

An Analysis of K-12 Teachers' Conceptions of Agriculture Prior to and During Engagement in an Agricultural Literacy Program

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Abstract

This study examined the K-12 teachers' conceptions of the agriculture industry prior to enrolling in an agricultural literacy program and how their conceptions changed throughout the program. The study used qualitative methods to analyze the data collected from entrance questionnaires, interviews, and reflective journals. Trustworthiness was established through the use of both methodological and investigator triangulation as well as rich description of the coding process and the establishment of an audit trail. Entrance questionnaires and interviews established the participants' prior understanding of agriculture. Data suggested the participants equated the agricultural industry with plant and animal production. From the reflective journal data it was determined that the teachers gained an awareness of the vastness of the agricultural industry and matured in their knowledge after participation in Summer Agricultural Institute.

Keywords: agricultural literacy; agricultural literacy program, conceptions of agriculture, summer agricultural institute

A 1988 National Research Council's (NRC) report on agricultural education, defined an agriculturally literate person as someone who has an understanding of agriculture from a historical, economic, social, and environmental perspective. The Council concluded that agricultural literacy in the United States was low and recommended providing all K-12 teachers with the training, resources and support needed to modify curriculum and incorporate agriculture (NRC, 1988). Since the publication of the NRC report, researchers have refined the term agricultural literacy and what it means to be agriculturally literate (Deeds, 1991; Elliot, 1999; Frick & Spotanski, 1990; Frick, Kahler, & Miller, 1991; Pope, 1990; Russel, McCracken, & Miller, 1990; Williams & White, 1991). Meischen and Trexler (2003) proposed an expanded definition of agricultural literacy which included agricultural content and a linguistic definition of literacy relative to culture. Researchers chose the following definition to define agricultural literacy in this study, because it was the most comprehensive and identifies the knowledge capacities of an agriculturally literate individual.

Agricultural literacy entails knowledge and understanding of agriculturally related scientific and technologically-based concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity. At a minimum, if a person were literate about agriculture, food, fiber, and natural resource

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systems, he or she would be able to a) engage in social conversation, b) evaluate the validity of media, c) identify local, national, and international issues, and d) pose and evaluate arguments based on scientific evidence. (Meischen & Trexler, 2003, p. 44)

With consideration to the National Research Council's (1988) position on agricultural literacy, the Department of Agricultural Education and Agricultural Sciences at Oregon State University in conjunction with the Oregon Farm Bureau developed an agricultural literacy program for K-12 teachers with little agricultural experience and background. Specifically, the program targets K-12 teachers in core subject who are not currently teaching agriculture related topics. The program, Summer Agriculture Institute (SAI), was intended to assist K-12 teachers in integrating agriculture into their curriculum (Balschweid, Thompson, & Cole, 1998). Preliminary research, conducted in 1998, revealed the SAI program to be effective, in that teachers who completed the SAI experience were integrating agriculture into their curricula and reporting favorable perceptions of the agriculture industry (Balschweid, Thompson, & Cole, 1998). However, the study did not address how the teachers' conceptions of agriculture may have changed through their participation in the SAI. The current research study was intended to examine the teachers changing conceptions of agriculture and if changes are evident, provide insight into considerations for the development of other agricultural literacy interventions.

The researchers chose to use the term conceptions, which implies an active relationship as the participant interacts with the agricultural concepts and creates meaning. The main distinction between the more commonly used term perception and the term conceptions is a shift from passive to active. Perceptions are commonly thought of as passive evaluations which can occur with limited interaction with the phenomenon of interest. For instance, researchers typically ask perception type questions of participants who have not directly interacted with and cognitively engaged with the phenomenon of interest. In order to form conceptions, participants must actively engage and create meaning, a process which usually involves substantial thought. While the authors make this wording distinction, most of the literature reviewed for this study utilized the more common term of perceptions.

Other researchers have studied teachers' perceptions of agriculture and have found teachers hold positive perceptions of agriculture (Elliot, 1999; Harris & Birkenholz, 1996; Osborne & Dyer, 1995). A qualitative study of elementary and middle school teachers in Michigan found teachers' perceptions of the food and fiber system were mostly shaped by the media and primarily focused on food safety and nutrition (Trexler, Johnson, & Heinze, 2000).

The SAI program is a week-long, three credit graduate course for elementary and secondary teachers who have had little to no experience in agriculture. Cost of tuition for the course is offset by industry support, which appeals to teachers who have an interest in learning more about agricultural topics. Given the low cost of tuition and registration for teachers, hands-on nature of the course, and positive word-of-mouth advertising, the SAI program has reached 322 K-12 teachers over the past 16 years.

The goal of SAI is to assist educators in using agriculture as a context for teaching mathematics, science, language arts, and social studies while meeting local, state, and national standards. The participants were presented current, factual, and scientific information about agriculture, given the opportunity to meet local agriculturalists, and took many resources back to their classrooms. SAI is an intensive program that spans 7 days with participants engaged in learning for an average of 10 hours per day. SAI is unique insofar as it also offers participants the opportunity to spend 24 hours with a farm family. The farm family stay is targeted to provide participants a chance to put a face with agriculture and to truly experience a day-in-the-life of a farmer.

Agricultural literacy intervention programs, similar to Summer Agriculture Institute, can be a resource for teachers to learn more about the agriculture industry. Through SAI, teachers have the opportunity to learn from various producers, agribusiness leaders, and agricultural researchers

with the intent to develop a basic understanding of agriculture and improve their ability to critically process agricultural information. With this in mind, it is vital to the success of the program to determine what teachers are learning and if their conceptions about agriculture change through their participation in this agricultural literacy program.

Theoretical and Conceptual Framework

The study used qualitative methods to investigate potential changes in teachers' conceptions of agriculture through participation in SAI. Before entering into a qualitative research project, the researchers must determine the lens through which they are going to view the data. Lincoln and Guba (1998) contend that qualitative research is viewed through a paradigmatic lens; such paradigms are belief systems which are supported on ontological, epistemological, and methodological assumptions.

The researchers utilized a constructionist epistemology which follows many assumptions of the relativist ontology (Lincoln & Guba, 1998). Such an epistemology assumes the nature of knowledge is constructed by human beings as they interact with the world around them (Crotty, 1998). Following the assumptions of relativism, as the human mind develops, realities are constantly changing. For example, a person will have a predisposition to agriculture and as they begin to inquire, their understanding of agriculture develops and a reconstruction of their prior scaffolding occurs. Thus, multiple realities can exist and are subject to constant revision (Lincoln & Guba, 1998).

Relating such an epistemological stance to agricultural literacy and SAI, a teacher might come into the program with certain assumptions and perceptions of agriculture. For instance, a participant may view conventional farms as large cooperate-owned farms that may not care about the environment. It is the aim of inquiry to provide a sophistication of the initial perceptions held by the inquirer or learner (Lincoln & Guba, 1998). Conceptually, it is the intent of SAI to reconstruct and co-construct the participants' understanding of agriculture and perhaps alter their conceptions of the agricultural industry.

The theoretical perspective which informs the methodology and data analysis of this study was closely aligned with that of symbolic interactionism. There are three basic assumptions which underscore symbolic interactionism and this study: (a) people act toward things according to the meaning they have for them, (b) meaning is derived from and arises out of social interaction, and (c) meanings are modified in an interpretive process with the things an individual encounters (Crotty, 1998). This perspective supports the ethnographic methods used in this study.

Driver (1995) argued students develop concepts of natural phenomena before they are taught science in the school setting. It can be hypothesized that elements of this are true for agriculture as well. Individuals may have already developed concepts of the agricultural industry prior to receiving any formal instruction. Constructivist schools of thought propose that individuals built a mental model of their natural surroundings, and as they do, new ideas are then assimilated into those mental models (Posner, Strike, Hewson, & Gertzog, 1982). Applying this concept to the study, one could propose that the participants in SAI each enter into the program with a mental model of what agriculture means to them, for instance, viewing a farmer as a middle-aged, white male who wears overalls and tends to livestock in a big red barn. Through participation in SAI, new knowledge would then be assimilated into previously constructed models. In alignment with the nature of knowledge each of the participants have different mental models of agriculture. A goal of the study was to determine if patterns emerge from the participants unique mental models of agriculture.

Frick et al. (1991) proposed an agriculturally literate member of society should have a basic understanding of agriculture. Their study identified 11 concept areas of agriculture, and proposed that an individual with agricultural literacy must have a basic understanding of each concept area (see Table 1 for concept one and sub-concepts).

Table 1

Agricultural Literacy Concept One and the Respective Sub-concepts (Frick et al., 1991)

Concept area	Sub-Concept Example
1) Agriculture's important relationship with the environment	<p>For Example:</p> <p>The agriculturalists role in protecting the environment,</p> <p>Opinions and perceptions,</p> <p>Chemicals,</p> <p>Positive/Negative effects of agriculture on the environment,</p> <p>Relationship of the environment and agriculture,</p> <p>Sustainable agriculture</p>

Each concept has several subconcepts which aids in the identification of the conceptual changes and understanding. Given the high number of subconcepts and pages needed to list them all, the authors have listed the subconcepts for only the first concept area. In addition to concept one, the additional concepts included: (2) The processing of agricultural products, (3) Public agricultural policy, (4) Agriculture's important relationship with natural resources, (5) Production of animal products, (6) Societal significance of agriculture, (7) Production of plant products, (8) Economic impact of agriculture, (9) The marketing of agricultural products, (10) The distribution of agricultural products, and (11) The global significance of agriculture. As the unit of analysis, this research used the 11 agricultural literacy concepts as a framework for analyzing the data produced in the study.

Purpose and Objectives

The purpose of this study was to examine participants' conceptions of agriculture prior to participating in an agricultural literacy intervention and determine if those conceptions changed during their experience. The study was concerned with two primary objectives: (a) determine the agricultural literacy conceptions held by the participants *prior* to SAI and (b) determine the changes in agricultural literacy conceptions held by the participants *during* SAI.

Methods and Procedures

The population for this study included elementary and secondary education teachers enrolled in the Summer Agriculture Institute held at Oregon State University during summer 2010. The 14 participants were randomly selected from a list of 25 teachers enrolled in the program and ranged from kindergarten to high school teachers. The selection of only 14 participants was based on a programmatic time constraint and the need to interview all selected participants immediately following registration and prior to beginning SAI. All of the teachers involved in SAI and those used as participants were first time attenders of SAI. The SAI program was designed to provide graduate credit for currently practicing teachers and many of the participants sign up and participate in SAI as a form of professional development.

Throughout SAI, the lead researcher participated in a majority of the program, experiencing the program and building rapport with the participants. It is important to build rapport and gain the trust of the participants to truly understand them (Fontana & Frey, 1998). Thus, the participants would conceivably feel more comfortable writing their true thoughts and voicing their candid perceptions about agriculture.

Qualitative methods were selected for this study because the researchers desired a descriptive set of rich data, which explored the research questions. To determine a change in agricultural literacy learning, the researchers examined the agricultural literacy conceptions of the participants in the SAI. Learning was operationally identified by the appearance of the agricultural literacy concepts in their writing. During their participation, the data were collected through an initial application, entrance questionnaires, interviews, and reflective journals.

Data Collection

Initial application. On the application for SAI, each of the participants were asked to give their definition of agriculture. This definition was used to examine the participants' prior conceptualizations of agriculture and explore the first research objective.

Entrance questionnaire. Participants also completed a researcher-created entrance questionnaire prior to beginning SAI. The questionnaire consisted of six open-ended questions grouped into five areas: (a) When you think of the U.S. agriculture and the food and fiber system, what comes to mind?; (b) Is it important for your students to understand agriculture? Why?; (c) Where do you get information about agriculture?; (d) What do you feel your role as an educator is in educating students about agriculture?; and (e) What do you teach about agriculture right now?. The questionnaire was intended to gather data on the teachers' initial conceptions of agriculture.

Teacher interviews. Upon arrival to SAI, the 14 participants were individually interviewed. The formal, semi-structured teacher interviews, lasting 20-30 minutes each, were audio taped and transcribed to allow for the thorough collection of rich data. The initial interviews consisted of several open-ended questions intended to explore the participants' understanding of agriculture, desire to learn more about agriculture, and how they plan on incorporating the content into their classrooms. The open-ended questions were developed by the researchers in an effort to explore the participant conceptions of agriculture. The following questions were used as a guide for the interviews:

- In your own words describe what a farm looks like.
- In your own words describe what a farmer does.
- In your own words describe what the agricultural industry looks like.
- What do you feel your students should know about agriculture?
- Have you ever taught agricultural concepts?
- Where do you get information about agriculture?
- What do you hope to learn from SAI?

Reflective journals. Each night during the SAI experience, the participants were asked to reflect upon their experiences in a journal. The participants were given two prompts to answer the questions, what did I learn about agriculture today and how can I use this in my classroom? The journals provided the researchers a means to more fully understand the participants' level of understanding of agriculture and observe the potential maturation of the participants' conceptions regarding agriculture.

Data Analysis

All data were coded to allow for ease of analysis. Topic coding and analytical coding (Richards, 2005) were used to reduce the data into categories. Each data source was topically coded for the 11 agricultural literacy concepts; the researchers coded independently and then compared coded categories. Coding in this manner enabled the researchers to generate consensus as to which agricultural category the statement best fit. The researchers do acknowledge the potential overlap between categories and the inherent difficulty in distinguishing breaks between concepts. While the unit of analysis for this research was the 11 agricultural literacy concepts, each of the concepts had several subconcepts. The researchers used these subconcepts to draw distinctions between participant comments and to refine the coding process.

In addition to coding the participant statements into the 11 agricultural literacy concepts, the researchers also established the codes of awareness, basic understanding, and deep understanding to differentiate the level of processing evident in the responses. The subconcepts were used to assist in coding into the categories of awareness, basic understanding, and deep understanding. For example, if a participant mentioned that agriculture had a large financial impact on the community, but did not go any further, the response would be coded for an *awareness* of economic impact. If the respondent went into greater detail, it would be coded for a *basic understanding*. Using economic impact as an example, the respondent may mention that agriculture has a significant impact on the economy and give an example where prices for commodities on the farm would affect the prices of food in the stores; this would evidence a *basic understanding*. To code a *deep understanding*, the respondent would have given an example of how farm prices of one commodity, crude oil, could affect the price of other commodities, corn, thus raising the price of food in the marketplace and the cost of ethanol blended fuels at the gas pumps.

As an example of the coding system used in the initial application, the definitions of agriculture, generated by two teachers, were analyzed in Table 2. The first definition of agriculture contained three parts; production of plant products, production of animal products, and relationship with natural resources. The definition mentioned three different agricultural concepts, however the participant definition was superficial and did not demonstrate a deep understanding of agricultural industry and was therefore coded at the awareness level. The second definition only contained two concepts (plant and animal) and was even more superficial in understanding than the first definition.

Table 2

Participant Definitions of Agriculture

ID	Definition	Code	Level
CG	The practice and study of crops, livestock, and land management	Plant	Awareness
		Animal	Awareness
		Natural Resources	Awareness
KC	The industry of farming- land or livestock	Plant	Awareness
		Animal	Awareness

Following coding, a descriptive analysis was conducted to determine what themes were emerging from the data (Huberman & Miles, 1998). To uncover the changes in conceptions, the data were examined chronologically from each participant. Entrance questionnaires and teacher interview data were used to determine teachers' initial conceptions of the agricultural industry, and data analyzed from the reflective journals were used to determine changes in conceptions. The researchers then examined the data to find patterns which emerged from the changes in conceptions.

Validity

Dooley (2007) stated that trustworthiness is the level at which the findings of the study accurately represent the respondents and their contexts. The author also noted, to achieve internal validity or credibility of a study, the researcher must represent the multiple realities accurately. Triangulation of data collection methods reduces the chances the conclusions will contain systemic bias or reflect the limitations of a specific data collection method (Gall, Gall & Borg, 2005).

This study used methodological triangulation (Denzin, 1970) by analyzing data collected from the initial application, entrance questionnaires, interviews, and reflective journals to validate conclusions. In order to obtain investigator triangulation (Denzin, 1970), the study used three independent researchers who coded each of the data sources and individually analyzed the data prior to collaboration. Two of the researchers were directly involved in the program; the third researcher was independent of the program. The third researcher was used to account for any bias the researchers had from participating in SAI along with the participants. Additionally, the researchers used participant observations to confirm the teachers' statements and reduce self-reported bias in the teacher interviews.

The bias of a researcher can skew the results of a study (Gall, Gall, & Borg, 2005). It is important for a qualitative researcher to state their bias in order to understand how the researcher's values can influence the findings and conclusions of a study (Maxwell, 1996). The researchers are all part of the agricultural education community and believe that it is important for individuals to have a basic understanding of agriculture. The researchers also acknowledge that participants who have had little to no experience in agriculture may be predisposed to show substantial gains in their understanding of the agricultural industry. In order to minimize any selection bias, the researchers randomly selected 14 participants out of the 25 teachers enrolled in the SAI. Additionally, the researchers utilized the 11 agricultural literacy concepts as a framework for coding the data to minimize bias in data analysis.

Findings

Quotations from participants were used as evidence to support the results of the study. Initials were used to protect the confidentiality of the participants.

Conceptions of Agriculture

Initial application. On the initial application for Summer Agriculture Institute, the participants were asked to define agriculture in their own words. This definition demonstrated the prior knowledge and conceptions of the teachers toward agriculture. The data were coded and analyzed to determine how the teachers, as a whole, defined agriculture and to serve as a benchmark for initial understanding in order to examine the rest of the data.

Table 3 categorizes the definitions of agriculture from the participants into awareness and basic understanding. All participants noted plants in their definition and 12 mentioned the raising of livestock. The production of plants and animals are the basic concepts which one would generally associate with agriculture. It was evident the participants' definition of agriculture was strongly influenced by production agriculture or farming. Therefore, it can be assumed that upon entering into the Summer Agriculture Institute, the participants equated the agricultural industry, primarily with plant and animal production. Noting the overwhelming notion that suggested agriculture is plant and animal production, the researchers desired to further examine the participants' conceptions of farming and the agricultural industry.

Table 3

Level of Understanding of Agricultural Literacy Concepts in Participant Definitions (N = 14)

Topic	Awareness	Basic Understanding
Plant Production	10	4
Animal Production	10	2
Economic Impacts	3	0
Relationship with Natural Resources	1	0
Marketing	1	0

Entrance questionnaire. On the entrance questionnaire, the participants were asked the question; when you think of the U.S. food and fiber system, what comes to mind? This question was aimed at obtaining more information regarding the participants' conceptions of agriculture and to confirm the findings from their initial definition of agriculture. The researchers wanted to determine if there was a deeper understanding of the agricultural industry and if the teachers' conceptions encompassed more than farming.

The entrance questionnaire yielded a greater variety of responses than the initial application question regarding agriculture (Table 4). Three of the participants directly mentioned regulations, but did not elaborate as to the extent of the role of regulations in agriculture. Three other participants mentioned balanced nutrition, food choices, and school lunch programs. The responses portrayed the participants' awareness of some of the societal impacts of agriculture. However, half of the respondents once again solely mentioned the production of plants and animals. One response, which demonstrated a basic understanding, equated agriculture with life, "without it we would not exist" (MS). Through participant observations the researchers were able to verify the participants' basic understanding of the societal significance of agricultural.

Table 4

Level of Understanding of Agricultural Literacy Concepts in Participant Perceptions of the Food and Fiber System (N = 14)

	Awareness	Basic Understanding
Plant Production	7	0
Animal Production	7	0
Public Policy	4	0
Societal Significance	3	1
Processing	2	0

Interviews. The data from the previous two sources suggested the participants' conception of the industry equated agriculture primarily with farming. Wanting to examine the participants' conceptions on production agriculture, the researchers asked questions to gather additional data on the distinction between farming and the agriculture industry. The participants were asked what they thought a farm looks like, what a farmer does, and what they thought of in regards to the agricultural industry.

In describing what they thought a farm looked like, one of the participants could not begin to describe what a farm would look like and did not respond to the question. Five of the participants' responses were very superficial at defining a farm. One participant responded, "When I think of a farm, I think of a big red barn" (JL). Another responded with, "I think all I know about a farm is what I've seen on TV, Little House on the Prairie like" (SV). The other eight participants were a little more in-depth with their responses and noted the variety of production, size of the farm, and production methods. Based on the responses, the researchers identified four of the participants as having a basic understanding of production agriculture.

When asked about the agricultural industry, 11 of the 14 participants restated their original claims associating agriculture with farming. The other three participants all referenced that the agricultural industry is larger than it appears to most people. Table 5 shows the responses of the three participants who elaborated on the vastness of the agricultural industry. Because of the difference in explanations, the researchers examined the background of these three participants to determine what might separate them from the other SAI participants. Each of these participants had past agriculture experience. GK and MS both grew up on family farms and GA had a degree in animal sciences. The researchers believed this could be the reason for the three participants having a basic understanding of the vastness of the industry.

Through the three sources used to obtain the participants' initial conceptions of agriculture, it was clear each of the participants had their unique model to define agriculture. As the researchers examined all of the evidence, the data suggest the participants mainly perceive the agricultural industry as farming. The reflective journals were used to establish if there was maturation in the conceptions held by the participants.

Table 5

Participant Responses to Appearance of the Agricultural Industry

ID	Response
GK	The agriculture industry is a business, supply and demand and hopefully the goal is to feed people and good food and products. It works a lot like a normal business.
GA	I think it's real diverse and I don't think people understand how diverse it is and it goes from what you do in the morning to what you slip into at night time to what you eat to what you wear. It's not just USDA it's so many things that I don't think people have a clue, personally.
MS	[The agricultural industry] is bigger than we see on the surface because it is more than the farm that you drive by. There are a lot of different extensions to it and I mean that it is linked to almost everything that we are a part of in some way or another.

Changes in Conceptions

The participants were asked to write what they learned about agriculture each day. In order to test changes to the participant conceptions of agriculture, which was the second research objective, the researchers analyzed the participants' daily journals to find evidence of their knowledge of the agricultural industry. The data were coded for the 11 agricultural literacy concepts.

After coding, the data were examined to determine if there was a maturation of knowledge by the participant. Table 6 shows the participants' level of understanding for each of the 11 concept areas of agricultural literacy.

Table 6

Participants' level of understanding of the 11 agricultural literacy concept areas during participation in SAI (N = 14)

	Awareness	Basic Understanding	Deep Understanding
Production of plant products.	9	5	0
Agriculture's important relationship with the environment.	7	2	0
The global significance of agriculture.	4	2	0
Production of animal products.	10	1	0
Economic impact of agriculture.	5	1	0
The processing of agricultural products.	10	0	0
Societal significance of agriculture.	6	0	0
The marketing of agricultural products.	4	0	0
Agriculture's important relationship with natural resources.	3	0	0
Public agricultural policy.	0	0	0
The distribution of agricultural products.	0	0	0

Conclusions and Recommendations

Through participation in SAI, it was evident that, through responses, reflections, and levels of understanding, the teachers enrolled in the program were becoming more agriculturally literate citizens. Participants' conceptions expanded through the first two categories as they shifted from awareness to basic understanding. However, despite the in-depth nature of the SAI experience the participants did not display more than a basic understanding of agriculture.

The goal of the first research objective was to identify the agricultural literacy conceptions held by teachers prior to engaging in the SAI. Based on a relativist ontology (Lincoln & Guba, 1998), realities are constantly changing and participants could be expected to reconstruct prior scaffolding when encountering a new experience such as SAI. Results indicated that prior to enrolling in SAI, teachers who participated in the study had only a minimal awareness of the agricultural industry. The participants' conceptions mainly consisted of plant and animal production. However, a few of the teachers were aware of economic impact (3 participants), relationship with natural resources (1), marketing (1), processing (2), public policy (4), and the societal significance of agriculture (3). Members of the agricultural industry know the industry reaches far beyond plant and animal production and thus an awareness of just plant and animal production, while important, is troubling in its lack of circumspect understanding of agriculture. The implications of this finding are that if teachers' knowledge does not extend beyond plant and

animal production, they will be highly unlikely to include anything except production in their curricula. Consequently, students may only be exposed to the production side of agriculture. Future agricultural literacy interventions should consider the basic knowledge held by participants and then attempt to add diversity to their perceptions of agricultural. It is important to note that in the conducted study, the majority of participants, prior to the intervention, had only an awareness level of understanding.

Future agricultural literacy programs should consider that participants in this study rarely referenced the 11 key concepts identified by Frick et al. (1991). The most common conceptions were animal and plant related. The researchers recommend that future programs consider specific ways to develop participant understanding in the other nine concept areas including: (a) agriculture's important relationship with the environment, (b) processing of agricultural products, (c) public agricultural policy, (d) agriculture's important relationship with natural resources, (e) societal significance of agriculture, (f) economic impact of agriculture, (g) marketing of agricultural products, (h) distribution of agricultural products, and (i) global significance of agriculture. These nine concept areas should be considered in program development, curriculum design, and programmatic outcomes. Purposeful attention to the identification and instruction around these nine areas will enable participants to reach more meaning levels of agricultural literacy.

Objective two sought to determine the changes in agricultural literacy concepts held by the participants during SAI. Utilizing constructivist epistemology as a theoretical frame, and the concept of symbolic interactionism, the researchers expected to see evidence of both the reconstruction and co-construction of knowledge as the participants interacted with agriculture. As the SAI experience progressed it was evident the teachers were becoming more aware of the agricultural industry. The data showed both an increase in awareness of the vastness of the industry and a maturation of understanding of the agricultural literacy concepts. Following the focused agricultural literacy intervention, the participants demonstrated awareness in all of the concept areas except public policy and distribution of agricultural products. A few of the participants demonstrated a basic understanding in five of the concept areas: (a) agriculture's relationship with the environment (2 participants), (b) production of plant (5) and (c) animal products (1), (d) economic impact of the agricultural industry (1), and (e) the global significance of agriculture (2). The participants' basic understanding is evidence that the agricultural literacy program was successful in fostering both an initial awareness and continued growth in agricultural literacy. Future agricultural literacy programs should consider an initial assessment of participant understanding, preferably during a pre-registration process. An initial assessment would allow for the modification of the agricultural literacy program to build upon prior knowledge and maximize continued learning.

The results indicate that the SAI is making progress toward developing more agriculturally literate teachers. Although the participants in this study demonstrated some growth in agricultural literacy, even after participation, the participants' conceptions of agriculture were still reflective of production agriculture.

It is imperative for the vitality of agricultural literacy to determine the best course of action to provide teachers a better understanding of agriculture. One week is an insufficient amount of time to teach an individual about the entire agricultural industry and future programs may want to consider a longer or sustained agricultural literacy intervention.

Agricultural literacy interventions should explore options to promote the continued maturation of agriculture concepts. One solution is the creation of a website with a blog or discussion board that would give the teachers a common space to share ideas and ask questions. The website would also allow for program organizers to post links to agricultural sites that would be beneficial to the teacher. The SAI website could be used by participants, prior to the agricultural literacy intervention, to allow for foundation knowledge, and as a sustained support for continued teacher growth. Web resources would also allow participants to share tools and curriculum support materials related to the integration of agriculture into their curriculum.

A limitation of this study was the fact it only focused on the teachers from one year who participated in SAI and only included data gathered during their participation in the program. In order to truly determine the effectiveness of this program it would be essential to observe the effects of participation on the teachers' curriculum and subsequently the agricultural literacy levels of their students. Future research should follow these teachers from their participation in SAI back to their classrooms. Additional research should be conducted to explore: (a) their conceptions of the agricultural industry after participation, (b) if they have infused agriculture into their lessons, and (c) if they have continued to learn about agriculture. It would also be important to make classroom observations and examine lesson plans for agricultural content.

A study should be conducted to examine the student impacts of teacher participation in agricultural literacy programs. How does teacher participation in agricultural literacy interventions impact the student awareness and appreciation of agriculture? Mixed method research could be utilized to ascertain growth in teacher knowledge and perceptions.

A unique aspect of the SAI is an overnight stay with a farm family. While this uniqueness was not a focus of the research questions for this study, it may have impacted the participant conceptions of agriculture. A study should be conducted to examine how this experience differs from participation in the rest of the program as well as a potential comparison to agricultural literacy programs that do not have a residency component. Are teachers obtaining a deeper understanding of agriculture from this experience or is this solely a fun learning experience?

As the population continues to grow and change, increasing the agricultural literacy of our society will be extremely important to the sustained success of agriculture. This research identifies opportunities for growth, and using an established framework, provides a means to assess the effectiveness of agricultural literacy programs.

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