

THE BENEFITS OF TEACHING AND LEARNING ABOUT AGRICULTURE IN ELEMENTARY AND JUNIOR HIGH SCHOOLS

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Abstract

The beliefs and mental images that teachers have about agriculture likely influence what and how they integrate agriculture into their instruction. The purpose of this action research study was to explore the beliefs and needs of elementary and junior high school teachers in regard to integrating agriculture into their classrooms. The sample consisted of 452 teachers from public schools in Illinois. Teachers responded to three, open-ended questions regarding their beliefs of the most beneficial aspects and needs of teaching and learning about agriculture. Teachers believed that agriculture provided situatedness, connectedness, and authenticity to teach their content areas to their students. Teachers also shared topics and instructional resources that they wanted to know more about regarding the integration of agriculture. The findings from this study can inform agricultural literacy coordinators and agricultural teacher educators regarding inservice programming for integrating agriculture into classrooms.

Introduction and Theoretical Framework

The integration of agriculture within the elementary and junior high curricula brings learning to life. Educators have suggested that the integration of agriculture into the general curriculum would help students learn based upon the arguments of experiential learning (Dewey, 1938; Mabie & Baker, 1996), a community-based curriculum (Fasheh, 1990), and authentic or applied learning in real-life situations (Wehlage, Newmann, & Secada, 1996). Elementary and middle school teachers believed that schools play an important role in the education about agriculture, food, fiber, and natural resources (Trexler, Johnson, & Heinze, 2000). Further, elementary teachers have noted links between students' understanding of food and food production to developing a respect for nutrition, agriculture's role in society, and the environment (Trexler et al.).

Interdisciplinary education is the key to

engaging people to think deeply about agriculture and its role in society (Lockwood, 1999). The theory of integration underpins the teaching of agricultural topics across the general curriculum because integrating agriculture would likely enhance learning experiences. A diversity of concepts and epistemologies from one content area can enrich student understanding in a different content area (Boix-Mansilla, Miller, & Gardner, 2000). As a result, students discover patterns, see the "big picture" and different perspectives about a topic, and develop greater knowledge of other content areas (Boix-Mansilla et al.; Grossman, Wineberg, & Beers, 2000) from their experiences within an integrated curriculum. As such, integrating agriculture across the curriculum could enrich student understanding of agricultural concepts and ways of thinking (Ivanitskaya, Clark, Montgomery, & Primeau, 2002).

The theoretical framework of the study was based on teachers' expectancy-value

motivation, including self-efficacy, outcome expectancy, and task-value motivation. Teachers are more likely to integrate agriculture in public education if they believe: (a) they have the abilities and knowledge to teach agricultural content, (b) integration will help them achieve teaching and learning goals, and (c) the benefits outweigh the costs of integrating agricultural topics into existing content areas of an often over-crowded curriculum. Teachers make decisions about the content they teach, how they will teach the content, and how much time will be spent on teaching the content (Winther, Volk, & Shrock, 2002). Therefore, the schemas (Markus & Wurf, 1987) that teachers have regarding agriculture, food, and the environment are likely to shape the instructional decisions that teachers make about incorporating agricultural topics into their daily classroom instruction.

Teachers' beliefs and previous experiences influence what and how they will teach (Borko & Putnam, 1996; Disinger, 2001; Pajares, 1992). Elementary teachers were more likely to integrate agriculture into the curriculum if they: (a) perceived agriculture as being relevant to careers related to horticulture, forestry, natural resources, and food processing; (b) valued integrating agriculture into the curriculum; (c) believed that it can be integrated or fit in various academic subjects; and, (d) had positive perceptions of the agricultural industry (Knobloch & Martin, 2002a). Further, teachers are motivated if they believe they can perform the desired tasks and influence the teaching-learning process with positive outcomes (Bandura, 1997; Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). Expectancy-value theory suggests that teachers are motivated if they value what they teach based on their interest in the content, the content's usefulness, and amount of effort they are willing to expend on the content (Eccles & Wigfield, 2002). Finally, schema theory suggests that a teacher's mental picture about a content area or topic shapes the way they think about and interpret information about the content (Winther et al., 2002). Experiences can shape one's way of knowing and schema about the content

(Calderhead, 1996). Trexler and Hikawa (2001) found in a case study that teachers developed agricultural curriculum materials using knowledge and information based on their experiences and available resources. Teachers with agricultural experiences had deeper conceptual understandings (Trexler & Heinze, 2001), were more confident in teaching agriculture (Humphrey, Stewart, & Linhardt, 1994), and more likely to integrate agriculture in their instruction (Knobloch & Martin, 2002b). Therefore, the agricultural content that teachers choose to teach and how those topics relate to their content areas are likely influenced by teachers' expectancy-value beliefs, ways of knowing, and schemas about agriculture.

Agricultural educators have suggested the importance of teaching agriculture in elementary and junior high classrooms (Frick, Birkenholz, & Machtmes, 1995; Hillison, 1998; Trexler & Suvedi, 1998). However, elementary and junior high school teachers struggled to teach agriculture (Blackburn, 1999; Russell, 1993; Trexler & Hikawa, 2001; Trexler & Suvedi). When elementary and junior high school teachers attempted to integrate agriculture into their classrooms, they taught traditional ideas with outdated materials (Terry, Herring, & Larke, 1992). Although there are many factors that contribute to the challenges teachers face to successfully integrate agriculture in their classrooms, teacher beliefs and schema regarding agriculture likely influence whether or not they teach agriculture in their classroom (Pajares, 1992). If teachers are more likely to teach content and use activities that they believe would be beneficial to their students, it is imperative that an investigation of what elementary and junior high teachers think and believe about integrating agriculture be conducted.

Purpose and Research Questions

The purpose of this study was to explore elementary and junior high school teachers' beliefs about the benefits and needs of teaching and learning about agriculture. The following research questions guided the study: (a) What is the most beneficial thing that you *teach* about agriculture? (b) How

do your students benefit most from *learning* about agriculture? (c) What would you like to *know more about* in agriculture?

Methods and Procedures

Two teams of researchers conducted this research project: agricultural literacy coordinators and agricultural education researchers. This research study was part of a larger action research project (Gall, Gall, & Borg, 1999) that assessed the beliefs of elementary and junior high school teachers from eight counties in Illinois to determine how agricultural literacy programs should be changed to meet needs mentioned by teachers. An agricultural literacy coordinator conducted the larger project. She worked with a group of five other agricultural literacy coordinators to help collect the data. The six coordinators worked with a target population of 211 public schools in 59 public school districts in 8 different counties. An accessible population of 2,405 elementary and junior high school teachers was asked to participate because the teachers were located in the counties served by the agricultural literacy coordinators. The six coordinators assisted with distributing and collecting the questionnaires. The agricultural literacy coordinators were interested in getting a large number of teachers' responses from all the schools in which they had worked. The coordinators delivered the questionnaires to the teachers at the schools, established a deposit box for completed questionnaires, and returned to pick them up at a later date. Nineteen percent of the teachers ($N = 452$) completed the questionnaire. Due to the low response rates in this study, the results should be interpreted with caution and not be generalized beyond the sample. Among the 452 participants in the larger project, 52% ($N = 234$) did not participate in agricultural literacy inservice education or receive any program assistance (e.g., guest speaker), 38% ($N = 162$) participated in an agricultural literacy inservice program or received services, and 10% ($N = 46$) did not specify if they had received education or assistance from an agricultural literacy program.

The data from the larger project were collected using a questionnaire with three open-ended questions to ascertain the teachers' beliefs regarding the benefits and needs of teaching and learning agriculture. A practitioner with 10 years of teaching experience in public education and four years as an agricultural literacy coordinator developed the three questions using language with which elementary and junior high school teachers could understand. An expert in agricultural education reviewed the instrument for face and content validity. Reliability measures of the questions in the larger project were not conducted because of the assumption that, when using open-ended questions if the participants responded truthfully and accurately, then the data would also be consistent and reliable. The first team of researchers typed the teachers' responses to the open-ended questions into a word processor and reported the teachers' responses as unanalyzed bulleted lists.

For the purposes of this study, a second team of researchers analyzed the word-processed documents of teacher responses in the larger project using a post-positivist epistemological stance (Lincoln & Denzin, 2000). Paper, pencils, and highlighter markers were used to help create organizers to code and summarize the qualitative data. The researchers created an open coding scheme of the major concepts, central ideas, or related responses (Glesne, 1999). One of the researchers in the team highlighted and coded all responses into central themes. The researcher reflected upon and reviewed all themes two weeks later to establish trustworthiness, and to determine if any themes could be combined or subdivided into sub-themes. The researcher reviewed all themes with a second researcher as a part of a peer debriefing process. Because the second researcher did not directly code any of the responses, inter-rater reliability was not analyzed. Frequencies were reported to reflect the magnitude of responses. The themes were then collapsed into key categories, and both researchers engaged in a coaxial coding process to develop the themes reported in the findings section of this paper.

In an effort to increase trustworthiness and credibility, the researchers reflexively

situated themselves in the study by identifying their three roles and how their backgrounds may have influenced the research study (Denzin, 2000): (a) researchers with constructivist ways of knowing; (b) interests in teacher beliefs, cognition, and motivation; and, (c) having positive experiences as former teachers and students in agricultural education. Additional steps were taken to maximize trustworthiness and believability, and minimize error and subjectivity of the conclusions (Glesne, 1999; Lincoln & Guba, 1985). Credibility was developed through peer debriefing conferences between researchers who analyzed the data and between the data collection and data analysis teams. A member check was conducted with the agricultural literacy coordinator who conducted the action research project. The researchers created an audit trail in order to compile and reference all information used in the study. Reflexive journaling and direct quoting were also utilized to establish dependability and to ensure accuracy of the evidence.

Results and Findings

Objective one was to understand the beliefs of elementary and junior high school teachers regarding the benefits of integrating agriculture into their classrooms. Two themes emerged—situatedness and instructional resources—from the 330 teachers who responded to the question, “What is the most beneficial thing you teach about agriculture?”

Theme 1: Situatedness

Situatedness is contextualizing the benefits of teaching agriculture as it relates to a teacher’s interests within an existing grade level or content area. Several teachers discussed the benefits of teaching agriculture as they related to specific topics of interest and the

contexts in which they taught. Remarks such as, “As a first grade teacher,” or “As a 7th grade language arts teacher,” reflect this notion. Regarding topics of interest, conservation and the environment, food production, the importance of agriculture to students’ lives, plants and seed development, agricultural careers, insects, animals, the cycles of life and nature, and food and nutrition were listed as the most beneficial thing about teaching agriculture (Table 1).

Not all teachers believed in the benefits of teaching agriculture. Four percent of the teachers ($N = 14$) stated that they did not integrate agriculture in their classrooms. Similarly, these teachers also situated themselves within the content area and grade level in sharing their rationale for not integrating agriculture in their instruction. The following quote illustrates this finding. “In Language Arts, as an 8th Grade teacher, I have to prepare my students for the state tests. I haven’t found time to teach anything about Agriculture.” This particular teacher’s response suggests that teaching agriculture may not fit her content area and grade level, may not help her accomplish her goal of preparing students for the state proficiency test, or may not have time to teach it. This theme of situatedness suggests that fit with content, grade level, and instructional goals, as well as lack of time were the main reasons these teachers did not teach agriculture.

Theme 2: Instructional Resources

Some teachers expressed that they did not have *instructional resources* to teach agriculture. “I have not taught Agriculture in the classroom. I usually stick to the book pretty closely, but I would certainly consider it if I had the resources.” Among those who reported benefits, some teachers discussed that guest speakers and curriculum materials were beneficial to teaching agriculture.

Table 1
Teachers' Perceived Benefits of Teaching Agriculture (N = 330)

Benefits	<i>f</i>	%
Conservation and the Environment	105	32
Food Production	55	17
Importance of Agriculture to Students' Lives (e.g., historical, social, and economic impacts on American society; role in culture and community)	36	11
Plants and Seed Development	34	10
Careers	21	6
Insects (e.g., butterflies, bees)	15	5
Animals (e.g., chickens, pigs)	13	4
Cycles of Life and Nature (e.g., growth cycles of plants and animals; weather cycles and seasons; water cycle)	11	3
Food and Nutrition	5	2

Note. Percentages were based on 330 participants and were rounded to nearest whole number

The second research question was posed to understand the perceptions of elementary and junior high school teachers regarding the benefits of student learning when agriculture is integrated in to the classroom. Teachers ($N = 320$) reflected on the question, "What do your students benefit the most from learning about agriculture." The themes of connectedness and authenticity emerged from this question.

Theme 1: Connectedness

First, teachers ($N = 169$) who shared their beliefs regarding the student benefits of learning about agriculture discussed how *agriculture provided connections for their students*. Teachers ($N = 27$) indicated that learning agriculture teaches students to appreciate the world that they live in, and in rural areas, to appreciate the farms and fields that surround them. A teacher shared, "...aware[ness] of importance of agriculture in their lives and learn to be respectful of the land and its importance." Some teachers ($N = 43$) indicated the importance of learning

about agriculture because they, "live in the Midwest", or because they, "live in a rural area" and they felt that it was important for students to be connected to the lives and livelihoods that are a large part of their schools, communities, and/or state. Teachers also indicated a benefit to learning about agriculture that connected students to the bigger world. Teachers ($N = 73$) indicated that the concepts students learn will teach them to be the future stewards of the environment. Responses such as, "Future generations and saving the environment, wildlife, and plant life," and "They learn to take care of our environment," illustrated this theme. One teacher noted, "They get to practice for when they're grown-ups in charge of their own planet." Finally, some teachers ($N = 26$) indicated that agriculture taught students a sense of connectedness to life. Teachers indicated that students learned about life cycles including how caterpillars grew into butterflies, how chickens hatched from eggs, and in some cases the birth of various animals. Further,

teachers indicated it was important for students to learn the water cycle, to learn how soil was formed, and how the seasons changed. In this case, learning about agriculture taught students to be connected to life. The theme of connectedness reflected the importance of understanding the ecosystem from ecological and systems perspectives.

Theme 2: Authenticity

The second theme that emerged in regard to student learning about agriculture was the theme of authenticity. Teachers ($N = 133$) indicated that *agriculture provided an authentic learning context for students*. Teachers ($N = 6$) described the importance of learning about agriculture as an authentic context for academic subjects. A couple of teachers shared, "They can use agriculture as a basis for reading, writing, math, social studies, and language activities," and "it expands their knowledge base." Further, some teachers ($N = 40$) described the authentic nature of agriculture in regard to its importance in the community. "Our school is surrounded by farmland. We study agriculture and observe it in action." One teacher believed that a learning benefit of integrating agriculture was its authenticity to students' every-day lives or immediate surroundings. Teachers ($N = 57$) noted the ability to create authentic learning environments through integrating agriculture because it could be, "observed in action." Finally, some teachers indicated that learning about agriculture was beneficial to students because the learning tasks themselves were authentic and based on

experiences. Teachers ($N = 30$) indicated that students benefited from the laboratory activities, agri-science kits, field trips, demonstrations, and guest speakers that provided active learning environments for students. "It's hands-on!" was a belief teachers had regarding student learning of agricultural concepts. The theme of authenticity represents the importance of real, concrete examples and experiential learning.

The third research question was asked to identify elementary and junior high school teachers' needs to know more about agriculture. Teachers were asked to reflect upon the open-ended question, "What would you like to know more about in agriculture?" The themes of *topics* and *resources* emerged from the 192 teachers who responded.

Theme 1: Topics

Of the 192 teachers, 58% of the teachers ($N = 111$) identified specific topics they would like to know more about in agriculture (Table 2). Teachers reported a number of topics they needed to know more about regarding agriculture including: farming, sustainable food production, environment and conservation, crops and soybeans, insects, by-products, importance of agriculture, survival of the farm, business, agriculture issues, careers, technology, biotechnology, food safety, food production, plants and flowers, animals, pesticides, forestry, food processing, dairy, new ideas, farmland use, and relating agriculture to students' everyday lives.

Table 2
Teachers' Needs: Topics About Agriculture (N = 192)

Topics	<i>f</i>	%
Farming (e.g. the role of farmers, their occupations, farm life, the business of farming, and changes that have occurred in farming)	28	15
Sustainable food production system (e.g., organic farming, erosion prevention, crop rotation, water quality)	21	11
Environment and conservation	17	9
Crops and soybeans	16	8
Insects	12	6
By-Products	10	5
Importance of agriculture, in general	10	5
Survival of the family farm and farm life; big corporate farms vs. smaller farms	10	5
Business, economics, trading, commodity prices, and costs of production	9	5
Issues, history, changes, and future of agriculture	8	4
Agricultural careers	7	4
Technology and farm equipment	6	3
Biotechnology and genetics	5	3
Producing safe and healthy foods (e.g., genetically modified organisms)	5	3
Food production	5	3
Plants and flowers	5	3
Animals	4	2
Pesticides	4	2
Food processing	4	2
Forestry	4	2
Dairy	4	2
New and cutting-edge ideas and products in all areas of agriculture	4	2
Farmland use	3	2
Relating agriculture to students' everyday lives	3	2

Note. Percentages were based on 192 participants and were rounded to nearest whole number.

Theme 2: Resources

Twenty-three percent of the teachers ($N = 46$) listed resources they would like to know more about in agriculture. Resources mentioned were: curricula, units, and lessons; projects and activities; field trips; guest speakers; Agriculture in the Classroom program; videos; student-focused resources and experiences; facts and terms about agriculture; and, other resources (Table 3). Related to instructional resources, 13% of the teachers ($N = 26$) mentioned that they would like to know more about

integrating agriculture into their instruction. Eight percent of the teachers ($N = 17$) mentioned they wanted to know how to integrate agriculture in all content areas as well as specific content areas such as science, geography, history, economics, language arts, and math. Seven percent of the teachers ($N = 15$) mentioned they wanted resources that were grade-level appropriate for kindergarten through 8th grade. Eight of these 15 teachers wanted resources at the K-1 grade levels.

Table 3
Teachers' Needs: Resources About Agriculture (N = 192)

Resources	<i>f</i>	%
Curricula, units, and lessons	11	6
Projects and activities	6	3
Field trips	6	3
Guest speakers	6	3
Agriculture in the Classroom program	6	3
Videos	6	3
Student-focused resources and experiences (e.g., take home to share with families; real-life farm experiences for students)	5	3
Facts and terms about agriculture	3	2
Other resources (e.g., in-service education, websites, free materials, games, stories, kits, and Extension)	7	4

Note. Percentages were based on 192 participants and were rounded to nearest whole number.

Conclusions, Implications, and Recommendations

Three themes emerged from the teachers' beliefs regarding the benefits of integrating agriculture into their classrooms. Teachers believed that agriculture provided situatedness, connectedness, and authenticity to teach their content areas to their students. These conclusions were aligned with the existing

knowledge base that the integration of agriculture into the general curriculum would help students learn based upon the arguments of experiential learning (Dewey, 1938; Mabie & Baker, 1996), a community-based curriculum (Fasheh, 1990), and authentic or applied learning in real-life situations (Wehlage et al., 1996).

First, teachers who shared their beliefs regarding the benefits of teaching

agriculture *situated themselves in their content areas and grade levels and saw agriculture as a venue to teach their content to students.* This conclusion supports the benefits of interdisciplinary education. Boix-Masilla et al. (2000) and Grossman et al., (2000) found that students see different perspectives about a topic and develop greater knowledge of other content areas. Teachers in this study acknowledged that agriculture provided the contexts to discuss and apply the content they taught to their students. It is important to understand that teachers situate themselves within their classrooms—both grade level and content—in finding value and fit to integrate and teach agricultural topics and concepts to their students (Knobloch & Martin, 2002a). Further studies should investigate teachers' instructional goals and how students' learning and perspectives are impacted by learning about agriculture in the context of academic content areas.

It was also concluded that elementary and junior high teachers in this study believed that *agriculture provided connections for their students.* Trexler et al. (2000) found that few elementary and middle school teachers believed it was important for students to understand the connections between humans, the food system and the environment. This study was similar to Trexler et al.'s findings, except Michigan teachers emphasized the role of food and nutrition in students' lives. Agricultural literacy initiatives should focus on helping teachers make connections with the environment, how food is produced, and the importance of agriculture in students' lives. An important implication is the avenue agriculture provides to help students learn about the ecosystem. Agriculture provides a context to discuss the inter-relationships between nature and human needs. Further inquiry should look at the benefits teachers have regarding agriculture and the ecosystem.

The third conclusion regarding the benefits of integrating agriculture in the classroom was that teachers in this study believed that *agriculture provided an authentic learning context for students.* Teachers discussed agricultural topics as easily transferred to students' everyday

lives, and teachers believed teaching and learning in agriculture was connected to real-life experiences, concrete examples, and lessons that were hands-on. Current research in teaching and learning indicates that learning is most meaningful when it is situated in authentic environments and when students can interact with or inquire into rather than be instructed into material (Mabie & Baker, 1996; Wehlage et al., 1996). This finding supports Dewey's (1938) philosophy that learning should be experienced in real-life contexts, yet Trexler et al. (2000) found that teachers did not feel that hands-on, experiential learning was practical due to financial limitations. Agricultural literacy professionals should continue to promote and develop agricultural education for the meaningful learning it evokes in students. Further research is needed to determine the impacts of experiential learning environments in agriculture on student development across the different academic content areas. Researchers should explore various ways agriculture provides authentic contexts and factors that enhance learning.

Although most teachers shared benefits of teaching agriculture, some teachers expressed that they did not teach agriculture in their classrooms. A number of teachers shared topics and instructional resources they wanted to know more about regarding agriculture. These topics and resources were similar to Trexler et al.'s (2000) study. Similarly, Trexler and Hikawa (2001) found that teachers' experiences and available resources influenced the development and use of agricultural curriculum materials, and that there was a lack of curriculum materials to teach connections with the agri-food system (Trexler et al.). Teachers in this study were most interested in understanding farming, sustainable food production systems, and the environment. Agricultural literacy initiatives should focus on helping teachers understand the farming system and the various trade-offs and consequences of using different food production systems. Education about

agriculture within the ecosystem should be further developed and connections should be explored with environmental literacy initiatives. Teachers' schema about agriculture and the environment should be further investigated to help agricultural educators meet the needs of more teachers regarding the integration of agriculture and the environment.

Contributions to the Field

This study is an example to inform practitioners and researchers of the advantages and limitations of action research. First, although survey researchers seek to generalize, the results of this action research study are contextually bound to the teachers who participated in this study and should not be generalized beyond the participants. Second, although data collection procedures must be based on sound, rigorous methods that ensure valid and reliable data, practitioners as researchers-in-action have tacit understandings and connections to the field, which provides a sense of practical validity and credibility as insiders. Third, although the methods could have been strengthened to increase the response rate, the practitioners wrestled with being less obtrusive as they sought to understand the needs of their clientele for the purpose of making programming decisions. Fourth, while the post-positivist nature of this exploratory study may have limited the depth of understanding of the findings because there was no follow-up or probing to clarify some of the teachers' comments, this study was an important initial look at teacher beliefs about teaching and learning agriculture. The information from this action research project was utilized in two ways to attain a better understanding of educational programming and the development of a questionnaire appropriate for elementary and junior high

teachers in regard to agricultural literacy. First, agricultural literacy professionals incorporated environmental education into their agricultural literacy inservice workshops and changed their local programming efforts to be more marketable to teachers who might integrate agriculture into their classrooms. Second, a team of agricultural literacy researchers developed questionnaires to assess teacher motivation regarding the integration of agriculture and the environment in elementary classrooms.

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