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# College Freshmen Perceptions of the High School CASE Experience

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**Abstract**

*Inquiry-based and problem-based learning are teaching strategies that classrooms across the United States are utilizing. Many agricultural education programs have incorporated hands-on or experiential learning activities, not only to teach their students, but to allow students to develop different skills to be successful within the agricultural industry. This study focused on students' perceptions of Curriculum for Agricultural Science Education (CASE). Leagans Major Elements in a Teaching-Learning Situation was the framework for this study. Students indicated through focus groups that hands-on experiences and activities worked well in allowing them to learn the curriculum. Students indicated a strength of the CASE curriculum was the objectives that guided the learning. Challenges students experienced were with equipment and instructions that were lengthy and wordy. Future research should focus on a larger audience in multiple high school CASE certified programs across the country as well as identify administrator's perceptions of the benefits and challenges of CASE.*

## Introduction and Literature Review

Inquiry-based and problem-based learning are teaching strategies that are being utilized in agricultural education classrooms. Both inquiry-based and problem-based learning are very similar in the intent, process, and learning outcomes (Parr & Edwards, 2004). A focus of the teaching strategies include hands-on learning opportunities for students by allowing them to think and process information in new ways. Inquiry-based instruction places students in the learning process and leads them to use critical thinking skills (Thoron & Myers, 2012; Thoron et al., 2011). Problem-based learning in agriculture education teaches students concepts and promotes engagement within the classroom (Davis & Jayaratne, 2015). Problem-based learning has shown to increase student retention, satisfaction, motivation, and critical thinking skills (Burris & Garton, 2007, p. 107).

When using inquiry-based learning, students engage by asking questions, addressing questions, finding evidence, and justifying and explaining their answers (Thoron et al., 2011). Thoron and Myers (2012) found teachers who used inquiry-based instruction were more effective and the students developed

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better argumentation skills than teachers who used subject matter instruction. When teachers use inquiry-based instruction, students were more engaged in the classroom (Blythe et al., 2015). Educators who use inquiry-based instruction create students who are more curious learners (Thoron et al., 2011).

Many agricultural education programs have incorporated hands-on or experiential learning activities, not only as a way to teach their students, but also to allow students to develop skills needed to be successful within the agricultural industry (Johnson et al., 1997). When teachers use inquiry-based learning in a classroom, students are deeply engaged in the learning process (Wells et al., 2015). Through learning and teaching strategies students become involved and are able to stimulate their brains in a new way (Wells et al., 2015). Curriculums that utilize experiential learning should combine with inquiry-based instruction to expose students to a broad range of teaching strategies to address various learning styles. Dyer and Osborne (1995) stated, "Students react differently to different teaching methods, and the selection of the proper method is critical to the learning style of those being served by the instruction," (p. 260). In addition, students come to the classroom with a varying degrees of content knowledge based on their exposure to different learning environments.

Curriculum for Agricultural Sciences Education (CASE) was established by the National Council for Agricultural Education (NCAE) in 2007. CASE is designed to bring real world agriculture problems to agricultural education classrooms while meeting national curriculum standards (CASE, 2013) and aims to ensure students' future success in college and careers with a focus on science, technology, engineering, and math (STEM) in the context of agriculture (CASE, 2011). CASE is student directed and focuses on inquiry-based learning. The goal for CASE is to prepare students for college programs in science, technology, engineering, and mathematics (STEM) while meeting national science, math, and English curriculum standards (CASE, 2013).

The design for CASE began after the Perkin's Act called for a reformation of Career and Technology Education (CTE) classes (Understanding, 2012, p. 1). The NCAE created a goal to help grow and improve these types of courses (Understanding, 2012, p. 1). After hiring outstanding teachers and industry leaders to lead the instructional development and design, the new curriculum was developed with the majority of the influence coming from two publications (CASE, 2012, p. 2). The first publication was *How People Learn* (National Research Council, 2000). This gave insight on how learning environments should be set up, creating the student center environment CASE displays (CASE, 2012, p. 1). The second resource was *Understanding by Design* (Wiggins & McTighe, 2005) which provided the lesson design and assessment for CASE (CASE, 2012,). CASE was also shaped by Project Lead the Way, Inc. with implementing activity, project, and problem-based (APP modality) learning. This method requires higher order cognitive skills throughout the learning experience (CASE, 2012, pp. 1-2). Courses were designed in a logical and sequential format that teachers are encouraged, but not required to follow. With these influences, CASE has developed a progression of eleven courses that take students down four different pathways depending on the structure of their local agriculture program. These pathways include Animal Science, Plant Science, Agriculture Engineering and Natural Resources.

Not only does CASE benefit the student, but the program is also designed to help agricultural education teachers by providing various support systems throughout CASE. One supporting feature of CASE is providing curriculum for teachers. This curriculum comes with lesson plans as well as materials for them (Understanding, 2012, p. 3). With this feature, teachers are able to remove some stress by focusing on instruction rather than preparation as seen in traditional classroom (Lambert et al., 2014). Another supporting aspect is the professional development that is provided when teachers become certified at CASE Institutes. During the professional development, teachers learn the course design and methodology of CASE, and they go through the majority of the lessons and activities that the students will be participating in (CASE, 2013).

The first CASE programs began in 2009 and have continued to develop over time. With the benefits it provides to both teachers and students, CASE has been able to reach over 400,000 agricultural education students at both the high school and middle school level in all 50 states within the first five years (Lambert et al., 2014).

According to Lambert et al. (2014) five themes were identified by teachers when implementing CASE into their programs. First, teachers found it easier to change their teaching methods toward a more student-centered approach than other curriculum. Second, teachers appreciated having course-ready materials available, although they did not make it through all the provided materials. Third, teachers reported the materials and equipment CASE provided were essential to successfully implement the curriculum. Fourth, it was very evident that CASE institutes, the professional develop training focused on introducing the curriculum to the teacher, was one of the most important pieces when implementing CASE. Finally, once the teachers implemented CASE in their classroom, they were able to find additional time that was used to improve student learning and refocus on their classroom.

Another study conducted by Carraway, et al. (2015) interviewed science teachers regarding CASE and found that they had a positive attitude towards the CASE curriculum. Science educators believed the CASE curriculum integrates several scientific concepts that benefit students who take agriculture classes. The teachers viewed the curriculum as helpful to students' performance due to the repetition of concepts. Carraway et al. (2015) study adds to the knowledge base of the CASE curriculum and gain perceptions of students who have experienced the curriculum in their own classrooms.

The CASE curriculum model has been around for more than a decade and many studies try to understand the teacher's perceptions of using CASE in agricultural classrooms; however, students' perceptions of being taught the CASE curriculum has not been explored. This study addresses the American Association for Agricultural Education's National Research Agenda Research Priority Area Five: Efficient and Effective Agricultural Education Program (Roberts et al., 2016).

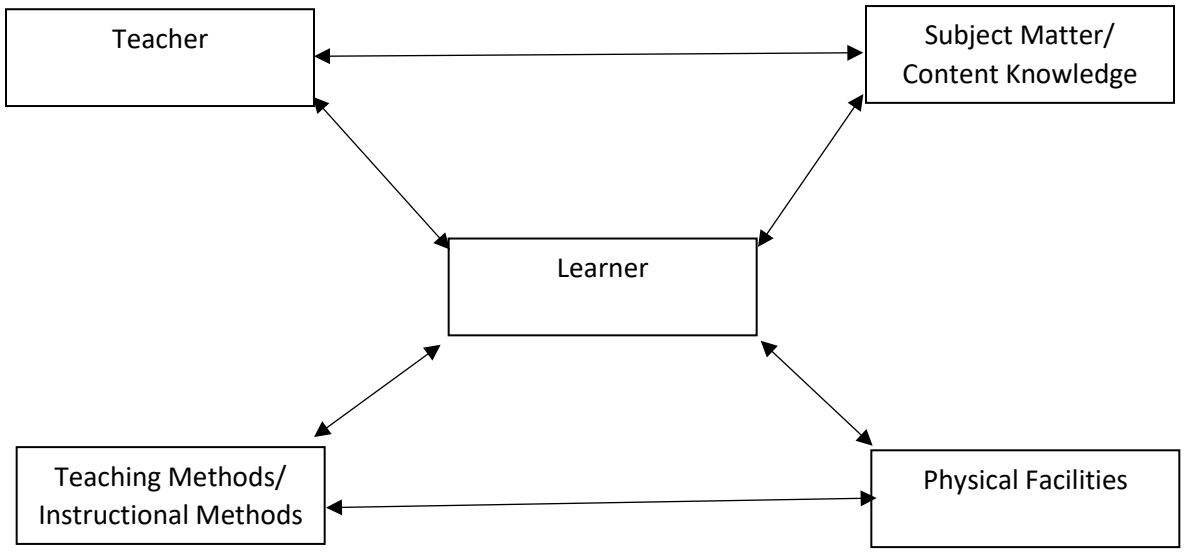
## Theoretical Framework

The theoretical framework used for this study was Leagan's Major Elements in a Teaching-Learning Situation (n.d.) (Figure 1). This model includes five factors influencing the teacher-learning situation (Prawl et al., 1984, p. 108). The factors are the teacher, learner, subject matter, physical facilities/environment, and instructional materials/methods. All the factors interconnect and directly affect the quality of the learning experience (Seevers & Graham, 2012). The teacher and learner bring different backgrounds and experiences to the learning situation. Learning will be compromised, if the background and experiences between the teacher and learner is too varied (Seevers & Graham, 2012). Predetermined learners can have the subject matter adjusted based on the learners needs. The instructional materials/methods must be applicable to the learner's background and previous experience and must be related to the subject matter. There must also be an available physical facilities/environment to allow for learning to occur (Seevers & Graham, 2012).

Because Leagan's major elements in teaching-learning situation places the student at its center, this study sought to explore the factors as they relate to the student learning experience of the CASE curriculum. For the purposes of this study, the element of subject matter focuses specifically on the content knowledge and the area of teaching methods focuses on the instructional methods. Available equipment and resources was the focus of the physical facilities.

**Figure 1.**

*Leagan's Major Elements in a Teaching-Learning Situation (n.d.).*




## Purpose and Objectives

The purpose of this qualitative study was to determine the students' perceptions of the CASE curriculum. The research questions for this study included:

1. What are the strengths and weaknesses of the CASE curriculum?
2. What teaching methods were used in delivering lessons?
3. How is the classroom physical facilities/equipment being utilized in delivering the curriculum?

## Methods

To address the research questions of this phenomenological study, researchers selected a basic qualitative approach for this study. When researchers are attentive in determining the way, people interpret and develop meaning from their past and current experiences, the researchers should conduct a qualitative research study (Merriam & Tisdell, 2016). The instrument developed for this study was two focus group interviews. Researchers selected a focus group method to study one phenomenon. Social constructionist theory which suggests that people develop knowledge in a social context through shared discussion (Berger & Luckman, 1966) was the epistemological approached framing this study. The study received Institutional Review Board (IRB) approval. Researchers posted flyers in a freshman collegiate agricultural orientation course to obtain participants. The researchers asked freshman students who took CASE curriculum courses in high school to participate in the study. Participants who had taken more than two CASE curriculum courses in the last two years of their high school experience became participants for the study. Once researchers identified participants, participants signed consent forms and returned them to the researchers.

Five participants were female, and one was male. Researchers created pseudonyms for each participant along with a brief description to provide additional context for participants. While the number and type of CASE courses each participated completed varied, all students did complete Principles of Agricultural Science-Animal, and Principles of Agricultural Science-Plant. This phenomenon allowed for both diversity in the courses that were represented and consistency in the fact that all completed two of the same courses.

- **Julie** grew up in a rural area school where high school agriculture was available. The CASE courses she took while in high school were: Introduction to Agriculture, Food and Natural Resources, Principles of Agricultural Science-Animal, and Principles of Agricultural Science-Plant.
- **Kayla** comes from a rural school and took many agricultural courses while in high school. The CASE courses Kayla took were: Principles of Agricultural Science-Animal, Principles of Agricultural Science-Plant, Natural Resources and Ecology, and Mechanical Systems in Agriculture.
- **Kelsey** grew up in a rural area school and took the following CASE courses: Introduction to Agriculture, Food and Natural Resources, Principles of Agricultural Science-Animal, Principles of Agricultural Science-Plant, Mechanical Systems in Agriculture, and Agriculture Research and Development.
- **Taylor** is from a rural area school and, in her time in high school, took the following CASE courses: Introduction to Agriculture, Food and Natural Resources, Principles of Agricultural Science-Animal, Principles of Agricultural Science-Plant, and Environmental Science Issues.
- **Molly** grew up in a rural high school and took the following CASE courses through her agricultural program: Principles of Agricultural Science-Animal and Principles of Agricultural Science-Plant.
- **Jason** grew up in rural school and took the following CASE courses: Introduction to Agriculture, Food and Natural Resources, Principles of Agricultural Science-Animal, Principles of Agricultural Science-Plant, Natural Resources and Ecology, Animal and Plant Biotechnology, Food and Science Safety, Environmental Science Issues, and Agriculture Research and Development.

During the fall academic semester, participants were interviewed. The guided questions utilized for this study asked open-ended questions regarding participants experience with the CASE curriculum. The first question focused on gathering the demographic information from the participants. The next set of questions focused on the CASE curriculum as the subject matter/content knowledge and the instructional methods the participant's agricultural teachers used. The last set of questions asked about the physical facilities/equipment participants had available to them. Researchers developed and used a semi-structured interview protocol to guide the interview session (Table 1).

**Table 1**

*Questions Used During the Focus Group*

| Interview Items |
|---|
| **Subject Matter/Content Knowledge** |
| Describe your CASE course experience |
| Describe what you liked about the curriculum |
| Describe the challenges you had with the curriculum |
| |
| **Instructional Methods** |
| Describe how the CASE course was taught |
| Describe how your CASE curriculum was delivered |
| Describe your thoughts on how science was integrated into the curriculum |
| Describe the hands-on opportunities utilized |
| |
| **Physical Facilities/Equipment** |
| Describe the layout of your classroom |
| Describe the equipment available to utilize in your classroom |

Researchers utilized focus groups to allow participants the opportunity to engage with others and share their opinions (Morgan, 1998). We believed the social aspect of discussing their experiences would elicit deeper, more reflective, and complete responses than individual interviews.

The researcher utilized qualitative research methodologies to promote trustworthiness of results. To ensure trustworthiness, credibility, and reliability of data, researchers used peer review of data, and member checks (Lincoln & Guba, 1985). Initial data coding was completed by the lead author to establish consistency in identifying codes. In the first coding cycle NVivo (Saldana, 2016) was utilized. NVivo coding captures the language used by the participants without losing the true meaning (Saldana, 2016). During this coding cycle the lead researcher utilized pattern coding (Saldana, 2016). In this second code cycle emergent themes were identified for individual participants and summarized by the first researcher. The second researcher then conducted an independent coding and compared the first researcher codebook for agreement. While independently reviewing the second researcher compared notes to the first coders note and major discrepancies were reviewed. Minor language differences were identified and while debriefing between the researchers consensus was reached on codes and descriptions. Research logs and peer review of data analysis occurred to promote trustworthiness and reliability of the data (Creswell, 2013; Merriam, 2009). The final step in reviewing the data focused on transferring the themes into a conceptual model (Saldana, 2016) to examine all categories and codes. During this step researchers conducted data source triangulation through peer debriefing and triangulation (Stake, 1995) to help achieve a high level of dependability of the data collected. Researchers are current or former agricultural education instructors with a wide range of backgrounds related to the teaching and learning experience. Two of the researchers have actively lead CASE Institutes and hold CASE certifications.

## Findings

The purpose of this qualitative study was to determine the students' perceptions of CASE curriculum. Of the students who participated in the study, five were females and one was male. Three of the participants did not have an agricultural background, but indicated they grew up in a rural setting. All participants reported having a graduating class between 42 and 98 students. When asked about how many students were in their agricultural education class, participants indicated the range was between 5 and 25 students. Participants shared their high school agriculture program offered between two to five CASE courses. The following are CASE courses that the participants were involved with in high school: Introduction to Agriculture, Food, and Natural Resources; Principles of Agricultural Science Plant and Animal; Natural Resources and Ecology; Mechanical Systems in Agriculture; Agriculture Research and Development; Environmental Issues; Food and Science Safety; and Animal and Plant Biotechnology. The findings are organized by the overarching categories of subject matter, instructional methods, and physical facilities.

### CASE Curriculum as Subject Matter/Content Knowledge

Four themes emerged within the category of subject matter/content knowledge: Student-centered and hands-on focus of CASE courses, frustrations with reading instructions and using equipment, explicit student learning objectives guiding the learning, and improved consistency of teachers' time management.

The first theme focused on CASE courses being student-centered and focused on hands-on learning. Participants expressed their teachers taught CASE in several different ways. Three of the participants indicated their agriculture teacher bounced around in the CASE curriculum, but also connected it back to what was happening in the industry. The other participants said their teachers followed the curriculum but may have skipped one or two lessons based on time constraints. Julie explained, "We started with 1.1.2 and went all the way through the sections which related and then did the lab that corresponded. This allowed students to build off of what they learned in the first section." Kayla said, "I liked the way our teacher bounced around because she taught it in an order she thought was

best fitted for the type of classes we were in or the backgrounds of the students who were in the class." Molly said,

> I appreciated the way my teacher taught CASE because a lot of the kids struggled learning about agriculture or they didn't have a background in it, she did it in a way which would help them not learn a bunch of new things at once, but they could build off of prior knowledge, or she associated it well with what they were accustomed to.

Jason explained,

> I really enjoyed bouncing around just because I feel like I got more out of it. I got the heavier content areas or the need to know areas just because we were so pressed for time, we just couldn't go from point A to point Z within a trimester.

Participants explained their CASE course experience provided a variety of teaching methods, which emerged and were well organized. Taylor said, "I liked how there were three parts to it, the lecture, the labs, and the videos." Kelsey said, "I liked the organization of it (CASE) because we used binders and everything in our binder went in order and we had everything in one place." Molly agreed the binders were helpful because "you had everything you needed to prepare for the test." Taylor explained, "I liked the hands-on learning aspect because I feel I learn better when it's hands-on learning. If I can touch it and see it, I can learn better." Kayla said, "I really liked the labs and having a variety of different tools to help you learn. CASE was good about pairing up hands-on activities. Some participants would take agricultural courses just for the labs because CASE was very unique in that aspect."

Participants also explained what they did not like about the CASE curriculum. Several participants indicated they did not like the worksheets provided in the curriculum. Jason said, "The worksheets got boring." Julie said, "The worksheets got frustrating towards the end of the trimester." Molly explained, "The activities given with certain topics were set for a younger age group than what the material was taught in."

The second theme focused on frustrations with instructions and the challenges with the lab equipment. Participants had issues with the amount and type of reading expected of them. They believed instructions were lengthy and wordy. Julie said, "The instructions were super lengthy, very wordy, and hard to follow. Everyone kept getting different readings, so we had to go back and see where we did something wrong." The lab equipment was frustrating because it often didn't work or was inconsistent. Kelsey explained, "The soil probes got irritating because sometimes they would work and sometimes they wouldn't and you kind of lost focus of what exactly you were supposed to be getting out of the lesson." These issues lead to longer than expected lessons. Kelsey explained,

> Our school offered agriculture courses as science credits so there were students in class that did not necessarily have an agriculture background, so the lessons would take a lot longer and we wouldn't get through one lesson in a day.

The third theme focused on learning objectives. Participants who were not from an agricultural background found the objectives especially helpful. In addition, the participants agreed it was very structured. Kayla explained, "If you build a house on concrete all the stuff that comes after it will stand. If you build it on sand, it's going to fall down." Julie said, "Having the structure helped the students out because you knew exactly what was going to come after what you were learning now. You knew there was going to be a lab and a test." Taylor pointed out, "I like how it kept the teacher consistent throughout. The teacher didn't have all these different styles and you knew what to expect." Jason explained,

> One benefit I saw was for those kids who didn't take any agriculture, the curriculum was basic enough that they could understand it and it wasn't as in depth as me coming from a farm, but still basic enough young city people could understand it.

Kelsey agreed, "Not growing up on a farm I learned a lot. It really helped me a lot. I actually learned things while everyone else thought it was super boring." Molly said, "It was the same for my agronomy

class. For me, it was all the basic stuff about crops and weeds that all these kids that grew up on a farm already knew." Taylor pointed out, "I like how it was diverse enough for kids who grew up on a farm, but simple enough for unexperienced agriculture kids." Julie said,

> The objectives laid out what you would be learning and when you were going back to prepare for your test, they would talk about what would be on it and you knew exactly which lecture set the notes would be in.

Jason explained, "I liked the objectives, too, because even now in college I know what to keep my eyes out for and know this will be an important thing, which I need to understand."

The fourth theme identified was the CASE curriculum keeping agricultural teachers on a more consistent schedule. Kelsey explained,

> With CASE it was a set, you had this PowerPoint and then you'd have this hands-on activity. A lot of times without a CASE course the teacher lectures while students take notes and in three weeks you take a test over the information shared. There was not as much hands-on learning. CASE had a lot of hands-on learning but also brought a lot of visual learning into lessons.

Molly said,

> I think it made my teacher stay on schedule. In my math class, we would be working on a unit and then the teacher would give us a work day for three days and we never really moved along. Then we would scramble for the next week trying to get back on schedule.

Taylor said,

> There was actual consistency in CASE courses. My other agriculture teacher who taught farm business management did not use CASE and by the end of the class it was more of a do whatever you want for the rest of the class.

Kayla pointed out, "Everything connected whereas in other classes you did not know how everything correlated." Julie said, "A lot of the teachers have issues with students, the CASE curriculum keeps us on track and provides a good foundation and helps students focus on the structure and being able to interpret it into their own words which helped them in other classes."

**Instructional Materials**

Researchers asked participants about the amount of science incorporated into the CASE curriculum. A single theme identified by participants was the balance of science in the curriculum and how it was easily relatable to agriculture. Julie explained, "I thought there was just enough science." Taylor agreed, "If there was much more science, I probably wouldn't have liked it as much." Molly agreed, "There was enough to introduce me to the science in agriculture." Jason said, "The activities and labs made it the perfect amount because I actually learned things, but it wasn't too high of a level." Kayla pointed out, "I think it was something all kids could understand." Kelsey explained,

> I thought it was cool with how relatable the topics you learned about in science, because in a science class you learn the pH are important, but in an agriculture, class shows you how the pH is beneficial with crops and soil.

Julie said,

> With CASE we get to learn science in a practical usable form. In biology I never got to see what it meant to me in agriculture. This brings it all back together in a setting that I love very much so it was very meaningful.

**Physical Facilities/Equipment**

The layouts of the classrooms were similar among all participants. Jason explained, "We had tables that resembled lab tables without the sinks so you could move them around and make a bigger table which was nice and versatile." Julie explained, "We had four rows of tables so we could just come in and sit." Kelsey said, "We switched from short little desks as tall as a second grader to four rows of tables." Molly said, "We had little 2-person desk in three rows." Kayla said, "We had 6-foot tables with chairs on

each side." Taylor said, "There were five tables in an octagon shape with cupboards and draws under the table."

All participants indicated the most common equipment used were microscopes, laptops, and teachers shared some of their supplies with their science classes. Participants also mentioned they completed a large amount of group work.

## Conclusion/Recommendations/Implications

The focus of this qualitative study was to determine the college students' perceptions of the CASE curriculum. The study's intent was not to generalize the results to all CASE students, but rather to describe the population of students who took part in this qualitative study. Use caution when generalizing the results to broader populations.

Overall, participants involved in the focus groups were supportive of the hands-on experiences provided in the CASE curriculum. The hands-on experiences allowed participants to connect ideas from class to real-world experiences. Hands-on experiences allow students to learn the content in a more enjoyable way (Johnson et al., 1997). When teachers incorporate hands-on activities into the coursework, students develop attitudes, skills, and competencies that will help them succeed later in life (Witt et al., 2014). This is supported by Leagans Major Elements in a Teaching-Learning Situation (n.d.) by allowing hands-on experiences in the classroom the teacher is incorporating the subject matter/content knowledge and teaching/instructional methods in a practical way for the learners to understand creating quality learning experiences (Seevers & Graham, 2012).

The participants also indicated the CASE curriculum was easy to adjust to the learning needs of the students. Many of the participants stated their teachers were able to bounce around within the curriculum to teach what they thought were the most important concepts for their class. However, this might not align with the intention when the curriculum was designed. Participants liked how CASE allows teachers to use multiple teaching styles from the handouts to lectures and labs, which is supported by the instructional materials and methods in Leagans Major Elements in a Teaching-Learning Situation (n.d.). This supports the design of CASE with the design of the APP's modality. Students react differently to teaching styles (Dyer & Osborne, 1995), which helps students stay engaged with the materials. When discussing strengths of CASE, participants all agreed they understood the consistency between the materials and the delivery methods. Participants also enjoyed how the CASE course schedule kept their teacher on a schedule allowing for little time to get off task. However, participants indicated several challenges using the curriculum. Participants all recalled having equipment issues along with the instructions being lengthy, causing frustration and confusion when trying to follow them.

Participants indicated in the study the hands-on experiences and materials worked well in allowing them to learn the materials better. With the variation of instructional materials, the learners received a quality learning experience (Seevers & Graham, 2012). Participants pointed out the curriculum made them use inquiry-based learning methods when working on labs and projects. Hands-on and inquiry-based methods used within the classroom emphasize academic content (Wells et al., 2015). For teachers to enhance students' learning of science materials, inquiry-based learning needs implemented within instruction (Blythe et al., 2015). All students indicated CASE did a great job of balancing science into the curriculum. Many students agreed if the curriculum had incorporated any more science, they would not have enjoyed the class as much.

All participants indicated they had tables within the rooms where the curriculum was taught. Participants indicated tables were easier to work at when performing group work. The classroom setup with tables was conducive for using CASE curriculum for lab work and student collaboration. Participants indicated classroom equipment was generally shared with the school's science programs.

This is very common among schools as many schools are facing funding issues (Thompson & Balschweid, 1999; Warnick & Thompson, 2007). According to Warnick and Thompson (2007) the major barriers teachers run into when integrating science into their agriculture classrooms include funding and equipment.

CASE perceptions of study participants limit the findings of this study. Future research should focus on a larger audience in multiple high school CASE certified programs across the country. In addition, research should focus on high school graduates who took CASE courses and did not attend college. An observational study of CASE teachers and their classrooms could help gain a better understanding of the challenges and strengths when implementing the curriculum. Future research should help identify the perceptions of administrators on the benefits and challenges of CASE.

Based on these findings, school-based agriculture teachers should consider implementing the CASE curriculum. It provides a structured format that seems to have the right balance of agricultural and science content in a context meeting the needs of students with and without agricultural backgrounds while allowing teachers to stay on schedule and pace for the entire class period and term. Students felt the curriculum was engaging and they appreciated the balance between learning the content knowledge and applying it through labs, projects, and problems.

However, CASE doesn't replace good teaching. Students reported not liking the worksheets because they got boring and redundant which might be analogous to reading a text book and answering the questions at the end of the chapter during each class period. These findings suggest teachers would benefit from providing a bit more variability in utilizing the curriculum to minimize the repetitive sense students felt lesson after lesson. CASE provides student opportunities to learn that agriculture, science, and equipment is not perfect, errors can be made, and equipment may not always work properly. Teachers should use those opportunities to as teachable moments to help students understand that the scientific method and the problems we face are wickedly complex, multifaceted and don't often have perfect, black and white solutions. Such a focus and emphasis within the curriculum will enhance student understanding of their content knowledge and deepen their critical thinking skills.

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