:

> A multifaceted activity that involves making observations; posing questions; examining books and other sources of information to see what is already known; planning investigations; reviewing what is already known in light of experimental evidence; using tools to gather, analyze, and interpret data; proposing answers, explanations, and predictions; and communicating the results. Inquiry requires identification of assumptions, use of critical and logical thinking, and consideration of alternative explanations. (p. 23)

Many of the recent Common Core Standards stress critical-thinking, problem-solving, and analytical skills, which are components of inquiry-based learning (National Governors Association, 2010). Inquiry-based learning has been found to be effective across different domains, such as agriculture, English, history, and science (Levy, Thomas, Drago, & Rex, 2013; Thoron & Myers, 2012). Levy et al. (2013) found inquiry-based leaning allowed science students to engage in conversations with their teachers about the validity of the chosen data collection method, while inquiry-based learning in history classrooms increased students' ability to analyze information. Levy et al. (2013) also indicated that inquiry-based learning in English classrooms allowed students to witness different ethical positions. Thoron and Myers (2012) found inquiry-based lessons in the agriscience classroom improved students' scientific reasoning abilities and Teig, Scherer, and Nilsen (2018) discovered a positive relationship between students' achievements in science classes and inquiry-based learning. The synthesis of 138 studies with a focus on inquiry-based learning by Minner, Levy, and Century (2009) revealed notable findings. They documented that inquiry-based learning had a positive effect for students which included content knowledge acquisition, retention of content, and conceptual understanding. Further, Blythe, DiBenedetto, and Myers (2015) documented that teachers who received inquiry-based training reported their students struggled in the beginning when implementing such instruction into the agriculture classroom but students learned more with inquiry-based methods than with traditional teaching methods once the students were familiar with the method.

Numerous studies have been conducted to examine teachers' perceptions and attitudes about inquiry-based instruction (Blythe et al., 2015; DiBiase & McDonald, 2015). Voet and De Wever (2018) found history teachers' adoption of the inquiry-based approach was significantly impacted by their self-efficacy related to organizing inquiry-based learning activities and the perceived hindrances of implementing these activities. Further, Thoron, Myers, and Abrams (2011) found, with proper training, agriculture teachers have positive attitudes towards utilizing inquiry-based instruction.

Agriculture classes naturally lend themselves to inquiry-based learning. However, incorporating inquiry-based instruction into the agriculture classroom brings with it many challenges for both teachers and learners (Edelson et al., 1999; Quigley, Marshall, Deaton, & Cook, 2011; Roehrig & Luft, 2007). While studies have been conducted to understand student perceptions of inquiry-based instruction, most of these cases were focused on post-secondary students, not secondary students. Akpulluku and Gunay (2015) conducted a case study about secondary science students' perceptions of inquiry-based learning unveiling that students enjoy inquiry-based learning and understand the importance of learning by doing. Students have a more favorable opinion of agriscience and have positive responses regarding the importance of agriculture when taught through inquiry-based learning activities (Thoron & Burleson, 2014). Post-secondary business students were more involved in learning and had increased knowledge when faculty used inquiry-based learning (Zafra-Gomez, Roman-Martinez, & Gomez-Miranda, 2015). However, little research has been

conducted investigating the perceptions of secondary agriculture students of inquiry-based learning in regards to their educational growth. As the momentum to implement more science into agriculture classrooms continues, there is a need to understand students' perceptions in order to better prepare teachers to utilize the inquiry-based approach and develop classroom strategies that encourage student participation. This will, in turn, guide instructors as they help students gain the necessary science knowledge and skills. Knowing students' perceptions about how they learn most efficiently will help educators improve students' educational experiences.

Theoretical Framework

Inquiry-based learning literature, which is rooted in the theory of constructivism, served as the theoretical framework for our study. Constructivism emerged from the works of Piaget's Theory of Cognitive Development and Vygotsky's Sociocultural Theory, which indicate students' knowledge schemes are modified through activities, problem solving, and discussion (Driver, Asoko, Leach, Mortimer, & Scott, 1994; Schunk, 2004). In science classrooms, students use constructivism to interpret experiences that lead to the discovery of meaning and the development of understanding (Palmer, 2005). According to Schunk (2004), the goal of constructivism is to provide students with an environment that motivates them to learn. Teaching strategies based on constructivism provide students with experiences, which allow them to develop their own knowledge schemes. Constructivist instructional methods include discovery learning, inquiry teaching, and peer-assisted learning (Schunk, 2004). Learners involved in inquiry-based learning construct their own mental representation of material, selecting relevant information, and interpreting the gathered information based on existing knowledge, which, according to Shuell (1993), is the basis of constructivism.

Purpose and Research Questions

The purpose was to describe perceptions about inquiry-based instruction of secondary agriculture students who had been exposed to inquiry-based instruction in their agriculture classes. The following research questions guided this study:

1. How do agriculture students define inquiry-based learning?
2. What perceptions do agriculture students have about the effectiveness of inquiry-based learning in improving their retention and learning of material?
3. How do agriculture students perceive inquiry-based learning can impact their critical thinking skills?
4. How do agriculture students perceive the use of technology could improve inquiry-based instruction?

Methods

Merriam and Tisdell (2016) support the use of a basic qualitative approach when the purpose of the study involves gaining a better understanding of individuals' interpretation and meaning of their experiences. Yin (2016) describes five aspects that distinguish qualitative research: the study of people within their real world, representing participants' views, accounting for context, considering insight or concepts to explain thinking and or behavior, and use of multiple sources of evidence. Thus, a phenomenological approach was utilized to examine the lived experiences of secondary agriculture students who had utilized inquiry-based instruction. Institutional Review Board approval was received to conduct the study.

Examination of students in secondary agriculture classrooms regarding their perceptions of inquiry-based learning, after exposure to the method, was sought to gain a deep understanding of student perspectives. The use of phenomenological research allowed the description of "the common

meaning for several individuals of their lived experiences of a concept or a phenomenon" (Creswell & Poth, 2018, p. 75). The phenomenon under investigation was inquiry-based instruction. The population was agricultural education secondary students who were under the direction of the same agricultural education teacher with training in inquiry-based learning. The study used convenience sampling in order to obtain a sample of students who had been exposed to the same learning environment and experiences with inquiry-based learning. The initial case sampling consisted of a purposive sample of 67 students enrolled in agriculture classes that included components of inquiry-based learning at a New Mexico secondary school. Of the 67 students, 24 returned parental consent and minor consent to be interviewed. The students included sophomores, juniors, and seniors enrolled in courses including animal science, horticulture, and career development. Students had received inquiry-based learning opportunities over an eight-month prolonged engagement. These inquiry-based learning opportunities were designed by the agricultural educator using the "Essential Features of Classroom Inquiry and their Variations" chart from the National Research Council (2000) which involves making sure each inquiry-based learning opportunity contains the following features: "a) learner engages in scientifically oriented questions; b) learner gives priority to evidence in responding to questions; c) learner formulates explanations from evidence; d) learner connects explanations to scientific knowledge; and e) learner communicates and justifies explanations" (p. 29). Each of the five essential features of an inquiry-based classroom can be learner-directed or teacher-driven depending on the needs of the particular lesson and class.

The 24 students were interviewed individually during the school day. Each interview lasted approximately four minutes and consisted of six questions. The length of the interview was based upon students' willingness to express their thoughts about inquiry-based learning. As the students answered the questions, their answers were transcribed and member checking was performed by immediately soliciting feedback from each student regarding interpretation of what was shared. If students indicated limited understanding of inquiry-based learning, we provided a description and examples of inquiry-based learning opportunities to ensure their answers were based on inquiry-based learning opportunities rather than a different type of learning opportunity.

Student data was coded using the following characteristics: the sequential number of the interview, student classification, course enrollment, and gender. This allowed an audit trail of the students within and across the data by encapsulating a description of the student within each code. For example, P01-10HM represented participant number one (P01), who was in the tenth grade (10), enrolled in the horticulture course (H), and was a male student (M).

The students represented a broad spectrum of agriculture classes. Those interviewed consisted of 13 females and 11 males. Sixteen students were enrolled in animal science (A), four in horticulture (H), three in career development (C), and one in both animal science and horticulture (AH). The sample included 12 sophomores, 10 juniors, and one senior.

Interview questions were developed based a review of literature and the purpose of the study. The interviews were conducted by the lead researcher, who was also the instructor of the courses. During the interview, students were asked six questions following the institutional review board approved protocol, with follow-up questioning as necessary to gain a deeper understanding of what the student was trying to express. Field notes were taken during the interviews for further analysis. In addition, observation notes were recorded following each interview which consisted of the researcher's thoughts and observations about the student and what they had shared. Interview questions are shared in Table 1.

Table 1

Interview Questions to Gain Deeper Understanding of Secondary Students' Perspectives of Inquiry-Based Learning.

Number	Question Text
1.	Describe inquiry-based learning in your own words?
2a.	Do you feel having inquiry-based learning opportunities has improved your critical thinking skills?
2b.	How so?
3.	What do you think is most beneficial about inquiry-based learning opportunities?
4.	What do you like most/least about inquiry-based learning opportunities?
5.	Is it better to be taught the background information before the inquiry-based learning opportunity or do you prefer that the teacher give you the connections after the activity?
6.	Are there any technologies- such as cell phones, recorders - that you think could be used to make the inquiry-based learning process more engaging/fun?

The establishment of trustworthiness is critical within qualitative research (Erlandson, Harris, Skipper, & Allen, 1993) as it enables "a reasonable claim to methodological soundness" (p. 131). We followed Lincoln and Guba's (1985) techniques to encourage credibility, transferability, dependability and confirmability. Credibility was increased by conducting the interviews at the school and seeking triangulation of findings. Thick description was used when possible to support transferability and an audit trail encouraged dependability and confirmability. Trustworthiness was ensured by having a second researcher analyze the data for emerging themes in consultation with the lead researcher. In addition, the lead researcher maintained a reflexive journal which was accessed during peer debriefing. Data collection took place over a period of one week. Students had been in their agriculture classes for six months at the time of interviews. This prolonged engagement allowed trust to form with students and the opportunity for persistent observation. Data were analyzed using the constant comparative method deriving emerging themes throughout the interview process (Glaser, 1965). We used the lens of constructivism to interpret the data. Recognizing that students can construe teaching methods in a very individual manner, we careful listened to what each student shared and considered their comments in the context of how inquiry-based learning had been employed in the class and within the context of the constructivist principles that had been applied. We were able to triangulate our findings by reviewing interview notes, observation notes, and the reflexive journal.

Primary Author's Lived Experience

The primary author's lived experience contributed to this study. She served as the students' agricultural educator and had taught at the school for five years. She had received prior inquiry-based professional development through participation in the National Agriscience Teachers Ambassadors program. To avoid bias, the two researchers worked together throughout the study by conducting debriefing sessions following each day of interviews. The knowledge possessed by the lead researcher about inquiry-based learning and her connection to the students enabled both data collection and analysis.

Findings

Students' Definition of Inquiry-based Learning

Four themes emerged as students described inquiry-based learning. Six (P01-10HM, P02-10HM, P04-10AF, P06-10AF, P19-11AF, P26-10HM) students described the process as "hands on," four (P03-11CM, P05-11AHM, P12-11CF, P20-11AF) students indicated the method required working by themselves, and two (P09-10HM, P23-12CF) students indicated inquiry-based learning involved questions. Half of the students (12) were not sure how to describe inquiry-based learning, even though all students had engaged in the process and been told what inquiry-based learning was at the beginning of the school year. As a part of the interview, students who indicated they did not know what inquiry-based learning was received an explanation of inquiry-based learning. Once students were provided an example of an inquiry-based learning opportunity, they indicated they understood inquiry-based learning and were able to define it. Those students who described inquiry-based learning as "hands on" did not mention anything about the process of locating, explaining, and justifying data as part of the process. However, they did indicate a belief that it was any activity where they were engaged in the process through some type of experience or project. Students whose answers were categorized as "work by yourself" described inquiry-based learning as an opportunity to learn by themselves rather than receiving direct instruction from the teacher. The two students who described inquiry-based learning as "learning by asking questions" and "finding answers" were unique in that they correctly described an essential aspect of the inquiry-based learning process.

Students' Perceptions of the Effectiveness of Inquiry-based Methods

Students expressed the most beneficial aspects of inquiry-based learning opportunities to be: learning by themselves, gaining knowledge, being different, having an experience, using prior knowledge, and entertaining. One student responded: "You don't get used to the teacher giving you the answer, you get to find the answer by yourself" (P13-10AF). Another student stated, "[it] helps your mind process, learning on your own improves understanding" (P14-10AM). Yet another explained inquiry was most beneficial because, "I never knew who or what the Pope was even though people kept telling me, until I researched it for myself, now I know" (P23-12CF).

Several students believed inquiry-based learning opportunities were beneficial because it increased their knowledge, learning, and retention. For example, inquiry-based learning "makes you use your mind more" (P12-11CF), "gets you prepared for harder questions" (P08-10AF), and "test scores are higher, [I] comprehend, [and] know what [the] answer is" (P10-10AF). Furthermore, inquiry-based learning is "more entertaining than lecture" (P19-11AF), and "I am more interactive in the activity, results are based off of me" (P26-10HM). This indicates students believed inquiry-based learning was beneficial because it was entertaining and engaging. Finally, one student said, it "allows everyone to learn the same thing, but in different ways" (P06-10AF).

Most of the students interviewed explained what they liked most about inquiry-based learning and not what they disliked. As students described what they liked most about inquiry-based learning, there were three primary themes that emerged: learn by yourself (P10-10AF, P12-11CF, P16-11AF, P19-11AF, P20-11AF, P24-11AM, P28-10AF, P01-10HM, P23-12CF), variation (P02-10HM, P04-10AF, P05-11AHM, P06-10AF, P02-10HM, P14-10AM, P26-10HM), and challenge (P09-10HM, P21-10AF, P15-11AF). Students expressed that inquiry-based learning was enjoyable because it was quicker than traditional teaching strategies (P14-10AM), makes you think harder (P09-10HM), and you could learn from your mistakes (P16-11AF). They also expressed that they enjoyed the process because it was hands on (P04-10AF) and not just reading (P26-10HM). Students expressed that they liked the research (P08-10AF), discussion (P13-10AF), and opportunity to learn new things (P07-10AM), which kept the instruction from being boring (P22-11AM).

Students expressed that they liked the fact that inquiry-based learning opportunities allowed them to learn things on their own instead of being given all the information by the teacher. One

student liked that "you get to question yourself, see what you already know" (P15-11AF), while another student liked the variation of inquiry-based learning (P02-10HM). One student mentioned that communication was important within inquiry-based learning: "I like [that] you can discuss with classmates, not just get the answer" (P13-10AF).

The aspects many students liked most about inquiry-based learning opportunities were the same aspects that other students liked least. The primary theme that emerged was challenge (P03-11CM, P18-11AM, P22-11AM, P23-12CF). Students said it was hard to find information (P18-11AM, P23-12CF), hard to get started (P03-11CM), and did not like having to think harder (P22-11AM).

Half of the students believed background information should be provided before completing the inquiry-based learning opportunity, while half of the students believed it should be provided after they had completed the inquiry-based learning opportunity. Even though students repeatedly answered that learning by themselves increased critical thinking skills and was beneficial, many still wanted to receive background information prior to an inquiry-based opportunity. One student recognized that getting the background information first would alter the inquiry approach stating, "Connections [to prior knowledge] after [the inquiry-based learning opportunity] because if given before it is not really inquiry, you already know how to do it" (P03-11CM). One student believed receiving background information first would make it easier because "we will use the information given" (P28-10AF).

Students' Perceptions of Impact on Critical Thinking Skills

All of the students believed inquiry-based learning opportunities would improve their critical thinking skills. The ways in which students felt it improved their critical thinking skills varied: learn by yourself (P03-11CM, P05-11AHM, P06-10AF, P07-10AM, P12-11CF, P13-10AF, P14-10AM, P21-10AF, P22-11AM, P23-12CF, P24-11AM, P26-10HM, P28-10AF), think harder (P01-10AM, P08-10AF, P09-10HM, P16-11AF), because you are doing (P02-10HM, P04-10AF, P10-10AF), problem solving (P15-11AF, P20-11AF), remember better (P19-11AF), and learn more (P18-11AM). Most of the students believed inquiry-based learning opportunities improved their critical thinking skills because they were required to find the answers on their own. For example, one student stated, "it gives you a better opportunity to do things on your own and the opportunity to think about what the answer is on your own" (P13-10AF), and another noted "we are made to think why things happen instead of being told what happens" (P09-10HM). Students also believed their critical thinking improved because they solved problems (P15-11AF, P20-11AF), remembered the material better (P19-11AF), and learned more (P18-11AM).

Students' Perceptions of Technology Use with Inquiry-based Methods

A question was included in the interview protocol specifically related to the use of technology to facilitate the inquiry process. Students identified technologies that could be used to make inquiry-based lessons more enjoyable; however, because students in the sample already used computers when completing inquiry-based learning, many students (P02-10HM, P03-11CM, P04-10AF, P08-10AF, P09-10HM, P12-11CF, P13-10AF, P15-11AF, P18-11AM, P19-11AF) indicated they did not think using additional technologies would make the learning process more engaging, fun, or beneficial. Those students who thought adding computers or cell phones would make the inquiry more engaging or fun wanted the technologies to be used to incorporate some type of game into the inquiry-based learning opportunity. One student stated: "Teenagers now are addicted to technology – allowing them to use technology will [allow them to] enjoy more" (P24-11AM). Some students thought the use of technologies would not be a good idea stating, "none, they [students] would just use them for other things, getting off task" (P13-10AF) and "none, that would make it [inquiry-based

learning] easier" (P03-11CM), indicating that making the process easier was not the point of inquiry-based learning.

Conclusions and Discussion

Findings suggest students see the benefits of inquiry-based learning opportunities once they understand the inquiry-based learning process. This supports research by Akhter and Fatima (2016) who found both teachers and students appreciated the autonomy in learning from inquiry-based instruction in teacher education programs and that they held more positive attitudes about how the inquiry-based instruction made them critical thinkers and autonomous learners. The students interviewed for this study did not reveal noteworthy negative thoughts regarding inquiry-based learning. Comments overall were positive about the autonomy of inquiry-based learning. Akpulluku and Gunay (2015) found secondary science students' favorite parts of inquiry-based learning were related to designing, application, and the decision process while the students did not want to encounter rote memorization during the inquiry-based learning process. All the students in our study believed inquiry-based learning opportunities improved their critical thinking skills. Students believed their critical thinking was improved because they had to think harder, problem-solve, and work on their own. Adding inquiry-based learning opportunities to agriculture classrooms might benefit students by improving their critical thinking skills and their ability to work autonomously. However, this would need to be studied.

Even though students stated they liked being able to learn on their own through inquiry-based learning, half of the students wanted the teacher to give the background information prior to the inquiry-based learning opportunity. Because part of inquiry-based learning is for students to find the answers to questions by utilizing resources, conducting research, and building experiments to find the answers instead of the teacher providing the answers, it will be important to find ways to provide background information without removing inquiry from the activity. Edelson et al. (1999) considered a lack of background knowledge in scientific reasoning as a major challenge of implementing inquiry-based learning. Students need enough information to know how to start the inquiry, but the rest of the connections should be made as part of the inquiry-based learning opportunity, allowing students to find the answer to the question and develop questions of their own without the teacher influencing their decisions. Teachers must refrain from giving students answers when they are in the process of moving through the inquiry process. It is possible that continuing to reinforce the definition of inquiry-based learning as well as the components of inquiry-based learning to students throughout a course would assist them in understanding and embracing the need for them to use questioning to move through related content. Findings clearly revealed that explaining the components of inquiry-based learning once was not sufficient.

Based on our findings, we concluded that the students interviewed reacted positively to inquiry-based learning. Students enjoyed being able to work independently, engage in problem-solving, and think at higher levels than is typically required with traditional lecture-based classes. However, findings revealed that students need to receive reminders about the nature of the inquiry-based learning process and explanations of why it is being utilized. Hand, Treagust, and Vance (1997) found that students understand the benefits of taking responsibility for their own learning but still need the teacher to verify their understanding. Only two students in the study were able to adequately describe inquiry-based learning; even though they had been told what the process entailed and participated in activities that followed the inquiry process. Thus, we concluded that secondary agriculture students may not fully comprehend the concept of inquiry-based learning, even when it is explained to them. Teachers utilizing inquiry-based learning might benefit from reminding students from time to time about the components of inquiry-based learning so that they can adequately engage in the process.

Inquiry is not about content, but rather is about learning how to learn. From the student's response, "I never knew until I looked it up," we concluded that inquiry-based learning has the potential to provide students an awareness of the need to explore in order to learn. Based on the comments about test preparation, we concluded that students have the perception that inquiry-based learning improves their academic performance. While this would need to be confirmed through additional research, this finding reveals that students have a positive attitude toward the potential for the teaching approach to assist their learning regardless of whether they enjoy the process. This provides a start to identifying methods to facilitate learning among students.

The aspects students enjoyed most about inquiry-based learning included work by themselves, think harder, and problem-solving. This implies that teachers should use more strategies in the classroom involving student-centered activities allowing students to problem-solve, think more deeply, and work independently. Findings revealed that some students found inquiry-based learning to be difficult and thus, they did not enjoy the process. Therefore, when utilizing inquiry-based learning, teachers would benefit from scaffolding their inquiry-based learning activities, slowly moving students from teacher-driven inquiry to autonomous-inquiry, over time. The scaffolding of inquiry-based learning activities would allow teachers to help students move away from the need to receive all background information in the beginning. As students become more comfortable with the process, they may also begin to see the benefits of finding information on their own.

Critical thinking is a skill that every student needs to have upon entering college or the workforce. Students in our study perceived inquiry-based learning to improve their critical thinking skills. We believe that students will develop a sense of self-efficacy as they problem-solve, research, and gather knowledge through inquiry-based learning. Self-efficacy has been directly linked to students' learning, persistence, and effort (Zimmerman, 2000). Therefore, inquiry-based learning has the potential to impact students' learning.

Implications and Recommendations

Students' perceptions about agriscience, according to the findings of Thoron and Burleson (2014), were more favorable when inquiry-based instruction was utilized. In our study, few students reported negative aspects related to their participation in inquiry-based learning opportunities. Utilizing more inquiry-based learning activities in agriculture classrooms might serve as a retention tool within agriscience programs. It could also encourage students to become more engaged in the agricultural community. If we can impact how students react to our teaching of agriculture, we can encourage learning. Thus, the fact that students perceived inquiry-based learning to increase their critical thinking skills indicates that use of inquiry in the secondary classroom can positively impact the perception of students about themselves as learners.

Further research is needed to gain an in-depth understanding of secondary agriculture students' perceptions about inquiry-based learning and the relationship that exist between students' perceptions and their academic achievement. This study captured the essence of how students react to inquiry-based learning opportunities which can assist in the development of improved strategies for agriculture teachers to implement inquiry-based learning in the classroom. Implementing engaging inquiry-based opportunities students enjoy has the potential to not only bring more students into agriscience courses, but also to improve those students' critical thinking, knowledge retention, and ability to work autonomously. Improving agriculture students' abilities to problem solve can positively impact the future agricultural workforce through their contributions. While this study only documented the students' perceptions, it is a first step toward documenting impact as a whole.

This study reported secondary students' perceptions of inquiry-based learning. Further research needs to be conducted to document impact of inquiry-based learning on students'

achievements and critical thinking skills. Since inquiry-based learning activities can be difficult to implement, research is also needed related to strategies to encourage and support teachers' adoption of inquiry-based learning in the agriculture classroom.

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