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Encouraging Teacher Change within the Realities of School-based Agricultural Education: Lessons from Teachers' Initial Use of Socioscientific Issues-based Instruction

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Abstract

Calls for increased interdisciplinary education have led to the development of numerous teaching methods designed to help teachers provide meaningful experiences for their students. However, methods of guiding teachers in the successful adoption of innovative teaching methods are not firmly set. This qualitative study sought to better understand how school-based agricultural education teachers decide to adopt or discontinue a teaching innovation when introduced through ready-made lesson plans, which is currently a common practice of teaching method integration in SBAE. Constant comparative analysis unveiled themes within the reactions to the teaching method's use, as well as how teacher actions to those reactions led to their ultimate adoption or discontinuance of the teaching method.

Keywords: socioscientific issues, SSI-based instruction, qualitative, agricultural education

The notion of change stemming from school reform has ironically been a constant within the United States public school system for the past 60 years. School-based agricultural education (SBAE) has not been omitted from these calls. In 1988, the National Research Council recommended that teachers "be encouraged to modify lesson plans to incorporate materials about scientific, economic, and public health aspects of agriculture" (p. 11) in order to rectify the problems associated with the "outdated" focus and content of agricultural education programs. Twenty one years later, the NRC's recommendations in *Transforming Agricultural Education for a Changing World* (2009) implied these changes had not yet hit mainstream agricultural education; the NRC again recognized that "educators have not helped students…make the connection between [multi-dimensional and challenging scientific, business, economic, environmental, and social issues related to food] and a degree in agriculture" (p. 4).

The national calls for increased interdisciplinary education and real-world connections (American Association for the Advancement of Science, 1993) have led to the development and delivery of numerous teaching methods designed to help teachers provide meaningful experiences for their students. While these methods are not unique to agricultural education, agriculture teacher educators focus on introducing these interdisciplinary teaching methods to their students (Newcomb, McCracken, Warmbrod, & Whittington, 2004; Phipps, Osborne, Dyer, & Ball, 2008). Parr and Edwards (2004) recognized inquiry-based instruction as a "method of choice" (p. 106) for

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science educators, and determined that there was considerable "pedagogical congruence" between it and the problem solving approach recommended by agriculture teacher educators (p. 111). Since then, inquiry-based instruction has been a heavily-studied and often-recommended method of teaching in SBAE (Easterly & Myers, 2011; Thoron, Myers, & Abrams, 2011; Washburn & Myers, 2010). Recent studies have introduced socioscientific issues (SSI)-based instruction, a method stemming from inquiry-based instruction and commonly highlighted within science education, as an appropriate method for use in SBAE due to its focus on agricultural issues (Shoulders, 2012).

Unfortunately, the introduction of a new teaching method into a teacher's set of skills is not a seamless process. Even when the theoretical underpinnings of a teaching method are undeniably accurate, "difficulties associated with implementing the approach effectively" can thwart its adoption rate among teachers, as Moore and Moore (1984) stated with respect to teachers' adoption of the problem-solving approach (Parr & Edwards, 2004, p. 112). Barriers to inquiry-based instruction have also been associated with teacher concerns regarding specific aspects of implementation within their own classrooms, such as safety, classroom control, increase in student misconceptions, and subjective grading (Shoulders & Myers, 2011). These barriers stem from the ideals of the teaching methods clashing with the implementation of the methods within the realities of the classroom, as was posited by Moore and Moore (1984).

Methods for reducing the barriers of teaching method adoption have been the focus of numerous curriculum programs, educational studies, and approaches within studies. While several studies within agricultural education have stated that ready-to-use materials created by curriculum specialists would increase the use of interdisciplinary and inquiry-based educational techniques (Anderson & Anderson, 2012, Washburn & Myers, 2010), studies focusing on SSI-based instruction in science education have employed procedures which guide teachers through the instructional development process (Klosterman & Sadler, 2011; Osborne, Erduran, & Simon, 2004; Sadler, Klosterman, & Topcu, 2011; Yager, Lim, & Yager, 2006; Zeidler, Sadler, Applebaum, & Callahan, 2009). The fundamental differences between agriculture teachers and science teachers can compound difficult decisions regarding how to introduce teaching methods originating in science education into agriculture classrooms (Shoulders & Myers, 2012).

Thus far, one study has examined the impact of SSI-based instruction in agriculture classrooms (Shoulders, 2012). This study found significant gains in student knowledge following the SSI-based instructional unit, which delivered 45 ready-made lesson plans and accompanying PowerPoints and student materials to teachers after they attended a one-hour training session on SSI-based instruction. While the methods of integration, chosen due to teachers' available time to engage in professional development related to the instruction, followed recommendations of researchers in agricultural education, the study experienced an exceptionally high attrition rate; seven out of the 11 original teachers requested to be removed from the study after they began utilizing the materials. The quantitative nature of the study did not lend itself to further investigation into the reasons for this high attrition. Based on the positive impact the SSI-based instructional model had on the students whose teachers remained in the study, the researcher recommended qualitative research be conducted to further understand how SSI-based instruction can impact student learning within the realities of the everyday classroom. The current study served to better understand how teachers made the decision whether to continue utilizing the SSI-based instructional approach when given ready-made materials in an effort to provide recommendations for teaching method adoption approaches appropriate for agriculture teachers, both within SSI-based instruction and for those focused on in the future.

Theoretical Framework

The Diffusion of Innovations theory (Rogers, 1995) guided this study. This theory illustrates how innovations spread throughout a social system. Rogers originally proposed five stages through which people proceed when deciding whether to accept an innovation (see Figure

1). In the first stage, *knowledge*, the participant has just been exposed to something new but has yet to desire to seek new information about it, unlike the next stage, *persuasion*, wherein the participant now gathers new information about how the innovation would work in his or her own situation in order to make a favorable or unfavorable opinion of it. The third stage, *decision*, is unique to each individual, and is the point where a participant decides whether to accept or reject a new idea. In the *implementation* stage, the participant has made a decision to continue with the innovation, but is still learning about it and weighing his or her options. Rogers noted that re-invention of the innovation is very common within the implementation stage. In the final *confirmation* stage, the individual has made a final choice to use the innovation and seeks reinforcement on that decision. The decision to implement an innovation may be reversed if the user is presented with conflicting information regarding the innovation. This reversal is termed *discontinuance*, and "may occur because an individual becomes dissatisfied with an innovation, or because the innovation is replaced with an improved idea" (Rogers, 1995, p. 21).

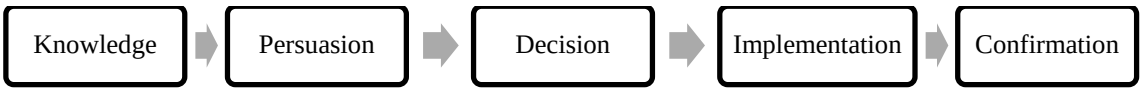

Figure 1. Stages of Theory of Innovations

In this study, researchers understood that participants were going through each of these stages during their experiences with the SSI based instruction. During the *implementation* and *confirmation* stages, participants could decide to discontinue the innovation based on their new experiences with it, possibly leading them to drop out of the study, as was observed in Shoulders' (2012) study. The purpose of this study was to gain an understanding of participants' experiences with the innovation as they went through the *implementation* and *confirmation* stages, as well as understand how and why some participants discontinued the innovation while others remained in the *confirmation* stage.

Conceptual Framework

In science education, SSI-based instruction has yielded positive results from studies that involved active teacher contribution throughout the design process. An SSI-based reproduction unit delivered positive results in student achievement (Dawson, 2011). Klosterman and Sadler (2011) involved two teachers in the design of a three-week global warming unit. They found statistically significant differences between students' pretest and posttest sores. A study by Yager, et al. (2006) was the result of teacher involvement from its outset, as the idea for the study was developed by two teachers. Findings showed statistically significant gains in students' general science mastery.

The introduction of innovative teaching methods in SBAE has historically taken on a different form than in science education. Due to the limited time and effort agriculture teachers are able to put toward professional development outside of their schools (Anderson, Barrick, & Hughes, 1992), successful educational change has been the result of initiatives supported by the school or training packages that have required little input from the teacher. In a study that examined high school agriculture student achievement scores, Dyer and Osborne (1996) found that the problem solving approach yielded results that were not significantly different from those obtained using the subject matter approach. This study delivered ready-made instructional units to teachers during an inservice workshop that lasted between two and six hours. In 2011, Witt found that students exposed to the CASE curriculum, which provides trained teachers with lessons designed to enhance the rigor and relevance of agriscience, spent significantly more time actively engaged during classtime than those taught through traditional instruction.

Currently, there is no recognized best method of introducing new teaching approaches to practicing teachers. The previous research has shown that including teachers in the instructional design process (Klosterman & Sadler, 2011; Yager, et al., 2006) and supplying teachers with prefabricated materials (Dyer & Osborne, 1996; Witt, 2011) have both presented successes and challenges for teachers. Combined with these conflicting results, the differences between common teaching method introduction practices in science education and in agricultural education further compound the difficult decision of determining how to best introduce science-based teaching methods, such as SSI-based instruction, into agricultural education classrooms. This study was designed to add to the body of knowledge in an effort to move toward a set of recognized best methods for introducing new teaching approaches to practicing teachers.

Purpose and Research Questions

The purpose of this basic qualitative study was to understand how teachers made the decision to continue or discontinue using an SSI-based instructional approach when supplied with ready-made materials. To achieve this purpose, the following research questions guided this study:

1. What are teachers' perceptions regarding SSI-based instruction throughout the unit?
2. What are teachers' perceptions regarding the use of ready-made materials in their classrooms?
3. How do teachers decide whether to fully adopt SSI-based instruction?
4. What teacher concerns and/or actions lead to decisions to discontinue using SSI-based instruction?

Methods

This study followed basic qualitative methodology in order to better understand how teachers made the decision to continue or discontinue using an SSI-based instructional approach when supplied with ready-made materials (Merriam, 2002).

Bracketing

In order for researchers to allow the data to be presented accurately, they must put aside previous notions by "bracket[ing] to the best of [their] ability and let the experience…speak to [them] at first hand (Crotty, 2003, p. 79). The researchers conducting this study each held very different previous experiences within agricultural education and with SSI-based instruction. The lead researcher selected the members of this varied team in order to highlight preconceived notions that may stem from specific previous experiences. While two of the researchers have experience teaching at both the secondary and postsecondary levels, one researcher is currently enrolled in a preservice teacher education program. Two of the researchers were engaged in high school agricultural education as students, while one received his/her initial agricultural education experience in college. Two of the researchers had previous experience with SSI-based instruction, while one did not. Two of the researchers had both created and used ready-made lesson plans before, while one had not. Recognizing that these previous experiences may have had an influence on the lens with which the researchers examined the data enabled the researchers to better ensure the objectivity of the findings.

Participants

Teachers were selected to participate in the study using purposeful criterion sampling, in which the cases studied meet specific criteria to ensure richness and quality of data (Patton, 1990). When using criterion sampling, the researchers predetermine the criterion by which participants

should be selected, based on aspects which the researchers deem influential on data quality (Patton, 1990). The social desirability of teachers to successfully and easily adopt teaching methods required that only teachers with proven ability to maintain honest communication with the researchers would supply honest evaluation of the lesson plans. Therefore, teachers were purposefully selected based on their history with the researchers, and those with a professional history that exhibited honest, detailed, and consistent communication with at least one of the researchers were invited to participate. The teachers were also selected based on their past willingness to attempt novel teaching approaches on their own.

To protect participant confidentiality, the five teachers participating in the study were given pseudonyms that accurately reflected their genders. Mrs. Smith, Mrs. Jones, and Mr. Jackson were all high school agricultural education teachers in Kentucky. Mrs. Jones and Mr. Jackson shared a two-teacher program. Mrs. Smith taught in a three-teacher program, but was the only study participant from her school. Mrs. Smith and Mr. Jackson had both taught for three years in the schools in which they were currently employed. Mrs. Smith, Mrs. Jones, and Mr. Jackson each used the study's lesson plans in their introductory agriculture courses, which consisted primarily of ninth grade students. Mrs. Smith's and Mr. Jackson's classes participated in block scheduling and held class every other day. Mrs. Jones had eight years of teaching experience, all in the school in which she was currently employed. Her classes were 45 minutes long, and students met every day. Mr. East was a high school agricultural education teacher in a single teacher department in Minnesota with three years of teaching experience. He had one year of previous teaching experience in North Carolina, and was engaging in his second year teaching in his current school during the study. He utilized the SSI-based lesson plans in his Ag. II course, which is a year-long course for sophomore students. Mr. East's students met for 45 minutes every day. Ms. Martin was a high school agricultural education teacher in a three-teacher department in Arkansas with three years of teaching experience. She utilized the SSI-based lesson plans in her Survey of Agricultural Systems course, which was comprised of students in grades 10 through 12. Each teacher taught a variety of animal science, plant science, mechanics, and introductory agriculture courses, and each had high school agricultural education experience.

Lesson Plans

The study by Shoulders (2012) used ready-made lesson plans that taught animal science content through the issue of the introduction of lab-grown meat into the nation's food supply. These lessons were developed by the researcher and reviewed by a panel of experts in agricultural education and SSI-based instruction. Their use in the original study led to increased student knowledge, but may have attributed to a high attrition rate. Because the current study was designed to examine the teachers' adoption processes which led to the high attrition rate in the 2012 study and because of the readily accessible lesson plans published by Shoulders (2012), the researchers determined that the use of these previously made lessons, as opposed to designing new lessons, would be most likely to lead teachers to follow adoption processes similar to those in the original study. Because of previously known events attended by most secondary agriscience teachers and potential unforeseen circumstances occurring at the various schools, teachers were given one full academic semester, from September through December, to complete the lessons. Because lessons were originally developed to align with the Florida content standards, each participant in the current study reviewed the content standards included within the unit to ensure they aligned with their state's required curriculum.

Teachers were initially contacted via phone. During this call, they were introduced to the study and its requirements. They were also invited to attend a 1-hour online training session with the researchers, which was designed to give teachers an understanding of SSI-based instruction. Following the phone call, teachers were sent digital copies of the first sub-unit of lesson plans, which mimicked the exact format of the remaining units. Teachers then attended the online training

session, during which they learned about the concept of SSI-based instruction, the lesson plans, and the requirements of the study. Teachers were able to ask questions during this time as well, and were given access to all lesson plans.

Data Collection

Two researchers were involved in all aspects of data collection, while one was omitted from data collection in order to enable him/her to analyze the raw data from a perspective alternate to that of the other researchers, whose lens of the data could have been altered by the data collection experience. Data was collected through the use of daily journal prompts, weekly semi-structured interviews, and a focus group (Flick, 2006). Journal prompts included a set of questions for teachers to answer after every lesson, and included items intended to guide teachers through a lesson reflection. Protocols for the semi-structured interviews were different each week, and each included questions that guided teachers through their overall reactions to the lessons, the current state of their classrooms' cultures, aspects of the lessons they had trouble with or altered, classroom preparation, and student behaviors. The planned focus group protocol enabled teachers that successfully entered the confirmation stage of adoption to collectively provide insight into what they saw as the main strengths of the lessons, the main weaknesses of the lessons, their students' reactions to the unit, the alterations they made to the lessons, and their opinions on what changes would enable a greater number of teachers to adopt the innovation. Daily journals were submitted by teachers via email at the end of each day. Weekly interviews were conducted via telephone and were recorded. The focus group was conducted through a recorded online session which enabled the group to speak together, see one another, and collectively work on a web-based "white board". All recordings were then transcribed and coded. Coded data was first identified by the participant (P1-5), then by the data source, (J = journal, I = interview, E = email), then by the number of the data source, then by line number (L). Mrs. Smith was coded as Participant 1, Mrs. Jones was coded as Participant 2, Mr. Jackson was coded as Participant 3, Mr. East was coded as Participant 4, and Ms. Martin was coded as Participant 5. Using this method, data obtained from, for example, the third participant, on the fourth journal entry, from lines 6-10 would be coded as P3, J4, L6-10.

Data Analysis

Daily written journals and interview and focus group transcriptions were analyzed using the constant comparative method (Lincoln & Guba, 1985), which includes four stages: 1) compare incidents applicable to each category, 2) integrate categories and their properties, 3) delimit the construction, and 4) write the construction. Following this method, the researchers reviewed transcriptions and journals for trends, which were utilized to discover emerging categories within the data. The researchers compared incidents at three levels: within each journal entry or interview transcription, between a participant's journal entries and follow-up interviews, and between all participants' journal entries and interviews. Researchers first used an open coding procedure to discover themes found within fragments of each journal entry or transcription and compare them to the remainder of the journal entry or transcription to determine whether other fragments aligned with the same theme. The researchers then compared fragments from individual texts to determine whether they repeated information or offered new information (Lincoln & Guba, 1985). Those with repeating information were coded to the same theme. Those with new information were initially coded into different themes. Once texts were coded into themes, the researchers sought to label the categories with the most appropriate theme titles. The determination of appropriate theme titles enabled researchers to further distinguish between repetitive themes, overlapping themes, related themes, and separate themes. This process enabled the researchers to establish a construction that contained each of the discovered categories in a manner that accurately portrayed the trends within them and displayed the relationships among them.

Evaluative Criteria

Lincoln and Guba (1985) recommended that the trustworthiness of a qualitative study can be evaluated by its credibility, transferability, dependability, and confirmability. Credibility, which establishes confidence in ability of the researcher, design, and findings to accurately represent the data (Ary, Jacobs, & Sorenson, 2010), was established through the use of frequent regular data collection, triangulation between researchers, and member-checking following both the transcriptions and the data analysis. Participants were given transcripts and then findings to ensure data were interpreted accurately. Transferability, which refers to the ability of the findings to be applicable to other contexts, was established through the use of thick description of each participant and his/her teaching experiences throughout the study. To address dependability and confirmability, which display the consistency of the findings and their degree of neutrality, an audit trail was established through the use of both audio recorded and transcribed data, interview and journal protocols, triangulation between daily journals and weekly interviews, triangulation in data analysis between researchers, and the bracketing of researcher subjectivity.

Findings

Data analysis yielded themes stemming from the teachers' perceptions of the lessons, their perceptions of their students' perceptions of the lessons, and their focus on the unique components of the agricultural education classroom. Texts were organized into the following themes: initial excitement, expected uniqueness of agriculture classes, conditioned to need a right answer, loss of connection between content and students' lives, student disengagement, decisions to discontinue, and confirmation of adoption.

Initial Excitement

All participants reported observing initial excitement among their students when starting SSI-based instruction. Several teachers expressed amazement at how interested the students were in the new material and how many questions they had. Mr. Martin, after teaching the first lesson which introduces lab-grown meat, noted, "sometimes they'll come up to me and be like, 'so this is something I'm eating right now?' So they do after class, they're…coming up to me and asking me like 'what exactly is really happening?'" (P1, I1, L104-106). Mrs. Smith's students showed excitement with initial questioning as well, noting, "the whole time we were looking at the PowerPoint, they were like 'wait, how do we know if we have that? What do we look for? Where does it typically come from?'" (P5, I1, L168-171). Mrs. Jones noted that the students' response to the lessons led to her own excitement in the lessons: "some are making very logical arguments and I'm impressed!" (P2, J2, L11). Mrs. Smith echoed the notion that teachers are excited when their students are excited, exclaiming, "I love when students are fired up about issues!! I feel that this is when students learn best." (P1, J1, L29).

Expected Uniqueness of Agriculture Classes

Teachers in each of the classes began to voice concerns over the lack of time out of the classroom, which they felt was an expectation of agriculture classes among students when they sign up for the class. The lessons included hands-on activities, but did not require students to utilize any agricultural laboratories outside of the classroom. Teachers expressed their students' expectations to engage in activities outside of the classroom, which was seen by teachers as a factor contributing to student unrest within the class. When comparing the study's lesson plans with her typical classes, Mrs. Smith said, "[my typical classes are] hands-on learning, so I think that this is

just a totally different style for them and me." (P1, I1, L53) She also mentioned that her classes are typically different from other classes in school:

> Kids expect to go in and sit for 90 minutes in a science class…[Ag. class] is just different. I'm glad that you get that it's different, because I think there are a lot of people that would be like, 'what do you mean it's different? It's a classroom with kids.' When they come in your room, their mindset's completely different than anywhere else. (P1, I1, L546-560)

Ms. Martin also explained that her students view agriculture classes differently, saying,

> I think they're worried that it's like classroom notes or worksheets…like they think that in Agri they get to do hands-on stuff. Not that they're not going to get that, but they're kind of like, well, we take notes in other classes. (P5, I1, L22-27)

Mr. Jackson mentioned that he felt a great need to keep his students "hooked on ag ed" and "keep them" enrolled. His concerns about items that may deter students from remaining in his classes were voiced when he noted, "I can tell you now, some of them are like, 'so when are we gonna you know, get around to doing some of this other stuff?'" (P3, I1, L75-76). He followed up his statement by sharing that his concerns were not stemming from his own interest in the material, but rather from observing that the students expected that agriculture classes were more fun than other classes:

> I love the material, and I love, I mean the students are really getting into it, it's just that this is a group we actually really want to keep close and we want to try to keep them, you know, having fun. (P3, I1, L139-141)

Mr. East also shared concerns regarding the lessons because of his observations with students, stating, "I hope there is some room for some hands-on activities dealing with animals, because this group is itching to have some experiences with animals or something out of the classroom" (P4, J2, L6-8).

Conditioned to Need a Right Answer

Many participants noted that their students were insistent on knowing whether their answers to questions posed in class or on assignments were right. Mrs. Smith conveyed that she had difficulties when students repeatedly asked her what the answers were. Mrs. Jones noted similar concerns, stating, "the kids were not…umm…I don't know the right word but they weren't able to…make their own decisions. Like I literally had to tell them on each slide this is what you should write here" (P1, I1, L80-84). Ms. Martin noted similar dependence on the teacher for answers from her students, claiming, "when they were doing more reading or having to think on their own, that was a little harder for them because they were…like well, what do you think?" (P5, I1, L74-75). Each teacher posited that students were having trouble with the self-directed answers because of their conditioning in other classes. Ms. Martin offered that her students needed a lot of prompting because they are not used to being self-directed (P5, J5, L11). Mrs. Jones observed this behavior from her students right from the start, stating after the first lesson, "students didn't understand what they were doing. I pretty much had to tell them what to write down, they weren't able to make their own decisions" (P2, J4, L3-4). Mr. East also made a recommendation about what may have helped his students perform better when he noted, "my students respond really well to 'this will be on the test so you need to know it'" (P4, J6, L4-5). He explained:

> There is something about this group and how they have been trained over the past few years since they've been in high school…ok, let's get this worksheet done and then let's do that…so they haven't been trained in inquiry based instruction or as much problem solving instruction or have been exposed to it as much or they're not as comfortable with thinking outside the box. (P4, I3, L39-42)

Mrs. Jones noted that this conditioning may also be reinforced in her own classes, because she "had a hard time explaining what would be a good response without just telling them what to put" (P2, J6, L4-5).

Loss of Connection between Content and Students' Lives

All those participating reported a time where connection between the students and the material seemed to be dwindling. Mr. East observed the lack of relevance his students felt, which presented itself as a lack of interest. He noted his students frequently said things like, "it can happen, but none of the meat in our grocery stores is lab grown meats, so we don't have to worry about it. Whatever. We're tired of talking about this, let's talk about something else. Let's go weld" (P4, I3, L69-71). Mr. Jackson shared that some of his students asked, "how is this really even an issue? Because we really don't know anything about it" (P3, I1, L199). Mrs. Smith's students started asking, "why are we learning this?" (P1, I2, L58).

Student Disengagement

Each of the classes experienced a point of student disengagement which was readily expressed by each teacher. Mrs. Smith noted that while she was interested in continuing with the lesson plans, "at this point, [the students] are done" (P1, I1, L280). Mr. Jackson voiced that after the first week, his biggest concern was "that they're getting burnt out already" (P3, I1, L68). Mr. East expressed his students' disengagement by noting, "I sort of feel like they want to say, 'here he goes with that whole lab grown meats thing again'" (P4, J5, L6-7). Mrs. Jones expressed that while her students were disengaged, she saw their level of disengagement as a fault of the education system: "I'm worried, like, I said that they're already like, 'ok, we're sick of this', which you know is awful, but here we can't keep our kids focused on something for a week without them…you know what I mean?" (P2, I1, L148-153).

Decisions to Discontinue

Teachers who made no modifications following student disengagement also started to have fears about student retention rate, causing them to discontinue the SSI-based instruction, which was carried out by disengaging from the study. In an email to the researchers, Mrs. Smith stated,

> My job is based on numbers and 4 lessons into this study, my students are not having fun, don't care for the material and are generally not very happy. If students are not happy and do not return to me, I have no job. (P1, E1, L1-3)

In a follow up interview, Mrs. Smith illustrated her students' perspective a bit more fully, shedding more light on her concerns:

> Our school is consolidating this year, I've got 35 kids in this class and they've got to go with me, or I won't have a job, so I've got to weigh out the options with that, I'm just going to have to move on to activities or something. Because every day they're just not…I like kids that come to my class and go, 'I'm so excited for your class today, what are we learning about?'. (P1, I2, L138-146)

In comparing her other classroom choices to the study's lessons, she said:

> We have other things going on like we have a new greenhouse, we're growing vegetables, we have free range chickens, we're getting a ferret and we're getting a bearded dragon and we have rabbits so if you incorporate all of that, they're like, 'we would rather learn about this'…It's not that we don't learn things in class, but if we can learn about our free range chicken in class and go out and touch it, it's different. (P1, I2, L107-111)

Mrs. Jones noted similar concerns in her email:

> I think Mr. Jackson spoke with you regarding us taking a break from the curriculum after fall break. We have got to start on some other things with the class...we are afraid to lose [our students]!!!! (P2, E1, L1-3)

Confirmation of Adoption

Participants who made modifications saw confirmation in their adoption of the SSI-based instruction in the form of student reengagement. These teachers utilized their agricultural facilities or hands-on activities to enhance the study's provided lesson plans. For example, both Mr. East and Ms. Martin incorporated a lab in which students made their own ice cream into the ready-made lesson on value-added products. In Ms. Martin's words, "the students were very engaged…many of the students were using the new terms while they were making ice cream…and relating what they were doing to the economy" (P5, J9, L11, L14). She also noted in the days after the lab that while she didn't alter the lessons, "the students were a bit re-energized by the lab and had more to reflect on than the previous assignments" (P5, J10, L14).

Following the student change after the ice cream lab, Ms. Martin became more willing to adapt the lesson plans to make them work for her students. She merged the issue with an electricity unit by focusing on the jobs that might be affected: "fewer agricultural animal facilities lead to less agricultural construction and skilled trade workers may be out of a job, focus on more alternative energy, or have to accommodate for an alternative type of structure" (P5, E1, L3-6). She noted that these blended lessons were welcomed by her students, saying they saw a break in the monotony through the use of hands-on labs focusing on the electricity side of the issue.

Mr. East observed a similar transition in his students. In the days following the incorporation of the ice cream activity, he said the students were really focused and "starting to get how to act and how to contribute to discussions" (P4, J9, L13). He also noted that the students responded well to the incorporation of a mock agricultural issues contest, with students "jotting notes feverishly as we came up with new issues that they could use for their argument" (P4, J11, L9-10). Observing increased engagement from his students, Mr. East began adapting more lessons to fit his classes, incorporating a field trip and an additional research project into the lessons.

Conclusions

Analysis of the data showed that within each class, after initial excitement, specific factors including the expected uniqueness of agriculture classes, students' conditioned need for a right answer, and a loss of connection between lesson content and students' lives, led to student disengagement from SSI-based instruction. Teachers' actions following this disengagement resulted in either increased engagement in SSI-based instruction or ultimate disengagement from the innovation, which caused the teacher to drop out of the study. This process of adoption or discontinuance as found within the data is displayed in Figure 2, and is discussed more fully below.

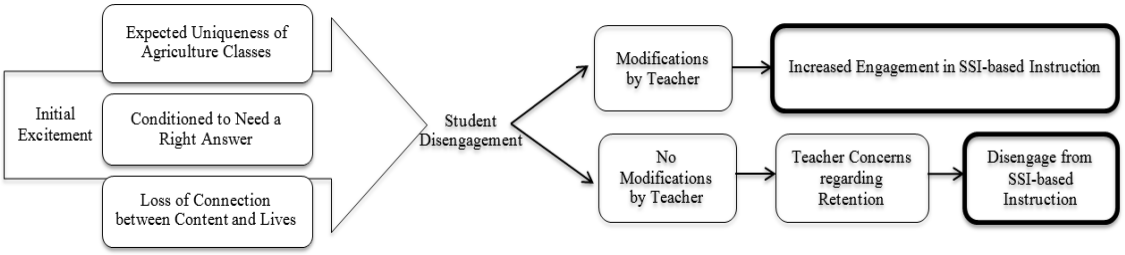

Figure 2. Evolution of Students' Reaction to SSI-based Instruction

Although all teachers expressed that students were initially excited about the new and modern material, three factors emerged as causes leading to student disengagement in all classes. These factors are the expected uniqueness of an agriculture class, the students' conditioned need for a right answer, and a loss of connection between content and the students' lives. Teachers each noticed the disengagement, but took one of two paths to reengage their students. Mrs. Smith, Mrs. Jones, and Mr. Jackson opted to discontinue use of SSI-based instruction and re-adopt their traditional methods of teaching, confidently feeling as though their previous methods of instruction would align with students' expected uniqueness of agriculture classes, their conditioned need for a right answer, and the relevance they needed to see between content and their lives. This action aligns with Rogers' (1995) position that adopters of an innovation may discontinue the use of an innovation during the *implementation* stage, and reflects the pattern of discontinuance seen in Shoulders' (2012) study. Mr. East and Ms. Martin chose to alter lesson plans in order to better align the innovation of SSI-based instruction with the students' expectations of the agriculture classroom and need for connections between content and their lives. This reinvention of the innovation was noted by Rogers (1995) to be a common occurrence within the *implementation* stage before adopters entered the *confirmation* stage. As Rogers suggested, the reinvention of the innovation enabled both Mr. East and Ms. Martin to continue to use the innovation throughout the study. Supporting the critical need for reinvention before entering the *confirmation* stage, both Mr. East and Ms. Martin recommended that, because of the differences in their classes, the ability to make their own activities to teach the content was a key component to the engagement they saw from their students. It was the reengagement displayed by students that gave them the confirmation they needed in order to fully adopt the innovation and make the lessons their own.

Recommendations

Based on the themes identified through examination of the data, the researchers agree upon the following recommendations for teacher educators interested in introducing agriculture teachers to curricular innovations. First, teacher reaction to student disengagement is key to the long-term success and implantation of a new curriculum innovation. Students and teachers expressed an initial positive reaction to the SSI-based instruction. However, once the realities of the SBAE classroom were realized, student disengagement and frustration with the new approach were witnessed. This finding is consistent with Moore and Moore's (1984) position that the ideals of novel teaching methods may clash with the realities of the classroom, setting them up for failure when implemented (1984). In this study, the reaction observed was reinvention of the innovation to overcome the causes of student disengagement. The teachers in this study who made modifications during the implementation stage by assessing student disengagement and making lesson alterations were rewarded with student behaviors that led to confirmation of the adoption. Rogers (1995) noted that modification is common during the implementation stage; this study suggests that personal modification may be necessary for teachers to reach the confirmation stage when deciding whether to adopt innovative teaching strategies. Teacher educators should therefore create easily adaptable materials for teachers, and during professional development, help teachers distinguish between the components of the curricular innovation that are crucial to its implementation those that can be altered to best meet the needs of the teachers' students.

Secondly, factors beyond just the classroom component of the complete SBAE program impact the adoption of instructional innovations, and it is recommended that curriculum innovations incorporate FFA, SAE, and classroom instruction. A number of teachers in this study struggled with the opportunity costs of teaching strictly in the classroom and spending less time focusing on the laboratory, FFA, and SAE components of the SBAE program. Ironically, agriculture teachers' year-round responsibilities in each of these three areas may keep them from being able to engage in professional development opportunities designed to help them tailor SSI-based instruction to fit their programs (Anderson, Barrick, & Hughes, 1992). Therefore, it is

recommended that teachers give attention to all aspects of the total SBAE program in any new curriculum innovation both during its development and during professional development with teachers.

Participants noted that students expected the culture of the SBAE classroom/program to be different than that of the other classes in the school. Teachers perceived that SSI-based instruction ran counter to the students' expected SBAE program culture and was too similar to what the students expected to find in other courses in the school. In reaction to student perceptions, teachers noted concern on how continuing with the SSI-based instruction would impact future student enrollment in the SBAE program. This teacher implementation concern is unique to literature regarding SSI-based instruction adoption. Previous studies investigating this topic were conducted in academic courses where teachers were not as concerned with student recruitment and retention (Dawson, 2011; Klosterman & Sadler, 2011; Osborne, et al., 2004; Sadler, et al., 2011; Yager, et al., 2006; Zeidler, et al., 2009). This phenomenon deserves further attention to assist teachers in implementing strategies to allow for new curricular innovations while mitigating any negative enrollment impacts. These strategies should include ways teachers can assist students' transitions from known or perceived cultural norms for the SBAE program/classroom to those the teacher is attempting to implement.

Finally, this study yielded a recommendation for future research. While this study discovered the process through which teachers proceeded in order to move from implementation to either discontinuance or confirmation, it did not uncover the reasons why teachers decided to either discontinue the innovation or reinvent it. Interviews with participants did not include any suggestions or recommendations regarding teachers' possible options to proceed when they expressed difficulties with the innovation; two teachers requested to alter lesson plans and three requested to discontinue their use. The researchers recommend that further investigation be carried out to determine the factors that lead teachers to make the decisions they choose with regard to reinventing or discontinuing an innovation.

While the question of whether ready-made lesson plans assist teachers in continuing their use of SSI-based instruction is not fully answered, this study did achieve its goal of furthering the knowledge base in that area. Ready-made lesson plans were successful in helping agriscience teachers adopt SSI-based instruction, but only when they made individual adaptations to the lessons. When no alterations were made, the ready-made lessons left teachers feeling frustrated, which led them to discontinue the adoption of SSI-based instruction. However, the aspects that led to these feelings of frustration, such as the need for students to engage in activities outside of the classroom, were largely unique to SBAE, and would not apply to science education, where classroom-based instruction is more expected by students. Rather than generalize the findings of this qualitative study, researchers should utilize a variety of quantitative methods to compare the impacts of ready-made lesson plans, teacher designed instruction, and the variety of methods in between, on teachers' adoption rates of SSI-based instruction.

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