Journal of Human Sciences and Extension

Volume 9 | Number 3 Article 10

10-28-2021

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Recommended Citation
Witte, K., Conner, N. W., Reiling, B. A., Balschweid, M. A., & Stripling, C. T. (2021). Barriers to Becoming CASE Certified as Seen by Agriculture Educators. *Journal of Human Sciences and Extension, 9*(3), 10. https://scholarsjunction.msstate.edu/jhse/vol9/iss3/10

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Barriers to Becoming CASE Certified as Seen by Agriculture Educators

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There is a need to improve science comprehension in the United States. Incorporating scientific principles into the study of food production provides context to engage youth in STEM education. The Curriculum for Agricultural Science Education (CASE) is an inquiry-based program that stimulates scientific engagement. While agriscience teachers believe in the concept, less than 20% are certified in Nebraska to teach CASE. Twenty-five active agriscience teachers, who were not CASE certified, individually discussed their reluctance to become CASE certified. Most research participants had a positive view of CASE but were concerned about the apparent stringent program structure. They questioned individualizing the CASE model for different teaching styles and programs. Three primary barriers to CASE certification were identified: cost, time, and administrative support. Although scholarships were available to cover certification costs ($2,500-$3,000) in Nebraska, participants questioned funding needed equipment and supplies to implement the program. Traditional CASE certifications require 50-100 hours of intense training, and participants opposed trainings that exceeded five days due to personal and professional obligations. Teachers also believe school administrators lack knowledge of CASE benefits. For the widespread implementation of CASE, certification trainings need to be more concise, implementation costs minimized, and school administrators informed of benefits.

Keywords: Agriscience, barriers, CASE, inquiry, science education

Introduction

In the United States, 78% of high school students are deficient in science (Desilver, 2017). Additionally, on the 2012 Programme for International Student Assessment, American students performed close to the Organization for Economic Cooperation and Development average (rank 213) in science, which is comparable to Austria, Belgium, Croatia, Denmark, France, Hungary,

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Italy, Latvia, Lithuania, Luxembourg, Norway, Portugal, and Spain (Schleicher & Davidson, n.d.). Nelson (1999) posited that the intelligent use of science and technology is critical to the continued advancement of society. In 1985, the American Association for the Advancement of Science launched Project 2061 as a long-term effort to improve science, mathematics, and technology. The following goals were created to improve K-12 science education:

1. Knowing the basic facts and principles that explain phenomena in the physical world,
2. Knowing the ways science is done and the nature of the knowledge it produces, and
3. Being able to think rationally about the physical world (Roseman, n.d., p. 1).

Maurer (2000), in his brief, *Integrating Science Education and Career and Technical Education*, indicated the need for career and technical education teachers to purposefully focus on how academic subjects are a critical component of career and technical education courses.

Incorporating science, math, and language arts standards into the agriculture classroom is not a new concept. In fact, since 1988, the National Research Council has called for explicit integration of science, which has led to the development of the term *agriscience*. Shelley-Tolbert et al. (2000) defined agriscience to be “a program that increases the number of science concepts integrated into agricultural classes” (p. 55). The transition to agriscience programs has created an environment where school administrators expect secondary agricultural education programs to provide a practical context for core academic subjects (Haug, 2011). According to Brister and Swortzel (2009), secondary agricultural education courses are excellent platforms for science education. Additionally, Knobloch et al. (2007) found that teachers believe agriculture provides an authentic learning context for students and that authentic learning helps students connect concepts to everyday life. The findings of Knobloch et al. (2007) indicated teachers believe students benefit from laboratory activities, demonstrations, and active learning environments which incorporate hands-on learning. Myers et al. (2009) found agricultural education teachers agree that science concepts are easier for students to understand when science is integrated into the agricultural education program. In the article, *Science Literacy for All in the 21st Century*, Nelson (1999) stated,

> In learning science, students need time for exploring, making observations, taking wrong turns, testing ideas and doing things over; time for building things, calibrating instruments, collecting things, and constructing physical and mathematical models for testing ideas, time for learning whatever mathematics, technology, and science they need to deal with the questions at hand. (p. 16)

However, Balschweid and Thompson (2002) identified three barriers to integrating science into agriculture courses: (a) lack of appropriate equipment, (b) lack of funding to support their efforts, and (c) a lack of in-service workshops or courses for learning how to integrate science into the curriculum. One method of integrating science into agriculture courses is through inquiry-based learning. Science education has accepted inquiry-based learning due to its active approach to

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learning (Parr & Edwards, 2004) and for allowing learners to conceptualize, investigate questions/problems, and then draw conclusions (Pedaste et al., 2015). Inquiry-based learning also increases the amount of time students spend in labs and decreases teacher-led discussion in classrooms (Hattie, 2009). The critical thinking and laboratory aspects of inquiry-based learning were used as a primary teaching method of choice to develop the Curriculum for Agricultural Science Education (CASE). More specifically, CASE was modeled after Project Lead the Way (PLTW). PLTW is known for being a way for schools to improve science, technology, engineering, and mathematics (STEM) courses through a problem-centered approach (Bottoms & Uhn, 2007). Bottoms and Uhn (2007) discovered that PLTW students in 2006 scored significantly higher in mathematics, science, and reading than other career tech students who were not enrolled in a PLTW program. PLTW is a comprehensive, expensive program to implement; therefore, it is important to understand school principals' perceptions toward PLTW. Rogers (2007) found, "principals whose school had offered PLTW three or more years perceived the effect of PLTW on students related to success in mathematics higher than principals from schools just starting to offer PLTW" (p. 58). School Principals are responsible for the curriculum being taught and curricular modifications (Praisner, 2003). One principal said, "PLTW has been a great addition to our curriculum. It has been a course where students learned to think" (Praisner, 2003, p. 3).

To assist agricultural education teachers in incorporating science into agriculture courses, CASE was developed as an inquiry-based curriculum modeled after PLTW. The 2007 National AgriScience Teacher Ambassador Academy participants reported that science integration requires additional planning and preparation (Myers et al., 2009, p. 122). However, CASE courses provide teachers with a comprehensive package of teaching resources required to facilitate programming (The National Council for Agricultural Education, n.d.).

CASE is a system of instructional supports for the classroom teacher that includes curriculum, professional development, assessment, and certification (The National Council for Agricultural Education, n.d.). Teachers attend CASE training to learn about the curriculum and practice going through the assignments much like their students, while being taught by fellow agricultural teachers. Shelly-Tolbert et al. (2000) reported that most traditional high school agriculture teachers initially expressed confusion about how to best teach and incorporate science concepts in an applied classroom. Therefore, CASE training allows teachers an opportunity to learn how to teach applied science concepts in an agriculture classroom (The National Council for Agricultural Education, n.d.).

According to Ulmer et al. (2013), agriculture teachers that participated in a CASE institute had increased science efficacy. Another study found that CASE certified teachers "generally perceive slightly higher science knowledge than non-CASE certified educators" (Pauley et al., 2019, p. 167). The CASE curriculum is designed to be more student-centered than teacher-centered, and Lambert et al. (2014) recommended agriculture teachers who become CASE certified be open

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and receptive to the idea of facilitating education through a student-centered learning environment.

Theoretical Framework

The theoretical framework used for this study was Ajzen's (2011) theory of planned behavior (TPB). According to Ajzen (2011), a person's intent to engage in a particular behavior drives the behavior, and the intent to engage in the particular behavior can be an indicator used to predict future behaviors. Behavioral beliefs, normative beliefs, and control beliefs are used when examining human behavior (Ajzen, 2011). Behavioral beliefs are impacted by the attitude individuals hold toward the expected outcomes of a particular behavior (Ajzen, 2011). Normative beliefs focus on the individual's perception of what others will think about a particular behavior and how motivated the individual is to comply with societal expectations (Ajzen, 2011). Additionally, control beliefs influence an individual's behavior change or lack of behavior change. An individual's beliefs toward a behavior change influence whether or not the behavior change is made (Ajzen, 2011).

TPB allows research to be conducted to determine someone's beliefs and how those beliefs impact their behavior. TPB also allows researchers to determine intentions and how individuals could be motivated to perform the desired behavior.

Purpose

The purpose of this research project was to determine the obstacles to agricultural education teachers becoming CASE certified. To that end, attending a CASE institute can cost "from $2,300 to $3,000 depending on the institute and location" (CASE Institute, n.d.). In Nebraska, teachers can receive CASE scholarships to minimize their costs, in part removing the financial barrier for attending a CASE institute. Furthermore, grants are available to help offset the cost of purchasing appropriate equipment needed to teach CASE courses, minimizing another barrier. While some barriers for Nebraska agriculture teachers have been minimized, many teachers have not become CASE certified. In Nebraska, as of June 2017, only 37 of 192 active agriculture education teachers were CASE certified (M. Kreifels, personal communication, May 2, 2017). This study sought to understand this phenomenon and was guided by the following research question: What barriers prevent teachers from becoming CASE certified?

Methods

This research was conducted using qualitative methods. Dey (1993) stated that "qualitative data deals with meanings, which are mediated mainly through language and action" (p. 11). By utilizing the qualitative paradigm, researchers can interpret and understand the phenomenon based on the participants' viewpoints (Denzin & Lincoln, 1994). The population for this study consisted of high school agriculture teachers in Nebraska. To be purposefully selected for this

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study, the following criteria had to be met: 1) not be certified in any CASE course, 2) not be attending a CASE institute in the coming summer, 3) be employed for the upcoming school year as a high school agriculture teacher, and 4) have taught high school agriculture for at least one year. To begin data collection, five participants were selected based on the participation criteria. Those first five participants and subsequent participants were asked to identify potential participants based on the criteria. Vogt (1999) defined this sampling approach as snowball sampling or "a technique for finding research subjects. One subject gives the researcher the name of another subject, who in turn provides the name of a third and so on" (p. 1).

Twenty-five agriculture teachers participated in this study, consisting of 16 males and 9 females. Twenty-two participants were traditionally trained agriculture education teachers, and 3 participants were transitionally trained agriculture education teachers. Years teaching varied for the participants, 1 participant had taught for 1-3 years, 7 participants taught for 4-7 years, 8 participants taught for 10-14 years, 3 participants taught for 15-19 years, 2 participants taught for 25-29 years, 2 participants taught for 30-34 years, and 2 participants taught for 35-40 years.

Prior to participating in a semi-structured interview, each participant signed an informed consent form approved by the IRB at the University of Nebraska. The semi-structured interviews were audio-recorded and transcribed verbatim. One interview was conducted with each participant, lasting approximately 30 minutes. For transcription and analysis purposes, participants were assigned the letter P and a number. The letter P stands for *participant,* and the number corresponds to the order they were interviewed; for example, P15 refers to participant 15 as recorded in the data. Questions from the interview protocol are listed below:

1. What is your gender?
2. What was your undergraduate degree in?
3. How long have you been teaching?
4. What science classes did you take during your undergraduate work?
5. In your opinion, what is the most important thing to teach in agriculture classes?
6. On the agriculture education spectrum, with one being preparing students with vocational training and ten being preparing them for college, where do you find your program? Why?
7. What is your perception of Curriculum for Agriculture Science Educators or CASE?
8. What content knowledge and skills do you believe you would receive from being CASE certified?
9. Have you considered becoming CASE certified? Why or why not?
10. What are benefits you have heard of or seen to being CASE certified?
11. What are challenges to you becoming CASE certified?
    a. If time, how much time would you be willing to give to become certified? Explain.
    b. Would you be willing to do an online training or pre-work prior to attending?

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   c. Cost, would a scholarship to cover the cost of the institution and purchasing some supplies be helpful? Why or why not?
12. Based on your current curriculum needs, what classes would you want to be CASE certified?
13. Is there anything else that would help you overcome these challenges?
14. Would administration encouragement/support influence your decision to become CASE certified?
15. Can you think of any other ag teachers who aren't CASE certified who I should be speaking with?

The data were analyzed using thematic analysis. Attride-Stirling (2001) defined thematic networks as "web-like illustrations that summarize the main themes constitute a piece of text." More specifically, the block and file approach was utilized because it allowed recurring patterns and themes to emerge (Grbich, 2007). Each interview transcript was read at least three times, and then words/phrases were highlighted and categorized into themes and sub-themes. To help ensure trustworthiness, techniques described by Lincoln and Guba (1985) were used. Triangulation was achieved by using multiple researchers. Member checking was used throughout the data collection process to determine if participants agreed with the researchers' findings, and peer debriefing was used to assure that proper qualitative protocols were followed.

There were five researchers involved in this study – two associate professors of agricultural education, one professor of agricultural education, one graduate student in agricultural education, and one associate professor of animal science. Four of the researchers were formally prepared as agriculture education instructors, and the lead researcher is currently teaching high school agriculture in Nebraska. Additionally, two of the researchers have been CASE certified and believe CASE is an effective curriculum for teaching the science of agriculture.

Findings

Two overarching themes, with six subthemes, emerged from the data. Overarching themes were (a) perception of CASE and (b) barriers to becoming CASE certified. The subthemes that fell under the Perception of CASE were (a) positive aspects, (b) negative aspects, and (c) age. Subthemes relating to the Barriers to Becoming CASE Certified were (a) cost, (b) time, and (c) administration support. Limitations of this study include participation limited to one state, lack of a national perspective, and barriers to participation in CASE identified only from the teacher perspective and not from an administrator perspective.

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Perception of CASE

Positive Aspects

Overall, most participants had a positive view of CASE. P3 stated, "it's a good program, and I think it is a way to very authentically challenge students." Similarly, P9 stated, "Things that would be useful would be the hands-on activities that would get the students in class maybe more excited." P21 thought the CASE would help apply content in a meaningful way within their classroom, something they struggle with as a veteran teacher. Participants felt the curriculum would be very useful and would give them great hands-on lessons to implement within their classrooms (P1, P2, P3, P4, P5, P6, P9, P10 P12, P15, P16 P20, P21, P23, P24). In fact, most saw the curriculum as very helpful. P11 said, "I think within my classroom scope and sequence would flow better compared to right now as I pull bits and pieces from various things."

Negative Aspects

Although participants were interested in the CASE curriculum, they were wary and concerned about program structure. P18 stated,

> My perception of CASE is everything is very structured, like you will teach this lesson and then this lesson, and for me, that doesn't always work that way. When you are teaching a subject, sometimes you have to jump here or back depending on where your kids' knowledge is. If they already know a specific subject, why do I need to cover that lesson again, and have maybe a boring classroom experience for them?

Another concern was utilizing all of the curriculum (P1, P5, P6, P8, P9, P19, P24, and P25). For example, P24 said, "I would stereotype we are all going to kind of teach our own material and mold our curriculum to fit our program, so if I'm going spend a lot of money and not utilize all the materials associated with CASE, I feel like it is a waste of money."

Age

Participants with more than 25 years of teaching experience were concerned about misusing resources and taking resources away from younger teachers that might better utilize the resources (P9, P13, P14, P16, P22, P25). P16 stated,

> I'm too close to retirement and didn't get started early enough, and I am kind of at that point in my life where I don't want to zero in on one thing. I think the resources might be better used on somebody who could impact more students over time.

Similarly, P9 stated, "My biggest challenge is the fact that I'm getting close to retirement, and I feel that there is [*sic*] younger teachers that would probably benefit more and be able to use it down the road." Still, these participants understood the benefit of being CASE certified. For

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example, P22 said, “I think I would have a lot more science in my curriculum than I do now; that’s really where I think I could improve a lot is having more science-based stuff.”

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Cost

Participants commonly believed that the CASE curriculum had educational value, but it was too expensive. This perception persists, despite the fact that scholarships are currently available to cover the cost of attending CASE institutes in Nebraska. P1 stated,

> I just know in my school district, it would be a pretty tough sell. You go and get certified, and now they would probably need to purchase some equipment. I’m sure that wouldn’t be as difficult if the training is paid for, yeah, the initial step to get them to commit to that would probably be difficult.

When participants were asked if the scholarship would cover not only the cost of attending but also the purchase of supplies needed to teach the CASE curriculum, all agreed that would make it easier to attend a CASE institute. For example, P8 stated, “I haven’t asked if my school would help foot the bill for some of those costs, my gut says not all of it, they may help with that, but scholarships for that would be beneficial.” P17 stated, “The supplies are fairly expensive, uh, and I don’t think the costs are inappropriate, but it doesn’t change the fact that it is a large amount of cash to outlay.”

Time

Participants were concerned about the time needed to attend a CASE institute. Concerns ranged from personal to professional regarding the amount of time needed to become CASE certified. P2 said, “A week and a half long, and I just can’t get away from kids and home life for that long.” Numerous participants were concerned about the time required to attend and being gone from their families (P2, P3, P5, P6, P8, P12, P13, P21, P22). On the professional side, P14 stated, “The way the schedules are now, a lot of the summer contracts have gotten narrowed down quite a bit.” P6 was concerned both personally and professionally, “My summer is pretty full; I use up all my contract days. Then I coach so, I don’t really want to take anything else from my family.” Additionally, P6 stated, “I need to get later in my career when my kids are older, um, maybe I’m not coaching as much, um, maybe there’s different factors going on in my life.”

All of the participants were interested in shortening the length of the CASE institutes by doing online pre-work before attending an institute. Most commonly, participants indicated that no more than five days should be required to attend a CASE institute. P5 indicated that shortened CASE institute would be much easier to attend.

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Administration Support

When participants were asked if administration support would influence their decision to become CASE certified, most thought their administration would support becoming CASE certified. P21 said, “If the school is willing to pay for it or something to that regard, that would give me more motivation to look into it [CASE institute].” Administration support would encourage participants to become CASE certified (P2, P6, P7, P8, P9, P12, P13, P15, P16, P17, P21, P22, P23, P24). P8 felt that if their administrator recognized the benefits of CASE, he would be more like to become CASE certified.

Conclusions and Recommendations

Teachers have varying perceptions of CASE, but most held CASE in a favorable light. They identified multiple benefits of attending a CASE training, including having access to the curriculum with its hands-on labs. Similarly, Knobloch et al. (2007) reported that teachers believed students benefited from laboratory activities, demonstrations, and active learning environments that incorporate hands-on learning. The teachers’ perception that the CASE curriculum is filled with student-centered learning opportunities aligns with Lambert et al.’s (2014) assertation that CASE participants need to be willing to teach a student-centered curriculum. However, there was concern that the curriculum was too rigid and structured. Participants expressed the need to make modifications based on the needs of their students. There was also concern due to the cost of CASE and not being confident that they would actually teach the entire curriculum. We recommend that CASE develop short units that last for approximately one week and stand-alone lessons that could be taught in one class period. This could serve as an introduction to the full CASE curriculum and be used as a recruitment tool to encourage the teacher to become CASE certified.

We also recommend that CASE trainings continue to be offered to preservice and in-service teachers and that teachers be informed ahead of time that CASE has been designed as a student-centered curriculum. CASE training would allow teachers to utilize the curriculum and incorporation of science-based activities throughout their careers. Thompson (1996) similarly reported that undergraduates (in-service teachers) studying to become agriculture teachers would be better prepared to teach if they received instruction on how to integrate science. To determine if high school students enrolled in a CASE course experience increased science scores similar to PLTW students, future research should examine the academic achievement benefits high school students receive from completing a CASE course, and if students completing CASE courses experience higher standardized science test scores than the average student in the United States.

Participants were concerned about how long it takes to become CASE certified, 50-100 hours of intense training, which is usually 7-9 days with a weekend off. Participants were more receptive to becoming CASE certified if the training could be reduced to 5 days, and the participants were willing to do online pre-work before attending an institute. Although Balschweid and Thompson

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(2002) identified the lack of in-service workshops or courses for learning how to integrate science into the curriculum as a barrier to integrating science, participants understood the need for training and admitted it would help them become more familiar with the material and labs. Identifying and removing barriers preventing agriculture teachers from attending a CASE training aligns with Ajzen's (2011) TPB and could lead to more agriculture teachers participating in a CASE training and teaching the curriculum. Based on the findings of this study, we recommend that CASE institutes be shortened to five days with pre-work prior to the training. Since conducting this research, there are now fast-track CASE courses being offered that include 5-days of face-to-face instruction and homework to complete prior to the face-to-face instruction (CASE Institute, n.d.). Future research should examine the impact that fast track courses have on teacher preparedness and effectiveness.

Participants were also concerned about the cost of attending and utilizing the curriculum, which is consistent with Balschweid and Thompson's (2002) findings regarding science integration. While scholarships that would cover the cost of attending an institute and implementing the curriculum would be well received, covering the participation and supply cost may not be feasible. One recommendation to minimize the cost barrier would be to share and focus on the benefits of a school offering CASE courses. Since high school principals have a role in selecting the curriculum that will be taught (Praisner, 2003), school administration in Nebraska needs to know that CASE courses can be offered for science credit. Administrative support for CASE institute attendance and certification may be enhanced if administrators are knowledgeable about CASE. Most participants believe their administration is uninformed about CASE and how CASE could benefit their school. The benefits of the CASE curriculum must be communicated with school administrators if we expect them to allocate funds for CASE certification. We recommend sharing information about CASE with local school administrators and with the Nebraska Department of Education. Future research should examine the perception that school administrators hold towards CASE.

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Journal of Human Sciences and Extension Volume 9, Number 3, 2021