

2014

Promoting a Shared Vision: Identifying Intersections Between Food and Fiber Systems Literacy Benchmarks and Illinois State Board of Education Standards

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PROMOTING A SHARED VISION: IDENTIFYING INTERSECTIONS
BETWEEN FOOD AND FIBER LITERACY BENCHMARKS AND ILLINOIS
STATE BOARD OF EDUCATION STANDARDS.

by

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B.A., Western State College of Colorado, 2009

A Research Paper
Submitted in Partial Fulfillment of the Requirements for the
Master of Science

Department of Plant, Soil, and Agricultural Systems
in the Graduate School
Southern Illinois University Carbondale
August 2014

RESEARCH PAPER APPROVAL

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AND FIBER LITERACY BENCHMARKS AND ILLINOIS STATE BOARD OF
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June, 25 2014

AN ABSTRACT OF THE RESEARCH PAPER OF

DANIEL P. INGOLD, for the Master of Science degree in PLANT, SOIL, AND AGRICULTURAL SYSTEMS, presented on JUNE 25, 2014, at Southern Illinois University Carbondale.

TITLE: PROMOTING A SHARED VISION: IDENTIFYING INTERSECTIONS BETWEEN FOOD AND FIBER LITERACY BENCHMARKS AND ILLINOIS STATE BOARD OF EDUCATION STANDARDS.

MAJOR PROFESSOR: Dr. Seburn L. Pense

Understanding of agricultural systems has been an accepted and necessary aspect of a child's education for centuries. Conventional agricultural education has proven effective in creating well-trained agricultural professionals and scholars, but has had the unintentional effect of limiting access to agricultural concepts to the non-agricultural student. This effect has potentially negative cultural consequences considering the importance agricultural issues. In response, agricultural educators have carried out an initiative to promote agricultural literacy in the classroom through an integration of agricultural concepts into core curriculum. *A Guide to Food and Fiber Systems Literacy Benchmarks* (Leising, 1998) is an example of programs that assess students' level of agricultural literacy. However, integration of agricultural concepts into core curriculum without undermining state required standards is considered a primary obstacle in reaching goals in agricultural literacy. This research article uses the conceptual model proposed by Agnew, Powell, & Trexler (2008) which promotes a clarified vision for joining the differing educational paradigms. In particular, this article uses the method of exploring intersections in food and fiber systems literacy benchmarks with Illinois State Board of Education performance indicators in order to construct simple and comprehensive lesson units that meet both sets of educational standards.

ACKNOWLEDGMENTS

To my dear lady, Julie Harvey, you provided the inspiration and sense of urgency to pursue an advanced degree. Without which, I may have never undertook the challenge, and undoubtedly would not have found the strength to make it to the end.

To my family and friends who encouraged me along the way, and gave me the support that was needed to stay focused and on track.

To my professors, and, in particular, Dr. Seburn L. Pense, who not only guided me through the process but provided me with invaluable knowledge, reference material, and positive influence.

To Stinson Library, in Anna, IL for creating calm and quiet atmosphere for my studies and research.

And, finally, to the faculty and staff at Southern Illinois University Carbondale for all of their efforts in bringing culture and higher education to the Southern Illinois region. You are an invaluable asset to the place I have called home for most of my life.

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CHAPTER 1

INTRODUCTION

Background

Knowledge of agricultural systems has been considered an essential part of a child and young adult's education in American culture well before the United States gained independence. Even into the 20th century, most of the nation was an agrarian society, and knowledge of agriculture was considered a necessary skill for the survival of the American way of life. During this period, society believed strongly that agricultural literacy was important for students and society as a whole (Kahler, 1988).

In the early 1900's, advocates for a change in primary and secondary education believed that subjects such as agriculture should be taught as a vocational science in order for the United States to remain as a competitive society on the global economic stage. As a result, vocational agriculture became a staple topic in public schools with federal funding through the Smith-Hugh's act of 1917. The new policy in public education brought about interesting changes to agriculture's role in general education. Not only did an entirely new group of agricultural teachers emerge from university agriculture departments, but agricultural education was also redefined in its own specific academic area of agricultural and mechanical practices to be taught as a topic separate from the other natural sciences through its own unique perspective (Hillison, 1987).

Consequently, the new directions in agricultural education caused a shift in how the subject was presented in the classroom, as well as limit the overall access the average public school student would have to agricultural principles. Instead of basic agricultural knowledge integrated into the primary and secondary interdisciplinary curriculum, the focus moved instead toward specialized vocational courses for secondary education students. From the inherent demands of agriculture in the 20th century, this approach to educating farm workers had its' proven merits. Since the 1930's, a steady evolution of domestic agricultural policy occurred. Starting with the 1933 Agricultural Adjustment Act, into the heavily industrialized 'fence-row

to fence-row' policies of the 1960's and 1970's, up to the emergence of the conservation movements of the 1980's and 1990's created a constant demand for qualified, proficient, and well educated agriculturalists (Cain & Lovejoy, 2004).

However, the educational paradigm which has upheld and continues to support the agricultural system, while having produced more technically trained agricultural workers needed by the industry, unintentionally resulted in an alarming majority of Americans that lack knowledge in areas basic to their daily lives, home economics, and in many ways to their survival (Kahler, 1988). The recognition of this shortcoming in public education has created contemporary interest among agricultural educators to promote agricultural literacy as a necessary and permanent goal of general education at all levels (Kahler, 1988).

In order to address the symptoms of a society lacking agricultural literacy, the term has been given an umbrella definition by educators and professionals in agricultural fields.

Agricultural literacy can be defined as possessing knowledge and understanding of our food and fiber system. An individual possessing such knowledge would be able to synthesize, analyze, and communicate basic information about agriculture. Such knowledge includes: the production of plant and animal products, the economic impact of agriculture, its societal significance, agriculture's important relationship with natural resources and the environment, the marketing of agricultural products, the processing of agricultural products, public agricultural policies, the global significance of agriculture, and the distribution of agricultural products. (Frick, Kahler, & Miller, 1991, pg. 52)

Additionally, agricultural literacy has since been deemed an even more pertinent issue within agricultural education due to an increasing demand on agricultural systems. In the most basic sense, as the planet's population rapidly grows, so too does the need for agricultural products. Adversely, with urbanization and a mechanized industry, the amount of people involved in agricultural production has decreased. Therefore, in a large democratic society, it is imperative

that people make informed decisions regarding all facets of the food and fiber industry (Ball & Kovar, 2013). The challenge arises in creating an agriculturally literate society when so few people have a working background of agricultural practices in relation to the basic needs of everyday life. This dilemma of modern society has serious implications when the mounting concerns of modern agriculture are acknowledged as a symptom of a rapidly growing and increasingly homogenous culture (Berry, 2004). As the complexity of issues within agriculture grows, the concept and meaning of an agriculturally literate society does also. Agricultural education must be as adaptive as agricultural practice itself in order to face modern questions such as genetically modified crops, animal rights, food safety, organic farming, ethanol production, globalization, locally supported agriculture, sustainability, environmental stewardship, climate change, resource management, and so forth (Ball & Kovar, 2013).

Statement of Problem

Teacher proponents for agricultural literacy have typically adopted a cognitive constructivist approach which argues that a base of knowledge is solidified through value oriented and experiential learning over broad areas of study which ultimately leads to specific skills and higher understanding (Agnew, Powell, & Trexler, 2008). However, not only does this theoretical framework undermine the compartmentalized vocational nature of agricultural studies, it also conflicts directly with contemporary policies such as No Child Left Behind and the later Common Core which enact a more conventional approach to public education. Such policies tend to place a greater emphasis on performance assessment through standardized testing (Kim & Sunderman, 2005). The apparent opposition between how agricultural educators see progress in agricultural literacy versus the current direction of political policy in public education suggests a need for a teaching method that takes a compromising stance in meeting the

perspective of both schools of thought.

Purpose of Study

The research and teaching methods proposed hereafter will explore the possibility of adapting a constructivist approach which infuses agricultural content into general education in a way that fits within existing required core curriculum standards. The primary instrumental tools used in this research paper are the benchmarks defined in the *Food and Fiber Systems Literacy (FFSL)* framework, (Leising, 1998), standards in public education as defined by the Illinois State Board of Education, (ISBE, 2005) as well as the conceptual model developed in a 2008 study conducted by Agnew, Powell & Trexler (2008) which attempts to alleviate the conflict between constructivist and conventional education paradigms as well as integrate past conceptual models in order to form a comprehensive method for improving the delivery of agricultural content into the classroom.

The following model (Figure 1), illustrates a potential positive dynamic existing between constructivist and traditional teaching paradigms. In theory, the expectation of cognitive constructivists is that through the application of an agricultural literacy framework, both knowledge and process skills are improved which will be demonstrated by higher standardized test skills. Along this path, successes and failures in innovation will both validate constructivist expectations as well as provide new concepts in how to integrate agricultural concepts.

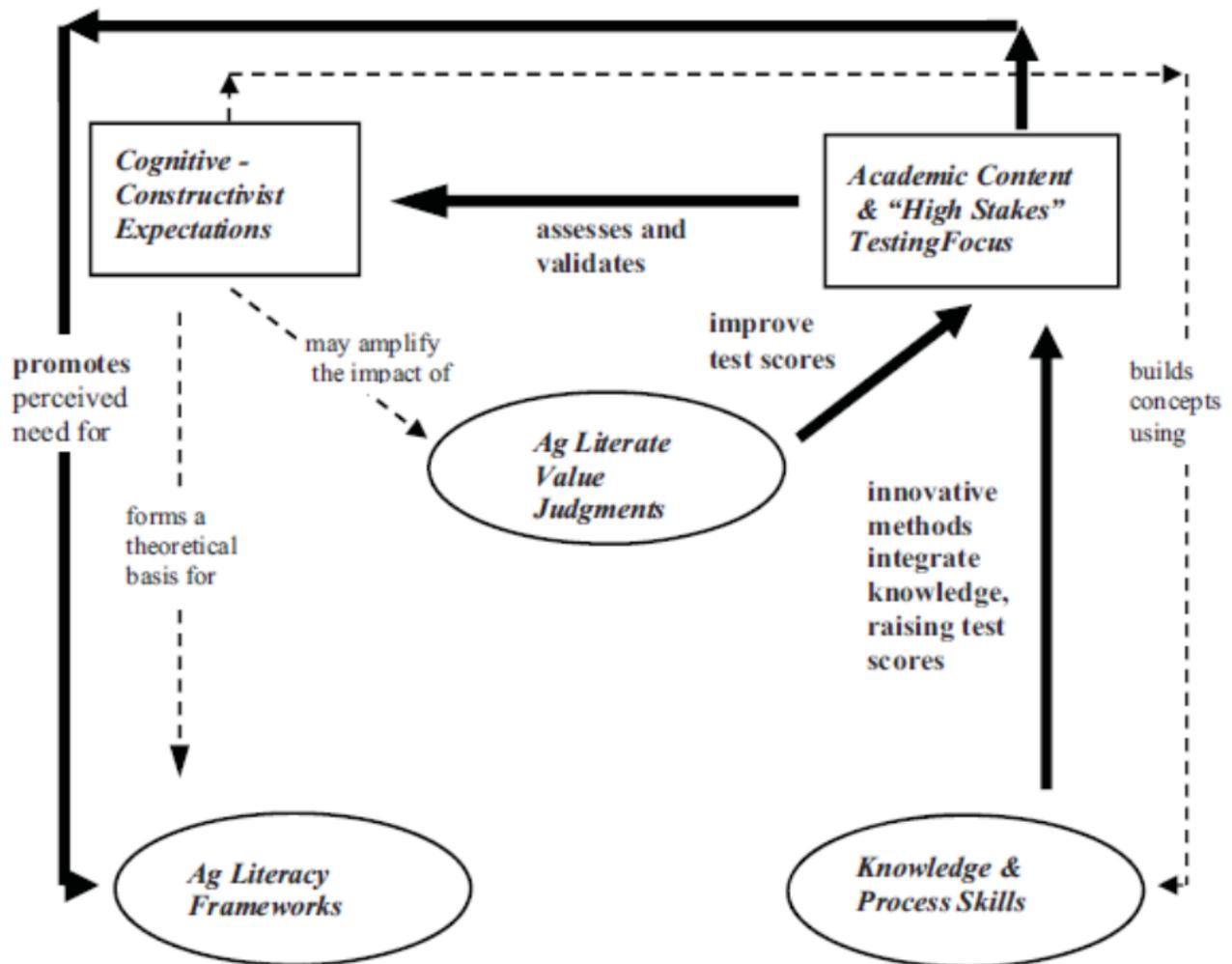


Figure 1. Paradigm shift promoting a shared vision of agricultural literacy (Agnew, Powell, & Trexler, 2008)

Research Objectives

The following research objectives are meant to explore past examples of agricultural literacy initiatives and research, as well different levels of success and failure at which goals in promoting agricultural literacy have been met. In doing so, the researcher hopes to reveal new insight into how agricultural content may be more successfully integrated into a wider range of non-agricultural courses and be adapted to fit common core standards.

- Review the history and available literature that details the progress and evolution of programs which promote agricultural literacy as defined by teachers and professionals involved in agricultural education, as well as previous studies which test existing agricultural literacy programs and analyze agricultural literacy levels in students.
- Analyze where possible agreement exists between agricultural literacy benchmarks and ISBE core curriculum standards, and propose potential course content and curriculum which utilize intersections between the two sets of standards.
- Design a test-evaluation method that would allow educators to measure the effectiveness of the proposed integrated courses, as well as create a test lesson plan demonstrating the integration of agricultural concepts into a core curriculum class.

Definition of Terms

Agricultural literacy - Possessing knowledge and understanding of the food and fiber system to a level that measurably satisfies specific standards set forth by professionals and educators in agricultural fields.

Agricultural literacy benchmarks – Age and theme specific performance indicators of agricultural literacy as defined in *A Guide to Food and Fiber Systems Literacy* (Leising, 1998).

Core curriculum – Refers to general education courses which are designed to prepare students to meet existing state prescribed educational standards.

Common Core – Reference to current public policy which steers the guidelines for state required standards.

Cognitive Constructivist Paradigm – An educational philosophy which proposes that factual knowledge and practical skills are a means to a higher level of experiential understanding, and that value-based decision making is not only the best indicator but also the ultimate goal of a well-rounded education.

Conventional or Traditional Paradigm – An educational philosophy which proposes that factual knowledge and practical skills are the cornerstones of the educational framework, and that standardized assessment of learning at this level is the best indicator of a student's performance.

CHAPTER 2

LITERATURE REVIEW

History of Agricultural Literacy Programs

Ever since the consensus emerged among agricultural educators that called for agricultural literacy to be reintroduced as a necessary theme in primary and secondary general education, several groups have made coordinated efforts to develop programs and standards that enhance the quality of agricultural education. Three influential programs stand out as effective tool kits to promote agricultural literacy within the general framework of public education (Agnew, Powell, & Trexler, 2008).

In 1981, the United States Department of Agriculture sponsored *Agriculture in the Classroom* (AITC). The grass-roots effort was initiated by an interdisciplinary group of educators and agricultural professionals to develop areas in which important agricultural concepts can be delivered through core curricula. Throughout the 1980s, AITC initiatives gradually spread throughout several states. While AITC has had minimal effect in some states, other states have greatly infused agriculture into academic subjects along with providing teacher training (Malecki, Israel, & Toro, 2004).

In 1988, *Project Food Land and People* (Project Food Land and People, 2012), (FLP) set out to develop curriculum that applies agricultural knowledge, skills, and environmental contexts to various subject areas. A large group of educational professionals from many backgrounds worked for 10 years to develop pilot-test lessons that incorporated integrated curriculum. A broad range of lesson units were designed to systematically fit core subjects with a thematic focus on agriculture. The lessons can be implemented in a selective manner within the scope of individual classroom curriculum (Brickell, 1996).

In 1998, a group of agricultural education researchers developed the *Food and Fiber Systems Literacy* (FFSL) curriculum framework highlighting five key areas of agricultural literacy; Understanding Food and fiber Systems; History, Geography, and Culture; Science, Technology and Environment; Business and Economics; and Food, Nutrition and Health. Each area was

then subdivided into a comprehensive set of benchmarks defined by grade-level. The FFSL framework included companion lesson units and a validated FFSL test for assessing levels of agricultural literacy (Leising, 1998).

These three frameworks can be considered complementary, rather than competitive, approaches to integrating agricultural content into existing core subject areas. While AITC and FLP both seek to equip educators with the tools to apply academic skills in an agricultural context, the FFSL benchmark framework takes the opposite approach of building a strong base for student's agricultural knowledge, then subsequently applying that knowledge to vocational and academic skills. Taken together, the programs cover both a top-down and bottom-up strategy to agricultural learning (Agnew, Powell, & Trexler, 2008)

Individual Assessment Research

In a study conducted by Hess and Trexler (2011), eight girls and ten boys in the upper elementary range (4-6th grade) were interviewed in a manner which demonstrated their understanding and experience of agricultural systems. The students were all from an urban setting with a variety of ethnic and social backgrounds. The students were first asked questions about their direct experience in agriculture and asked to identify and explain the origins of the different parts of a cheeseburger. The questions were designed so that answers could reveal their knowledge of agricultural systems. Their answers were analyzed on a scale of compatibility relating to the theoretical framework of Trexler's (2000) synthesis of AAAS's (1993) Project 2061 Benchmarks for Science Literacy and A Guide to Food and Fiber Systems Literacy Framework (Leising, 1998). The research found that all informants had few experiences in visiting farms, or in community or relative's gardens. Also, no informant grew plants or raised livestock themselves, and that three had no agricultural experience whatsoever (Hess & Trexler, 2011). The questions about cheeseburgers revealed a majority of students could identify a particular food product, but held vast misconceptions of the origin of those agricultural products according to the benchmarks adopted by the study (Hess & Trexler, 2011). The findings

suggest a gap of knowledge in students of this age group concerning their food's origin and production.

The cheeseburger interview experimental design has been applied in several cases to assess various themes in agricultural literacy. Trexler's (2000) original study similarly explores primary students' understanding of pest-related science using the same benchmark standard. Nine reasonably bright fifth-grade informants of various backgrounds and experience were hand chosen and given an interview regarding the parts found in a cheeseburger (Trexler, 2000). The findings of this study suggest that 1) experience plays a pivotal role in elementary students' understanding of pests, 2) students lack well developed language to discuss pests and their control, and 3) core biological concepts underscore pest related understandings (Trexler, 2000). Again, the students' compatibility to benchmark understanding was shaky. Student's understanding appeared to be linked to experiential background, and that off-campus learning experiences indicated an influence on overall pest related issues (Trexler, 2000).

As before, Meischen and Trexler (2003), conducted a study on fifth-grader understanding of meat and livestock production, and the study group fell short of an understanding compatible with benchmark standards (Meischen & Trexler, 2003). Hess and Trexler (2011) also found, in regards to understanding agriculture in a democratic, social, and economic sense, that when compared to grade specific benchmarks, few areas of compatibility existed. (Hess & Trexler, 2011). The collection of cheeseburger interview studies seem to strongly indicate an alarming lack of agricultural literacy in its primary education subjects and shows little sign of improvement over time. The studies appear to be effective in assessing individual knowledge of its informants, and yield prospects for interesting future research relating agricultural literacy with geographic and cultural background. However, though the studies incorporated a theoretical framework, neither a correction to the framework itself nor a practical approach to improving curricula seem to be of special interest within the study discussion.

An Assessment of Food and Fiber Systems Knowledge in Selected Oklahoma High Schools (Pense & Leising, 2004) is a somewhat different example of research which assesses individual

knowledge in accord with FFSL benchmarks. Using the FFSL framework, Pense and Leising (2004) assess the agricultural literacy of 330 Oklahoma twelfth grade students involved in either general education or agricultural education, determine strengths and weaknesses in overall agricultural knowledge, as well as differences based on academic focus. Results were also reviewed under the context of rural, suburban, and urban backgrounds. Among the findings, it was concluded that students from all areas of study possessed at least some agricultural knowledge. Knowledge of students in agricultural education did not differ significantly from those in general education. Students from rural schools possessed less agricultural knowledge than those from urban and suburban schools, and that students from all backgrounds fell short of demonstrating a level of agricultural literacy that met FFSL benchmarks (Pense & Leising, 2004). The implications of this study suggest a thin scope of secondary education programs in regards to agriculture, as well as a need for agricultural educators to widen the impact of the subject area and to coordinate with educators in other disciplines (Pense & Leising, 2004). The timing of this study, conducted 15 years after the plea for improvement in agricultural literacy within agricultural education began, suggests a need for greater efforts to realize its original goals (Pense & Leising, 2004).

Individual assessment research has been applied to educators as well. A study of educators from 200 Missouri schools determined informants' knowledge and attitude toward agriculture, as well knowledge and attitude of administrators based on relative area of discipline (Birkenholz & Harris, 1996). The study found a homogenous positive attitude and perception toward the importance of agriculture as a topic. Unsurprisingly, agricultural educators possessed the highest levels of knowledge in the subject, with only little difference existing in knowledge of agriculture among educators of other disciplines. The study points out that, with such positive attitudes toward agriculture, educators such as these are ripe for integrating agricultural literacy into their classrooms (Birkenholz & Harris, 1996). Another interesting implication is the apparent lack of nation-wide improvements in meeting agricultural literacy goals; evident through the results of assessment studies conducted since the article was written, despite a

willingness of educators to integrate agriculture into curricula. The results of most assessment studies seem to suggest educational programs face difficulty incorporating agricultural content as well as possible flaws within the conceptual framework supporting agricultural literacy benchmarks.

Program Testing Research

A somewhat different research approach, program testing, attempts to evaluate the effectiveness of an educational program by how it meets a given framework of agricultural literacy standards. A study by Agnew and Powell (2011) sought to determine the level to which K-5 classes adopting the FLP curriculum had met FFSL benchmarks for agricultural literacy. It was found that all categories of FFSL standards were to some extent met by the program curriculum, although some more than others. In general, it was found that the practical distinction between an infusion of concepts and their full integration was somewhat murky, and that the full potential of the FLP is most likely not fully realized (Agnew & Powell, 2011). The study also recommends a reassessment of FFSL benchmarks which further clarifies the requirements and definition of specific areas in order to improve the integration of content (Agnew & Powell, 2011).

An earlier study by Balschweid, Cole, and Thompson (1998) evaluates the effects of a teacher training program on participating K-12 educators on curriculum content. Complete responses to a mail-in survey were gathered from 52 educators who had participated in the Summer Agriculture Institute (SAI) offered by Oregon State University. Responses to the survey were used to assess topics such as educator perceptions and attitudes toward integrated curriculum, perceptions of student interest toward agricultural content, participating teacher demographics, and barriers to integrating agricultural content into curriculum (Balchweid, Cole, & Thompson, 1998). Participants of the program tended to be veteran teachers, and found the information offered by the program to be useful in integrating agriculture into their curriculum. The participants' perceptions of student interest toward agriculture tended to be positive, with the subjects of soils, agricultural mechanics, and economics to be the least popular. However, little

over 30% of participants managed to integrate the program's content into lessons more than five times a year. Barriers to integration were predominantly described as a lack of time to change and modify curricula (Balschweid, Cole, & Thompson, 1998).

Similar summer institutes exist in Illinois which provide teacher training in implementing AITC concepts and agricultural topics. The program has a rich history, and several facets of information sharing which can be used as resource for educators in the state to educate themselves and find relevant information about agriculture practices, history, and issues in the state of Illinois (Illinois Agriculture in the Classroom, 2014). However, though data exists, no recent studies have been conducted which measure the efficacy of the IAITC programs.

Students in Oklahoma and Montana schools experienced an increase in levels of agricultural knowledge following an experimental program tested against the FFSL framework (Igo, Leising, & Pense, 2000). The study identifies the subjects of history, geography, environmental sciences, and agriculture to experience the highest frequency in improvements of agricultural literacy (Leising, Pense, & Igo, 2000). Program testing research yields useable information with which to measure the value of programs aimed at reaching benchmarks in agricultural literacy. It not only highlights areas where improvement in current programs is needed, it opens a dialogue between existing educational programs and the conceptual models that guide them. Analysis of program testing results can lead to innovation in the approach to teaching agriculture. Both program testing and individual knowledge assessment studies seem to point toward the importance of a solid and clearly defined conceptual framework by which to measure standards and progress.

Development of a Conceptual Model

An acceptable framework building agricultural literacy relies ultimately on a consensus among educators that increasing agricultural understanding and awareness is a core asset to a well-rounded general education. A large-scale survey of Illinois public school teachers was used to probe information about teachers' perceptions of the benefits of teaching and learning agriculture in primary and middle-school education. The respondents overwhelmingly agreed

that agricultural content provides a sense of connectedness and authenticity to the subject matter. The survey revealed a long list of topics of interest in which agricultural education could be integrated into curriculum, as well as resources they would need to more effectively incorporate lessons. Barriers to integrating topics were listed as shortages of time and content material with which to implement lesson plans (Allen, Ball, & Knobloch, 2007).

The accumulation of agricultural literacy research has produced a wide range of issues, shortcomings, and suggestions in regards to improving K-12 agricultural education. Agnew, Powell & Trexler (2008) introduced a clarified conceptual model by which agricultural literacy can progress. The article considers the history of conceptual framework development, common barriers to implementation and delivery of agricultural content, as well as examples of existing benchmark systems in order to create a more cohesive conceptual model. The model suggests an infusion of inductive, deductive, and evaluative approaches. Programmed integrated curriculum, applied knowledge, and process skills create a positive feedback of information useful for improving the delivery and content of educational material. Additionally, standardized test requirements must be recognized as a reality instead of a barrier to integrating agricultural content. Moreover, an updated conceptual model is adaptive to current trends in agriculture, as well as responsive toward all possible ways to foster agricultural literacy. The overall goal is to create individuals equipped with the knowledge needed to make informed social decisions about agriculture (Agnew, Powell, & Trexler, 2008).

CHAPTER 3

DISCUSSION

Bridging the Divide: ISBE Standards and FFLS Benchmarks

Through the review of literature, two thematic issues materialized. Not only is there still much progress to be made in meeting goals in agricultural literacy at a national level, but also the greatest challenge for agricultural educators is to incorporate the constructivist methods perceived as most effective at fostering agricultural literacy into a public school system which is heavily skewed toward a conventional assessment-based learning paradigm. This research paper will attempt to identify at least one technique through which agricultural content may be integrated into core curriculum in order to satisfy FFLS benchmarks without undermining existing ISBE required standards. A study by Nolin & Parr (2013) strongly indicated that agricultural courses tend to boost overall standardized test performance and serves as a basis for the conceptual approach suggested in this article. If agricultural classes enhance preparation for standardized testing in general, then perhaps incorporating agricultural concepts into a broader range of common core courses will only improve, rather than hinder, students' ability to meet required common core standards. The proposed method also utilizes the conceptual model previously introduced by Agnew, Powell, and Trexler (2008) which suggests that a positive feedback dialogue between enhanced agricultural content in course material and standardized test performance will best indicate if both benchmarks in agricultural literacy and core curriculum standards are being met.

The overall design for such courses would imitate FLP-style lesson units that satisfy any possible intersection between FFLS benchmarks in agricultural literacy and state defined standards for common core classes required by the Illinois State Board of Education. Illinois standards were chosen because not only does the state have comprehensive and readily available set of public education standards, but is also a state with a relatively large urban population while simultaneously containing large number of rural communities (NCES, 2012). In other words, it

is a state that may benefit from an agriculturally literate urban population which makes decisions regarding policies affecting rural agricultural practices. As mentioned, FFSL benchmarks highlight five separate thematic areas of agricultural literacy. However, to present the teaching method only two academic areas are used within the context of this research. History, geography, and culture, as well as science, technology, and the environment were chosen to correspond to the core academic areas of social science and natural science respectively. Although only two topics were chosen for analysis, it is pertinent to realize the implicit possibility that such connections could potentially be made in all five FFSL benchmark themes. To further specify the scope of the teaching units, both sets of standards were taken specifically from 9th and 10th student grade-levels. Tables 1 and 2 provide a comparison of state performance standards and agricultural literacy benchmarks in the subjects of *natural science* and *social science*.

Table 1. Comparison of Natural Science Performance Indicators

Illinois State Board of Education High School Performance Standards (ISBE, 2005)	Food and Fiber Literacy Benchmarks (Leising, 1998)
Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments, and solve problems.	Students will identify how Food and Fiber Systems affect ecosystems. They will evaluate the positive and negative impacts of agriculture on ecosystems.
Understand the fundamental concepts, principles, and interconnections of the life, physical, and earth/space sciences.	Students will explain why all countries' agricultural systems depend on natural resources. They will evaluate why Food and Fiber Systems compete for natural resources.
Understand the relationships among science, technology, and society in historical and contemporary contexts.	Students will recognize U.S. management and conservation practices impact other countries. They will evaluate the impact of these practices on Food and Fiber Systems in other countries.
	Students will recognize how science and technology impact Food and Fiber Systems. They will analyze the effects of science and technology on food, clothing, shelter, and career choices.

Table 2. Comparison of Social Science Performance Indicators

Illinois State Board of Education High School Performance Standards (ISBE, 2005)	Food and Fiber Literacy Benchmarks (Leising, 1998)
Understand political systems, with an emphasis on the United States.	Students will compare nomadic life to settlement and towns. They will analyze how the barter system evolved and encouraged economic growth, communication, and multiculturalism.
Understand economic systems, with an emphasis on the United States.	Students will identify nations where international food and fiber involvement exists. They will investigate the impact of global societies on food and fiber systems.
Understand events, trends, individuals and movements shaping the history of Illinois, the United States, and other nations.	Students will identify the role agriculture played in U.S. development. They will analyze agriculture's role in events that shape the nation.
Understand world geography and the effects of geography on society, with an emphasis on the United States.	Students will recognize how world cultures affect agriculture. They will explain how consumer trends impact Food and Fiber Systems.

It is important to note in each definition of both benchmarks and state standards the emphasis on the verb which describes the extent of learning demonstrated by the student. Bloom's taxonomy of learning represents a framework which defines where such levels of knowledge lie in a hierarchical pyramid. Each level of the pyramid represents a different level of learning development or mastery of a skill (Lord & Baviskar, 2007). While each verb in the benchmark and standard definitions (Tables 1 & 2) lie within the taxonomy level of 'comprehension', it is suggested that the educator recognize the difference in each action or cue in order to create lesson plans that meet the objective of each definition.

Example Topic

Each agriculturally infused lesson plan attempts to tackle specific concepts and themes in a way that effectively addresses both sets of performance indicators. The intention of the educational method is to enhance agricultural literacy without compromising any agreement with state required standards. Among lesson units already provided through FLP curricula, some

examples of test curricula which incorporate agricultural themes might include (FLP, 2012):

Natural Science

- Experimentation with water quality testing in areas downstream of land used for intensive conventional agricultural systems. Such a lesson could introduce hypothesis testing and scientific method, exploring water conservation and erosion control technologies, and discussing the difference between point and non-point pollution sources.
- Understanding the nitrogen and water cycles in terms of agricultural production and crop physiology. Subtopics covered might include soil testing, soil nutrient balances, annual precipitation rates, as well as technologies and calculations used to supplement nutrient and water requirements.
- Understanding technology, biological diversity, and bio-engineering in terms of agricultural practice. Other issues may include GPS harvesting, genetically modified organisms, food storage technology, and integrated pest management.
- Understanding soil type, climate, and topography in agricultural terms. Subtopics might also include soil loss and water runoff calculations, soil saturation and retention by soil type, climate zones, and the Conservation Reserve Program.

Social Science

- Understanding the historical evolution of public policy as it effects agriculture. Topics covered could include existing agricultural policies such as the Farm Bill, the purpose of governmental agencies such as the Department of Agriculture, Food and Drug Administration, or the Department of Natural Resources, as well as organic certification standards.
- Understanding the economic impact of agriculture on a state, national, and international level. Subtopics could include the contribution of agricultural production to GDP, interstate commerce and distribution of agricultural products, and trade agreements regarding the import and export of agricultural products between nations.

- Understanding differences in agricultural production in terms of geography, culture, and climate. This lesson would identify where particular crops are grown, discussions on cultural tendencies toward specific crops, and agricultural practices and technologies as an adaptation to region and climate.
- Understanding the impact of globalization and technology on modern agriculture. This topic might include discussions on fair trade vs. free trade policy, the impact of financial institutions such as the International Monetary Fund and World Bank on global agricultural production, labor rights, immigration policy, and the mechanization of agriculture.

In agreement with the ‘shared vision’ conceptual model of Agnew, Powell, & Trexler (2008), the goal of such lesson units is not to teach agricultural concepts for their own sake, but to infuse such concepts into common core classes without undermining state required standards in order to build a stronger understanding, practical experience, and eventually an ability to make value based decisions regarding agricultural issues, thus contributing to an informed and agriculturally literate society. The integration of agricultural concepts into general education does not eliminate the need for specialized vocational courses which prepare students intending to enter into agricultural fields, or pursue a post-secondary agricultural degree, but simply aims to introduce agricultural education to a broader student audience. Ultimately, the decision to integrate agricultural content rests in the instructors hands. Yet, given a general trend toward positive attitudes about agricultural issues among educators across subjects, simple adjustments in teaching methods and course curricula such as suggested here seem to be a practical tool for promoting a more potent infusion of agricultural content.

CHAPTER 4

CONCLUSION AND RECOMMENDATION

CONCLUSION

Although simple in concept, the idea of identifying intersections between FFLS benchmarks in agricultural literacy and state required standards appears to be a novel, logical, and practical solution for educators to find compromise when attempting to meet the goals of each set of standards. FFLS benchmarks appear to be the best existing framework for this purpose, in that it shares a similar format with ISBE core requirements. However, it is necessary to consider that FFLS benchmark definitions are in current need of expansion and update in order to meet 21st century definitions of agricultural literacy (Agnew, Powell, & Trexler 2008).

Furthermore, in keeping with the conceptual model presented by Agnew, Trexler, & Powell (2008), it is also recommended that the proposed integrated courses include a possible evaluation tool in order to determine how effectively they enhance academic progress. Repetitive post-evaluation testing represents a way to illicit a positive feedback loop that can be used to measure the efficacy of an experimental teaching method. Following is a mock research proposal which serves as an example of how integrated course material could be examined through post-evaluation. In addition, a lesson plan which demonstrates how an agricultural topic could be introduced into a general education course is included in the Appendix A.

Recommended Research

Length/Type of Study:

Study would be conducted over the course of one academic school quarter (10-12 weeks).

Sample Population Selection:

Two Illinois high schools would be chosen that fit National Center for Education Statistics (NCES) locale categories as either being urban/suburban or rural/town. Locale categories are defined principally by number of population in or adjacent to a defined city or urbanized territory, as well distance of a school from the determined metropolitan or urban center (NCES, 2012). The two high schools selected for this proposal would be:

Johnson City High School, Williamson County, Illinois (NCES, 2012)

Meets Criteria as rural/town locality

576 Total Students

Student/Teacher Ratio ~ 14.71

Belleville High School, St. Clair County, Illinois (NCES, 2012)

Meets criteria as urban/suburban locality

2,688 Total Students

Student/Teacher Ratio ~ 18.21

**exact n □ □ □ unknown*

Treatment and Control Methodology:

Courses given to control groups would undergo no modification in regards to integrating agricultural topics into existing curriculum.

Courses given to treatment groups would introduce at least four, week-long, agricultural topics which are designed to reflect an intersection of state educational standards and FFSL benchmarks within the normal bounds of each study subject. Two academic areas would be used within the framework of the study which correspond with the core academic areas of general science and social science.

Course Selection Criteria:

Two 9th grade general studies courses from each designated high school would be selected for the study. The two courses selected are to be representative of two essential standard topics; Science and Social Sciences. (ISBE, 2005) To be eligible for selection, the study courses will meet the following criteria:

Course is offered in two study periods, with distinctly different student bodies.

Course of a given subject area is taught by the same instructor for both student groups.

Course has the same overall curricula objectives for each study period it is taught.

Study Group Framework:

Under the course selection criteria, four sample groups emerge from each high school. They can be categorized as follows:

- **Science, Urban/Suburban**

- *Control group ~ no treatment received

- *Study group ~ integrated curriculum

- **Social Science, Urban Suburban**

- *Control group ~ no treatment received

- *Study group ~ integrated curriculum

- **Science, Rural**

- *Control group ~ not treatment received

- *Study group ~ integrated curriculum

- **Social Science, Rural**

- *Control group ~ no treatment received

- *Study group ~ integrated curriculum

Post Evaluation Testing:

At the completion of the quarter, students from each sample group would be given a post-evaluation survey intended to assess the level to which FFSL benchmarks standards have been met. The survey will consist of twenty multiple choice responses to questions. Each question would provide five generalized answers designed to assess specific areas of agricultural literacy. The validity of survey questions is based upon the three specific requirements discussed in the 2004 study on Oklahoma High Schools (Pense & Leising, 2004). The requirements defined by these methods are as follows:

Each question references at least one of the five areas of benchmark standards defined by the FFSL framework. In this research, the two areas will be theme **II.**) History, Geography, and Culture, and theme **III.**) Culture, Science, Technology, and Environment (Leising, 1998).

A panel of three credentialed Agricultural Education teachers and three graduate students in Agricultural Education who had no contact with any of the test sites would be asked to serve on the test development panel to write the items.

Questions would be validated by a panel of secondary school teachers of various disciplines to ensure that each item addressed its corresponding FFSL benchmark content, the content would be grade level appropriate, and each item was language appropriate (Pense and Leising, 2004).

Individual answers to questions would be represented on an ordinal scale, from one to five, with one being the lowest level of agricultural literacy and five being the highest. With twenty questions, individual test scores would range from 20-100.

Data Analysis

Two sets of statistical analysis will be deployed using up-to-date data analysis software to measure the outcome of survey results.

Paired t-test – Used to determine any significant difference between mean total scores of the control and treatment groups, as well as control and treatment groups within the two specific subject areas, and total rural vs. urban test scores.

One Way ANOVA & Post Hoc Analysis (if applicable) – Used to determine any significant difference in test scores between individual groups, as well as significant difference between rural and urban groups in all categories.

Test assumes a p-value of .05 and a Confidence Interval of 95%.

Limitations

- A device or instrumentation for measuring any statistical difference in ISBE student performance indicators between control and treatment groups should be implemented in a similar study. This could be done by analyzing standardized test scores between control and treatment group. Such an addition to the study would further the dialogue that addresses the integration of agricultural literacy benchmarks and common core standards.
- Selection of schools could be more random, these two schools were chosen due to their appropriate relative size, location, and representation of poverty and ethnic minorities.
- Having one teacher per subject could create bias, although different teachers would possibly cause too much variation in teaching method.
- Two school years may be an approach to correct bias of a single teacher. With more time elapse between treatment and control groups, it would be harder for an instructor to let one curriculum affect the other.
- Selecting more schools for the study would create a larger n . Also, further studies could change the sample groups to be categorized as control schools and study schools. This might reduce the possible error in instructor bias or information leaking from one class to the next.
- The test methods and instrument could be modeled more directly off of the assessment test already existing in the FFSL handbook.
- Locale could be subdivided into two further categories; Urban, suburban, town, rural.

Summary

Following a review of literature, it is found that three existing programs form a viable foundation for promoting agricultural literacy in the public education system. AITC, FLP, and FFSL represent programmed responses by agricultural educators who are concerned at the apparent lack of agricultural content in general education courses. Given the trend of positive attitudes toward agricultural topics in educators throughout all fields of study, this research suggest that the key to incorporating agricultural content into common core courses is to uncover simple teaching methods that can be used by educators to promote a higher level of agricultural literacy in students. Finding intersections in existing sets of performance indicators in both agricultural literacy benchmarks and state prescribed standards represents one way in which educators may find a practical solution to meeting goals in agricultural literacy without compromising the requirements set forth by common core educational policies.

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APPENDICES

Sample Lesson Plan Appendix A

Title of Lesson: Calculating Soil Loss using a USLE Calculator

Objectives: The student will be able to meet the following objectives with a score of 80% or better at the completion of this lesson.

1. Explain the importance of soil conservation from an agricultural or ecological perspective
2. Define the following terms: Conservation, annual precipitation rate, erosion, acre, slope, crop residue, crop rotation, tillage, best management practice, soil type
3. List the 6 major factors of the universal soil loss equation (USLE): (A) predicted soil loss in tons per acre per year (R) rainfall, (C) management practice, (P) conservation practice, (LS) length and slope, and crop residue, and (K) soil erodibility
4. Explain the relationship between (A) predicted soil loss and (T) tolerable soil loss, and how the different USLE factors affect predicted soil loss. As well as determine which factors people have some control over.
5. Enter factors into an interactive USLE calculator and interpret the output based on lesson worksheets.
6. Locate the USDA website and web soil survey database.
7. Students will not be required to research soil data and USLE factors on their own, only identify and define the different factors and their significance. Sample problems or evaluation exam will provide all needed values for the calculation, student will only need to identify what each value represents in relation to the 6 USLE factors.

Situation: The lesson will be taught to a group of 9th or 10th grade physical science

students. The lesson is meant to meet Illinois State Board of Education performance indicators in science 11, 12, & 13. The performance indicators met by this lesson are to: conduct an inquiry investigation, interpret and represent data to produce findings, analyze and evaluate findings to modify research design.

Reference and Teaching Material

1. Chalkboard/Dry Erase Board
2. Projector hooked up to PC with internet access
3. USLE interactive calculator (several available online)
4. Soil loss calculations example problems - Plant and Soil Sciences e-library
5. Dictionary

Interest Approach: Students will learn about a topic in natural sciences from the perspective of a farmer protecting his/her land from soil loss. Students will be given a slide show illustrating the destructive forces of erosion, and how such a force has an effect cropland. Students will be asked how soil erosion occurs, and what human and non-human factors come into play, their answers will be written on the chalkboard under a the title "Factors in Soil Loss".

TEACHING PROCEDURES:

Method: Illustrated lecture, handout, online demonstration, discussion, take home worksheet.

Motivation: Students will be asked if any of their family members are farmers and what type of farms they have. They will be asked why it is important that any farm conserve topsoil.

Summary: After the completion of the lesson, students will have a basic grasp of the importance of soil conservation, how soil loss is calculated, and a basic sense of the different factors which come into play in soil loss calculations. They will have explored a topic that satisfies some areas of state required student performance indicators, as well as gain exposure to a theme that meets basic benchmarks in agricultural literacy.

Evaluation: A take home worksheet will be turned in at the end of the lesson. Students will be given ample time to complete the worksheet, as it will require the use of a computer based USLE calculator. A short quiz will be given consisting of matching terms and definitions, as well as a short word problem that requires critical thinking about soil loss factors.

Outline of Lesson:

- I. Introduce Topic
 - A. Show brief illustrated slideshow
 - B. Engage students on the topic of soil erosion and soil conservation
 - C. Write student generated responses regarding soil loss factors
- II. Introduce Terms and Concept
 - A. Define for students all relevant terms, giving examples and detailed written definitions
 - B. A definition list handout could be provided for this purpose to eliminate any excuse for the students' need to take notes
 - C. Introduce the USLE equation and identify and explain what the different variables mean and how they relate to the terms previously

discussed. Definitions for variables could also be found on the definition list handout.

III. Online Demonstration

- A. Show students the USDA web based soil survey database website.
- B. Explain to students how data can be retrieved from this website, and how that data can be used for the USLE calculations.
- C. Take students to a website that provides an interactive USLE calculator where values can be entered into the calculator to yield a predicted soil loss value (A-value).
- D. Explain the concept of tolerable soil loss (T-value) and then compare that value to different predicted values.

IV. Conservation Management Practices

- A. Explain to students how different cropping, tillage, or conservation methods have an outcome on predicted soil loss.
- B. Give examples of entering into the USLE calculator different crop rotations, tillage practices, or water runoff reduction technologies in order for students to visualize how human impact has a large effect on predicted soil loss values.

V. Evaluation

- A. Distribute the take home worksheet with simple practice problems for explaining and interpreting soil loss calculations - Plant and Soil Science e-library

- B. Students should be allowed at least two nights in order to get access to a school or library computer in order to complete the worksheet.
- C. A short quiz over term definitions, as well as a revised version of one of the practice problems on the take home worksheet will be given on the day the worksheet is due.

VITA

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Research Paper Title:

Promoting a Shared Vision: Identifying intersections between Food and Fiber Systems Literacy benchmarks and Illinois State Board of Education standard requirements

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