

Evaluation of Elementary Agricultural Education Curriculum for Integration

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Abstract

Agriculture has lacked in educating beyond its own industry. If agricultural education is integrated into public education, agricultural knowledge can increase the agricultural literacy of youth. This research evaluated the representation and use of agricultural concepts within agricultural elementary curriculum and textbooks. Results concluded the lessons evaluated within the elementary curriculum did not include an even representation of all 10 agricultural literacy concepts, or knowledge, skills, and attitudes/beliefs (KSABs) contexts. Overall, the top three categories included: Plants, Agronomy, and Horticulture (27.9%), General Agriculture (21.1%), and Food and Nutrition (13.9%). Teachable knowledge was found across all evaluated curriculum textbooks, the largest presence found in Plants, Agronomy, and Horticulture (28.7%) and General Agriculture (22.3%). There was no significant presence of skills or attitudes/beliefs across all curriculum textbooks. The current curriculum materials evaluated in this study indicated that without educational resources available to teach; how, when and where life sustained products originate, agricultural literacy of society will continue to suffer. Agricultural education in elementary curriculum needs to occur, following the re-evaluation of educational resources.

Introduction

The lack of agricultural literacy in society has become a rising concern. The general population should be able to analyze and communicate basic information about agriculture (Frick, 1990). Public agricultural literacy levels have been reported in multiple case studies and research as being below the average level, set by experts in the agricultural industry (Meischen and Trexler, 2003; Terry et al., 1992). There is a problem in the lack of agricultural literacy among youth (Balschweid et al., 1997). The Committee on Agricultural Education in Secondary Schools (1988)

recommended that all students should receive systematic instruction about agriculture beginning in kindergarten or first grade and continuing through twelfth grade. Clemons et al. (2018) viewed the confluence of agricultural literacy and being agriculturally literate, asking participants questions about how professionals in the fields of agriculture define agricultural literacy, and being agriculturally literate. Specht et al. (2014, p. 8) stated "agricultural literacy and experience have the potential to impact young people's reactions to negatively skewed visual material related to modern production agriculture." Yet, there is an absence of agriculture in elementary curricula (Vallera and Bodzin, 2016). Literature is currently lacking in studies evaluating course content of adequate agricultural material, along with material designed to enhance service learning (Culhane et al., 2018). Agricultural education is not largely present in most public schools' curriculum. Based upon previous research, Ohio, Oregon, Georgia, and Texas are attempting this type of curriculum implementation (Swortzel, 1997; Balschweid et al., 1997; Herren and Oakley, 1995; Terry et al., 1992). Vallera and Bodzin (2016) analyzed upper-elementary science textbooks and various curriculum programs used within the United States for the presence of agricultural concepts and topics. Supplemental agricultural curriculum can serve as the connection between academic material for educators, student understandings, and agricultural literacy (Spielmaker and Leising, 2013). Culhane et al. (2018) found that involving the community in a hands-on experience learning for students can also benefit the university and community stakeholders. "An understanding and documentation of the past, may allow the ability to understand and predict current and future issues in agricultural education" (Ray, 2015, p. 4). An approach to reach new goals to reinvent agricultural education was set into place for the year 2020 (Conroy and Kelsey, 2000). Current agricultural education programs still need to be reinvented and implemented in order to increase

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agricultural literacy. Implementing agricultural education into early elementary curriculum might just be the solution the National Council was looking for 20 years ago.

Conceptual and Theoretical Framework

The conceptual and theoretical framework of this study is to address the current agricultural literacy level, the lack of industry knowledge and curriculum integration to improve agricultural literacy in society. Agricultural Education is being evaluated with hopes of integrating agricultural topics in future early elementary level curricula. As consumers, agriculture holds important in all stages of life, for “basic needs of food, clothing and shelter” (Spielmaker, 2019, p. 22). Therefore, exposing youth to agriculture can be achieved by combining knowledge, skills, and attitudes/beliefs (KSABS) to increase agricultural literacy among students, teachers, and parents. (Vallera and Bodzin, 2016). Each individual lesson was reviewed and placed into either; 1) provide content knowledge, 2) teach a related skill, or 3) influence an attitude or change a belief. Agriculture needs to be taught through educating the public. Information introduced and learned at a young age has been shown to have significant impact on literacy and retention (Greeley Tribune, 2005). Educators who introduce agriculture into the curriculum also learn in the process of teaching (Baker et al., 2015). This process of integrated curriculum can lead to an agriculturally literate society.

Purpose and Objectives

The purpose of this study was to evaluate the representation and use of agricultural concepts within supplemental agricultural elementary curriculum and textbooks. Discovering resourceful materials for agricultural integration; and how they can be used to increase agricultural literacy in the classroom, will serve as a resource for teachers and agriculturists. The objectives of the study were to determine to what degree (frequency) agricultural literacy concepts are embedded in agricultural elementary textbooks and curriculum; and to determine the contexts (knowledge, skills, or attitudes/beliefs) agricultural literacy concepts appear within these materials.

Materials and Methods

The agriculture curriculum textbooks used in this study were selected for evaluation by studying textbooks utilized in classroom instruction. A one-hundred-year timeline was evaluated, dating back to early agricultural education curriculum utilized in the classroom until now. The qualitative historical analysis evaluated the difference between past and present elementary agricultural curriculum textbooks, evaluating a 100- year timeline in agriculture education (Thies, 2002). Current agricultural education curriculum materials can be found utilized in Ag in the Classroom programs today, and a textbook dating back to 1909. The books selected for this study included One Hundred Lessons in Elementary Agriculture; a Manual and Text of Elementary Agriculture for Rural School (Nolan, 1909),

which contained 100 individual agricultural lessons, and Acres of Adventures Books 1 and 2, which both included 40 agricultural lessons each (National 4-H Council, 2006a) and (National 4-H Council, 2006b).

This research was conducted using a mixed-methods design. Meta-analysis formally defined “as the statistical analysis of a large collection of analysis results from individual studies for the purpose of integrating the findings” was the qualitative approach utilized (Glass, 1976 as cited by Kulik and Kulik, 1988, p. 3). Studies have been conducted evaluating agriculture’s presence in various subject areas. Supplemental agricultural curricula have been published as resource materials, yet elementary teachers have limited time, knowledge and access to utilize them in the classroom. Balschweid et al. (1997) suggested for further research to focus on specific materials that could be utilized by educators in integration. The design of this study explored current agricultural themes in supplemental elementary agricultural curriculum materials. Each curriculum material was evaluated and placed into 1 of 10 agricultural categories by lesson, with selected examples aiding in categorization. Vallera and Bodzin (2016) provided the framework behind the agricultural categories and selected word examples. Lessons were categorized based upon the presence of the examples that represented the agricultural categories. Table 1 presents the Agricultural Categories and examples utilized for this study within each category. Each individual lesson was then reviewed and placed into either; 1) provide content knowledge, 2) teach a related skill, or 3) influence an attitude or change a belief (KSABS). A code-sheet with definitions and action verbs for the KSABS was utilized in the categorization process (Vallera and Bodzin, 2016). The definitions and action verbs for the examples of KSABS (see Table 4) were utilized from Knowledge, Skills, or Attitudes/ Beliefs: The Contexts of Agricultural Literacy in Upper Elementary Science Curricula (Vallera and Bodzin, 2016). The tables were utilized to determine the frequency and contexts in which agricultural literacy concepts were represented within supplemental agricultural elementary curriculum and textbooks. Numerical values demonstrated the number of lessons and frequency presence of each curriculum textbook evaluated individually and as a whole.

Results and Discussion

This study revealed a presence of agricultural concepts within the evaluated supplemental agricultural elementary curriculum and textbooks. Tables illustrate the selected examples and lessons that fell into each category of curriculum materials, Acres of Adventures: Books 1, Acres of Adventures: Book 2, and One Hundred Lessons in Elementary Agriculture; a Manual and Text of Elementary Agriculture for Rural School. It was found that lessons within the materials evaluated did not include a balanced representation of all 10 agricultural literacy concepts. Table 2 illustrates the frequency of the agricultural categories in the curriculum and textbooks across all agricultural lessons. More than a quarter (27.9%) of all agricultural lessons were categorized as Plants, Agronomy, and Horticulture. The agricultural categories of Plants, Agronomy, and

Table 1. Agricultural Categories with Examples

Agricultural Category	Select Examples
General Agriculture	Agriculture; by-products; consumers; farmer policy; wildlife
Food and Nutrition	Calories; diet; food; food chains; minerals; nutrition
Plants, Agronomy, Horticulture	Bacteria; CO ₂ ; crops; fertilizers; irrigation; plants
Livestock, Meat, Poultry	Animals; birds; fish; livestock; migration; veterinarian
Dairy	Cheese; cows; dairy; products; homogenization; pasteurization
Work Animals and Machines	Farm machinery; ox/oxen; plow; simple machines; tools; tractor
Fiber	Building structures; fiber; paper; shelter; timber/lumber; wool
Land and Natural Resources	Habitat; land/landforms; lakes/ponds; natural resources; erosion; water
Environment and Sustainability	Climate; conservation; ecosystem; energy; pollution; sustainable
Agriscience and Biotechnology	Agribusiness; biodiversity; biofuels; disease; pesticide; recycling

Table 2. Frequency Presence of Agricultural Literacy Concepts Across All Textbooks

Agricultural Category	Number of Lessons	Frequency
General Agriculture	38	21.1%
Food and Nutrition	25	13.9%
Plants, Agronomy, Horticulture	50	27.9%
Livestock, Meat, Poultry	10	5.6%
Dairy	6	3.3%
Work Animals and Machines	8	4.4%
Fiber	8	4.4%
Land and Natural Resources	20	11.1%
Environment and Sustainability	7	3.9%
Agriscience and Biotechnology	8	4.4%
Summary	180	100.0%

Horticulture (27.9%), General Agriculture (21.1%), and Food and Nutrition (13.9%) represented the top three categories across all curriculum texts. Further, only 10 out of the 180 analyzed lessons (5.6%) were in the Livestock, Meat and Poultry category, with no lessons providing information of livestock/meat consumption. The Land and Natural Resources agricultural category landed more towards the middle of the frequency presence (11.1%) with 20 lessons across the curriculum and textbooks.

Table 3 illustrates the number of lessons placed in each agricultural literacy concept and the frequency in each of the evaluated curriculum texts. Out of all materials, the 100 Lessons Manual, and Acres of Adventures: Book 2 contained a lesson that fit into all Agricultural Literacy categories. With further evaluation, the curriculum textbook with the greatest presence across all agricultural concepts individually was One Hundred Lessons in Elementary Agriculture; a Manual and Text of Elementary Agriculture for Rural School. Findings showed that not all of the evaluated curriculum textbooks provided a lesson presence in all agricultural categories. Acres of Adventures: Book 1 completely lacked a presence in Livestock, Meat, and Poultry, Work Animals and Machines categories. When analyzing the data across

all curriculum texts, there were two categories represented in the top three highest percentage across the texts: General Agriculture and Plants, Agronomy, and Horticulture. The two most frequently referenced lessons were found in the Plants, Agronomy, and Horticulture category (36.0% and 27.5%), totaling 50 lessons across all evaluated curricula. Food and Natural Resources, Plants, Agronomy, and Horticulture, and General Agriculture appeared to be sufficiently covered through all materials. Frequencies varied across categories. Table 3 shows the frequencies that each category is represented in the individual curriculum books separately and together; as Acres of Adventures: Books 1 and 2 were designed to be utilized together. Out of all three analyzed curriculum texts, Acres of Adventures: Book 2 was the most balanced in percentages of each agricultural literacy concept across the materials.

The contexts in which agricultural concepts appeared across elementary agricultural curriculum presence was not evenly represented according to knowledge, skills, and attitudes/beliefs. If there was a context basis, the results were categorized as to whether the lesson not only fit in just one KSABs, but marked across multiple contexts. Across all 180 agricultural lessons, only 6.1% of the lesson contained all KSABs contexts. Each curriculum text contained at least 1 lesson with all contexts. Table 5 illustrates a presence of knowledge across all curriculum texts. However, this was not the case when lessons were individualized by agricultural categories. Most agricultural concepts were presented as knowledge contexts (87.2%). Plants, Agronomy, and Horticulture disciplines represented the largest percentage (28.7%) of knowledge, followed by a 22.3% presence with General Agriculture. Results indicated that there was not a significant presence of Skills (33.3%) or Attitudes/Beliefs (30.0%) across the curriculum lessons. Food and Nutrition represented 28.4% of the skills learned from the lessons, and a 24.1% presence in General Agriculture that would change attitudes/beliefs among students. Further, One Hundred Lessons in Elementary Agriculture; a Manual and Text of Elementary Agriculture for Rural School contained 7 lessons (7.0%) that represented all KSABs contexts. This was the most KSABs across all the materials.

Table 3. Frequency Presence of Agricultural Literacy Concepts in Texts

<i>Agricultural Category</i>	<i>AA1¹</i>	<i>AA1</i>	<i>AA2</i>	<i>AA2F</i>	<i>AA1,2²</i>	<i>AA1,2 %</i>	<i>100L</i>	<i>100L</i>
General Agriculture	f	%	f	%	f	16.3%	f	%
Food and Nutrition	5	12.5%	8	20.0%	13	26.2%	25	25.0%
Plants, Agronomy, Horticulture	13	32.5%	8	20.0%	21	17.4%	4	4.0%
Livestock, Meat, Poultry	11	27.5%	3	7.5%	14	2.5%	36	36.0%
Dairy	0	0.0%	2	5.0%	2	2.5%	8	8.0%
Work Animals and Machines	1	2.5%	1	2.5%	2	5.0%	4	4.0%
Fiber	0	0.0%	4	10.0%	4	7.5%	4	4.0%
Land and Natural Resources	4	10.0%	2	5.0%	6	10.0%	2	2.0%
Environment and Sustainability	1	2.5%	7	17.5%	8	6.3%	12	12.0%
Agriscience and Biotechnology	2	5.0%	3	7.5%	5	6.3%	2	2.0%
Summary	3	7.5%	2	5.0%	5	100.0%	3	3.0%
		100.0%	40	100.0%	80		100	100.0%

¹ “AA1” is Acres of Adventures: Book 1; “AA2” is Acres of Adventures: Book 2

² “AA1,2” is Acres of Adventures: Book 1 and 2; “100L” is One hundred Lessons in Elementary Agriculture; a Manual and Text of Elementary Agriculture for Rural School

Table 4. KSABs Definitions and Action Verbs

	<i>Knowledge</i>	<i>Skills</i>	<i>Attitudes/Beliefs</i>
Definitions	complex process of learning concepts, principles, and information, and remembering, relating, and judging ideas or abstract phenomenon	the ability to use one’s knowledge effectively and readily in execution or performance; a learned power of doing something competently: a developed aptitude or ability	conviction of the truth of some statement or the reality of some being or phenomenon especially when based on examination of evidence
Action Verbs	analyze, classify, compare, describe, differentiate, explain, generate, identify, interpret, justify, prioritize, recognize, summarize, understand, use, verify	adapt, assess, categorize, clarify, communicate, construct, cooperate, demonstrate, detect, develop, document, employ, evaluate, organize, prioritize, propose, recommend, utilize	appreciate, assume responsibility, assure, be conscientious, be ethical, demonstrate composure, develop, endorse, express, justify, maintain awareness, resolve, respect, value

Table 5. KSABs Context Percentages of Agricultural Literacy Concepts in Texts

<i>Agricultural Category</i>	<i>Knowledge</i>	<i>Skills</i>	<i>Attitudes/Beliefs</i>
General Agriculture	22.3%	16.7%	24.1%
Food and Nutrition	10.8%	28.4%	11.1%
Plants, Agronomy, Horticulture	28.7%	20.0%	13.0%
Livestock, Meat, Poultry	6.4%	3.3%	11.1%
Dairy	3.8%	3.3%	3.6%
Work Animals and Machines	4.5%	5.0%	5.5%
Fiber	3.8%	5.0%	9.3%
Land and Natural Resources	12.7%	5.0%	13.0%
Environment and Sustainability	2.5%	5.0%	7.4%
Agriscience and Biotechnology	4.5%	8.3%	1.9%
Summary	100.0%	100.0%	100.0%

Summary

Supplemental agriculture curriculum can serve as the connection between academic material for educators, student understandings, and agricultural literacy (Spielmaker and Leising, 2013). Results revealed that agricultural elementary curriculum contained lessons from all agricultural categories when evaluated as a whole. Although individual textbooks lacked in all agricultural literacy concepts individually; as they were intended for. Agricultural categories with select examples illustrate that the overall categories may not represent what agriculturists hoped. The current curriculum materials in this study revealed that society cannot begin to bridge the gap in knowing where their food comes from, without educational resources available to teach how, when, and where our life sustained products originate. However, we need additional resources. Over 100 years "Agricultural Education as a discipline has a long and storied past, filled with accomplishments and setbacks" (Ray, 2015, p. 3). This study indicated that our agricultural education curriculum has not varied for 100 years; a large part of our professions' problem. Curriculum developers need to re-evaluate the design in publishing agricultural literacy education materials for integration into the classroom.

In the way of recommendations, results indicated a need for curriculum reform to redesign or create new content that fits the current need for agricultural education in the current society. The current disconnect from the agricultural industry standards and the curriculum developers leads to a struggle in the integration process to promote and increase the agricultural literacy level in young students or adults. With re-evaluation of the agricultural literacy concept examples used, the literacy concept categories used can still well represent the industry. Work needs to be done by adding updated sample examples and content material to increase knowledge and address some of the agricultural literacy downfalls. Curriculum materials should also be designed upon the will to learn, inspire, promote growth, teach and understand. Designing the lessons to teach and educate students in a way that knowledge and life skills can be molded; while possibly molding an attitude or belief (Vallera and Bodzin, 2016). The delivery of curriculum will then turn into knowledge, and serve as a resource for agricultural literacy. Future studies should be conducted on this research across other agricultural elementary curriculum materials and textbooks. Evaluating curriculum books across multiple sectors can provide more of an accurate understanding for curriculum developers to gain resources and materials that could be utilized in development, for integration purposes. Utilization of the NVivo coding system when analyzing future curriculum textbooks could "lessen the burden" (Zamawe, 2015). Due to the time restraint and error that could come from manual coding, NVivo can allow for more of a variety of curriculum textbooks to be analyzed (Zamawe, 2015). In regards to elementary teachers' perceptions, future research could analyze why teachers are uncomfortable with integrating agriculture in their classroom. Future research could also include conducting a study or survey analyzing the knowledge that students learned from an integrated lesson

or curriculum material in an elementary classroom. Thus, future research needs to be conducted for the integration of curriculum to benefit agriculturists, elementary educators, and curriculum developers.

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