ASSESSMENT OF REFERENCES TO AGRICULTURE IN A MIDDLE GRADE SCIENCE TEXTBOOK

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Master of Science

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by

MARSHALL SWAFFORD

Dr. Robert Terry, Jr. Thesis Supervisor

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The undersigned, appointed by the Dean of the Graduate School,
have examined the thesis entitled.

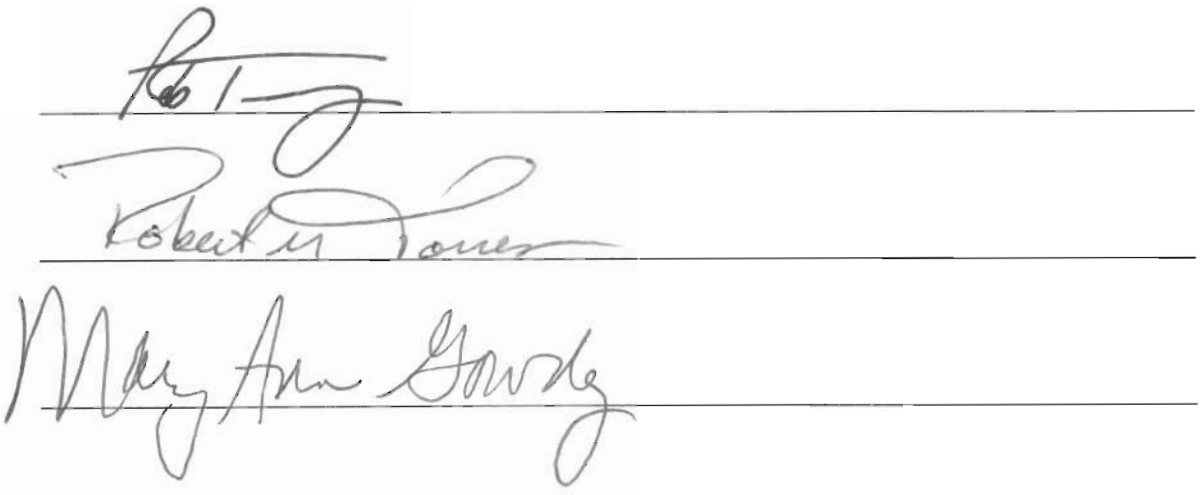
ASSESSMENT OF REFERENCES TO AGRICULTURE

IN A MIDDLE GRADE SCIENCE TEXTBOOK

Presented by Marshall Swafford

A candidate for the degree of Master of Science

And hereby certify that in their opinion it is worthy of acceptance.



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ASSESSMENT OF REFERENCES TO AGRICULTURE
IN A MIDDLE GRADE SCIENCE TEXTBOOK

Marshall Swafford

Dr. Robert Terry, Jr. Thesis Supervisor

ABSTRACT

Purpose: The central purpose of this study was to assess the degree of bias toward agriculture within a middle grade science textbook. Literary formats used to reference agriculture within the text were also assessed.

Procedure: A content analysis was used to identify all references to agriculture within the textbook. All references were categorized according to the agricultural literacy areas as defined by Frick, Birkenholz, and Machtmes (1995). Subsequently, all text references were then analyzed for bias using the Lowry-Hayakawa news bias categories. Text references were coded as reports, inferences, judgments, and others and were assigned a numerical score based on the assigned code. This allowed an overall bias score of the textbook, in regards to text references to agriculture, to be established.

Findings: A total of 265 references to agriculture were found within the textbook. One hundred fifty-one were text, 82 were pictures/diagrams, ten were unit background information, eight were student activities, eight were assessment components, and six were auxiliary materials. An overall bias score of 1.13 was determined.

Conclusions: The following conclusions were drawn upon completion of this study.

a) Within the examined textbook, science students are exposed to agriculture on average once every three pages. b) Written text, pictures and diagrams are the most common formats used to reference agriculture. c) The agricultural references tend to focus on plants, processing agricultural products, and agriculture's effect on the environment. d) Text references were mostly reports in nature. e) The textbook is generally unbiased in its portrayal of agricultural concepts.

CHAPTER 1

INTRODUCTION

Background and Setting

Agriculture has been and always will be a vital component of American society. American agriculture feeds and clothes millions of Americans as well as residents from other countries (National Research Council, 1988). However, as each generation moves away from the farm, the country loses its ties to production agriculture (Flood & Elliott, 1994). The shift in sociological ideals has led to the consuming public lack of understanding about the importance of agricultural programs (National Research Council). A factor that contributes to the lack of agricultural knowledge by society is that agriculture has not been included in the total educational experience (National Research Council).

The National Research Council (1988) reported that agriculture was not taught in elementary schools and has been isolated in vocational agriculture departments at the secondary level. The National Research Council suggested that:

> Beginning in kindergarten and continuing through twelfth grade, all students should receive some systematic instruction about agriculture. Much of this instruction should be incorporated into existing courses rather than taught in separate courses (p. 2)

Law (1990) proposed that secondary educators in core education areas should teach subjects which are linked to agriculture and can provide context to include agriculture in classroom instruction. Russell, McCracken, & Miller (1990), also suggested that agricultural concepts could be infused into core subjects such as mathematics, reading, science, and social science.

Textbooks play an important role in the notion of including agriculture into core areas. Textbooks have been a standard in classrooms for as long as most citizens in this country can remember (Altbach, 1991). According to Woodward, Elliott and Nagel (1988), textbooks not only contain narrative, but color photographs and graphics, chapter exercises, worksheets and other activities. They also pointed out that teacher's editions with assessments and other content area programs are also typical of current textbooks. They concluded that throughout the elementary and junior high levels, textbooks have taken over the curriculum over the last several decades. Altbach (1991) summarized the importance of textbooks in schools stating, "Even in an age of high technology, the oldest technology in education, the textbook, remains very important." (p. 1)

Today's students are among the largest reading audiences in the world (Altbach, 1991). Textbooks account for at least seventy-five percent of their academic exposure to literature (Altbach, 1991). These textbooks are frequently students' major or only source of information on a particular academic subject or a given topic within a subject area. The inclusion or exclusion of specific content has sparked intense battle among educators with opposing viewpoints (Altbach, 1991).

The role and influence of textbooks in education creates another question. Is there bias in public school textbooks? According to Vitz (1986), the answer is yes. The

exclusion and bias in textbooks is disturbing as taxpayers are providing the funds to purchase books that are found in a system that claims to be committed to impartial knowledge and accuracy (Vitz). Since students gain most of their knowledge from school and textbooks these books need to be as impartial and accurate as possible to disseminate quality information (Altbach, 1991).

Several studies have been conducted researching the use of agriculture as a context to teach science (Balschweid & Thompson, 2002; Hillison, 1996 Thompson, 1998; Thompson & Balschweid, 2000; Thompson & Balschweid, 1999 Warnick & Thompson, 2002; Thompson, & Gummer, 2003; Warnick, Thompson, 2001). These studies indicated that teachers and administrators have positive perceptions about integrating science and agriculture (Warnick Balschweid & Thompson, 2002; Thompson, 1998; Thompson, 2001; Thompson & Balschweid, 1999; Thompson & Balschweid, 2000; Warnick & Thompson, 2002; Thompson, & Gummer, 2003). Furthermore, administrators and teachers both noted that integrating science and agriculture was an effective way to help students meet state standards (Balschweid & Thompson, 2002 & Thompson, 2001), and that students who had completed an integrated agriculture education course were better prepared to succeed in a science course (Thompson & Balschweid, 2000). However, the studies also noted that issues such as funding, equipment, integration techniques, and science teachers' lack of agricultural knowledge were barriers to successful integration (Balschweid & Thompson, 2002; Thompson, 2001; Thompson & Balschweid, 1999; Warnick, Thompson, & Gummer, 2003; Warnick & Thompson, 2002). Likewise, studies exist that describe the bias towards agriculture in news media (Terry, Dunsford & Lacewell, 1996; Whitaker & Dyer, 1998; Whitaker &

Dyer, 2000). However, no research exists describing the references made about agriculture in science textbooks, nor the bias that might exist towards agriculture in those references.

Statement of the Problem

No investigations have been conducted to examine references to agriculture and bias towards agriculture in core academic textbooks.

Statement of Purpose

The purpose of this study was to assess the agricultural references made in a selected middle school science textbook and determine if there is any bias towards agriculture in those references.

Significance of Study

This study was conducted to determine what agriculture concepts middle grade students are exposed to in core area classes. Results of this study will provide information to be used to develop core area textbooks that will be used as context to teach students about agriculture concepts.

Objectives of the Study

The following research objectives were developed to accomplish the purpose:

1. Identify each instance where agriculture is referenced in a selected textbook used for science instruction in the middle grades.
2. Assess the literary formats used in each reference to agriculture in the textbook.
3. Categorize the references to agriculture found the in the textbook according to category of agricultural literacy.
4. Determine what bias, if any, exists in the references to agriculture in the textbook.

Scope of the Study

The scope of the study was all of the agricultural references within the *Glencoe Science Integrated Series: Level Blue Teacher Wraparound Edition* (2003) textbook. The references were categorized according to agricultural literacy and literary format.

Theoretical Base for the Study

The theoretical base for this study was attained from a review of literature. The goal of this review was to examine the need for all students to learn about agriculture, the role textbooks play in education, and the bias toward agriculture in a middle grade general science textbook.

The United States has the lowest per capita food cost of any country in the world (National Research Council, 1988). However, American consumers have little knowledge

about the production of the food products that are consumed everyday (National Research Council). To compound the issue, Hamlin (1962) noted these same people will eventually help create the policies that control the production of food products. Without agricultural knowledge, uneducated decisions will be made which will affect food production, or the decision making power will be placed in the control of a select group of policy makers promoting the agendas of a small class of producers (Wright, 1992).

According to the National Research Council (1988), students should receive some systematic instruction about agriculture. However, a very small percentage of students are actually enrolled in "traditional agriculture courses." Therefore, to reinforce Hamlin's argument, agricultural policy and nutritional choices will be made by individuals who have never had instruction about agriculture. What can be done to change this lack of agricultural knowledge? Law and Pepple (1990) argued that agricultural concepts should be integrated into core area subjects including science, mathematics, social studies, and language arts.

Altbach (1991) noted that textbooks are not only used as a resource by teachers, but have become the curriculum in which educators so heavily rely. Therefore, the use of textbooks is an excellent way to provide context to integrate agricultural concepts into other educational subject areas. Textbook publishers employ a variety of literary formats to provide education about and examples of content area concepts (Deighton, 1971). These same formats can be used to incorporate agricultural concepts into existing textbooks.

It has been documented that agriculture is not immune to bias (Terry, Dunsford & Lacewell, 1996; Whitaker & Dyer, 1998; Whitaker & Dyer, 2000). These researchers

also noted that the news media is often negatively biased in its portrayal of agriculture. Furthermore, it has been noted that bias toward various ideas, religions, and populations, exists in textbooks (Vitz, 1986). But, does bias exist toward agriculture in textbooks? Through extensive literature review, no research was found that examines the previous question. This lack of data does not diminish the value of the question. On the contrary, it begs for data to be gathered to determine if the information disseminated through textbooks about agriculture is portrayed in an objective manner.

In summary, studies have reveled that, American society has a sub-standard knowledge about agricultural concepts. Furthermore, negative bias exists toward agriculture in the public sector. Therefore, to ensure the general public's knowledge of agriculture is adequate and objective, incorporating agricultural concepts in core area textbooks can be an effective format to improve these deficiencies.

Assumptions of the Study

The content analysis portion of this research was conducted under the following assumptions:

1. "Report" sentences are more likely to be perceived as objective rather "inference" or "judgment" sentences.
2. Textbooks are a main source of information to middle grade students.

Limitations of the Study

The following limitations were considered when collecting information for this study:

1. Since only one textbook was used for this study , the results cannot be generalized to the population (all middle grade science textbooks).
2. The average student does not use the narrow definitions of reports, inferences, and judgments that were used in this study.

Definitions

To assure common understanding for the purpose of this study, the following terms were operationally defined:

Agricultural Literacy – "Understanding and possession of knowledge needed to synthesize, analyze, and communicate basic information about agriculture" (Frick, Kahler, & Miller, 1991, p. 49).

Auxiliary Material – Are any written materials that accompany a textbook and include workbooks, worksheets, study questions, and project ideas (Britton, Woodward, & Brinkley, 1993).

Bias – "A mental leaning or inclination; partiality; bent" (Neufeldt & Guralnik, 1988, p. 135).

Inference – "A statement about the unknown based on the known" where a writer or speaker "draws an inference from some set of observable data" (Hayakawa, 1978, p. 24).

Judgment – A statement that contains “expressions of the speaker’s approval or disapproval of the occurrences, persons, or objects he is describing” (Hayakawa, 1978, p. 25).

Middle grades – Educational classes between grades five through eight (National Center for Educational Statistics).

Report – A statement that is “verifiable… exclude as far as possible, inferences, judgments, and the use of ‘loaded’ words” (Hayakawa, 1978, p. 23); can be proven either accurate or inaccurate (Hayakawa, 1978).

CHAPTER II

REVIEW OF LITERATURE

The purpose of this chapter is to present and familiarize the reader with information pertinent to this research topic. Through the presentation of related research, the chapter examines the role and influence of textbooks, content analysis of textbooks, objectivity and bias in textbooks, and agricultural literacy. Literature reviewed included dissertations, papers from conference presentations, articles from professional magazines and journals, books, teaching materials, and other sources.

Textbooks

Role of Textbooks in Education

Textbooks are a type of literature compiled by authors, publishers, specialists, or authorities for use by teachers and students (Johnsen, 1993). They can be hardback or softback, printed, mimeographed, or photographed (Deighton, 1971). However, there is a difference between textbooks and schoolbooks (Johnsen). According to Johnsen textbooks are books written, designed and produced specifically for instructional use. They include exercises, study questions, and practice materials (Deighton). Schoolbooks are books used in instruction but more loosely tied to pedagogical theory (Johnsen).

Textbooks embody the vision of knowledge of identifiable groups of educated people (Altbach, 1991). In many instances, textbooks become the curriculum that education is based on for teachers and students throughout classrooms on a daily basis (Altbach). Wade and Moje (2001) noted that teachers rely on textbooks to structure content, organize lessons, and provide ideas and materials for teaching and assessments. According to Deighton (1971) textbooks are presenters of higher order data such as concepts, rules and other generalizations. Furthermore, Deighton noted textbooks are designed as a written guide to the subject of a course of study.

Uses of Textbooks

According to Wade and Moje (2001) there are two approaches used by teachers and students regarding textbooks: transmission of knowledge and student participation in knowledge construction. The transmission approach tends to be more teacher-centered; where the teacher is actively engaged in lecturing, explaining, asking questions, demonstrating, giving assignments and instructions, monitoring student learning, based on the textbook (Wade & Moje). The participation approach (Wade & Moje) involves students being the active constructors of knowledge and interpretations of texts. Furthermore, the textbooks are used as tools for learning and creating new knowledge, rather repositories of information (Wade & Moje).

Design of Textbooks

To support learning, a well written textbook must be comprehensible to the reader, must represent an excellent curriculum, and support student-centered instruction

(Chambliss & Calfee, 1998). According to Chambliss & Calfee comprehensible textbooks contain structured sentences and paragraphs that create interest for the reader. Furthermore, (Chambliss & Calfee) understandable texts contain linkages that join sentences, paragraphs, and sections into a logical whole which enables a reader to "flow" through the literature, thus increasing comprehension. To represent an excellent curriculum a textbook must address student and society needs and the appropriate domain, or subject-matter (Chambliss & Calfee). Finally, according to Chambliss and Calfee a well-written textbook addresses student-centered learning by including the four elements of effective instruction, designated by the acronym CORE. Chambliss and Calfee proposed:

> Effective instruction *connects* to student knowledge, *organizes* new content for student, provides opportunities for students to *reflect* strategically, and gives students occasions to *extend* what they have learned to new contexts (p.54).

This model is illustrated in Figure 1.

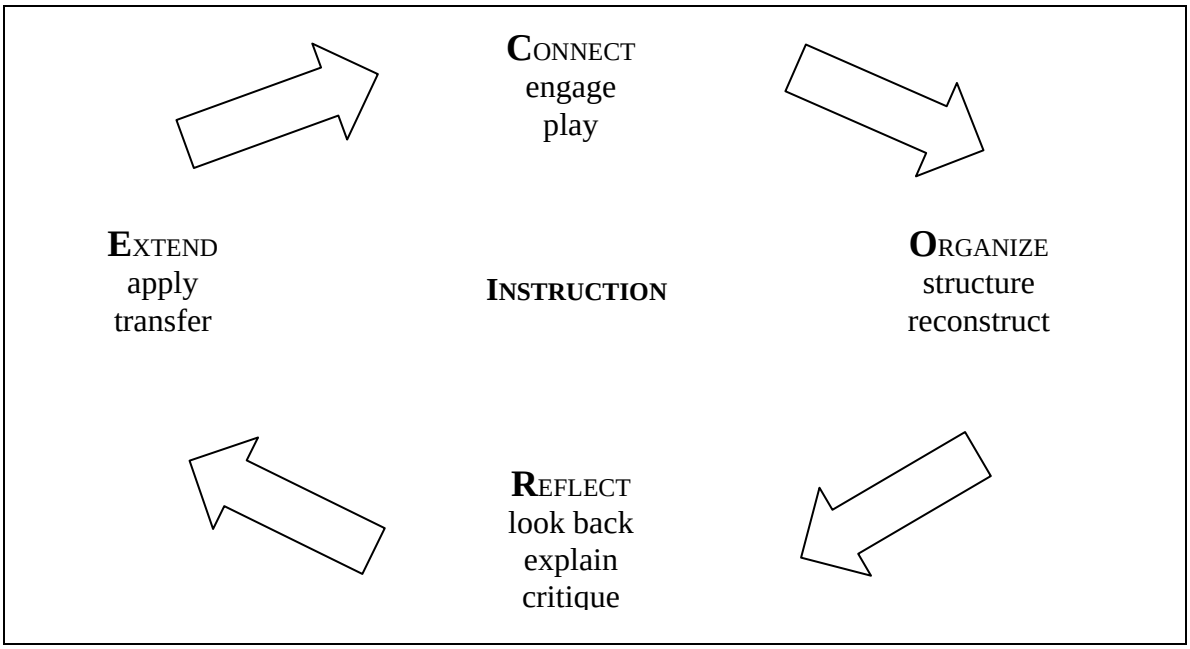

Figure 1. A Model of Student-Centered Instruction. Source: Chambliss and Calfee (1998).

Contemporary textbooks make great use of graphic devices (illustrations) to organize and display relationships of data (Deighton, 1971) and include auxiliary materials to enhance learning (Britton, Woodward, & Brinkley, 1993). Britton, Woodward, & Brinkley argued that illustrations, when used carefully, can serve instructional and just as importantly, motivational purposes. Auxiliary materials are any written materials that accompany a textbook and include workbooks, worksheets, study questions and project ideas (Britton, Woodward, & Brinkley). It was noted (Britton, Woodward, & Brinkley) that auxiliary materials, by their very nature, enhance higher-order thinking skills by requiring the students to use critical thinking, problem solving, creativity skills to complete the assessments.

Content Analysis

Overview of Content Analysis

Content analysis can be defined simply as a method to analyze message content (Budd, Thorp, & Donohew, 1967). The need to define content analysis stems from the idea that researchers need to know the boundaries of the process so that it can be applied and used effectively (Roberts, 1997). Janis stated that content analysis may be defined as:

> …referring to any technique a) for the *classification* of the *sign-vehicles,* b) which relies solely upon the *judgments* of an analyst or group of analysts as to which sign-vehicles fall into which categories, c) on the basis of *explicitly formulated rules,* d) provided that the analyst's judgments are regarded as the reports of a scientific observer (p. 55).

Roberts argued the need for a definition that best combines all definitions of content analysis. Roberts proposed content analysis is "any systematic reduction of a flow of text (or other symbols) to a standard set of statistically manipulable symbols representing the presence, the intensity, or the frequency of some characteristics relevant to social science" (p. 14).

Uses of Content Analysis

Content analysis became more well-known in the early twentieth century when a series of quantitative analyses of newspapers were published (Robson, 1993). Since then, several specific uses of content analysis have been identified and documented (Budd, Thorp, & Donohew, 1967; De Sola Pool, 1959; Holsti, 1969; Roberts, 1997; Robson). Robson documented that content analysis has been used in attempts to assess biases in

school textbooks. Roberts pointed out that content analysis could be used to measure themes in texts such as folk tales, newspapers, letters, and poetry. Holsti and Robson note that content analysis has been used to analyze qualitative interview and questionnaire data. Additionally, attitudes, favorable and unfavorable, can be analyzed in texts and other publications (Robson). De Sola Pool and Roberts suggested that content analysis be used to describe texts through frequencies as well as draw inferences from texts as to their effects. On a broader scope Budd, Thorp, & Donohew suggested content analysis should be used to examine all types of communication, from texts to magazines to advertising.

Methods and Procedures of Content Analysis

As text analysis has become more common place, two basic methods have come to the forefront, conceptual analysis and relational analysis (Palmquist, 2002).

The following is a brief description of the steps included in conceptual analysis (Budd, Thorp, & Donohew, 1967; Neuendorf, 2002; Palmquist, 2002; Robson, 1993):

1. Define the level of analysis - This is verified by determining which word, set of words, or phrases will constitute a concept.
2. Conceptualizations - This involves developing a pre-defined or interactive set of concepts and categories. The researcher must decide whether to code for every single positive or negative word that appears, or only certain ones that the researcher determines are most relevant to the study.

3. Code for existence or frequency of a concept - A decision must be made to record each concept every time it appears (frequency) or only if it simply appears (existence).
4. Distinguish concepts - The researcher must decide whether concepts are to be coded exactly as they appear, or if they can be recorded in some altered or collapsed form.
5. Define coding rules - The researcher must develop a set of rules by which less general concepts will be translated into more general ones.
6. “Irrelevant “information - The researcher must decide what to do with the information in the text that is not code (i.e., “the” and “and”).
7. Test the coding on samples and assess reliability - Include two or coders or observers to read sample text and code accordingly and compare the results of each coder to assess reliability between coders.
8. Code the texts - The researcher reads through the text and records each occurrence of a concept.
9. Carry out the analysis
10. Analyze the results - The researcher examines the data and attempts to draw whatever conclusions and generalizations are possible.

Relational analysis examines the relationships among concepts in a text (Roberts, 1997). The relationships are analyzed for their strength, a positive or negative relationship and their direction, or which concept influences the other (Wise, 2002). Palmquist (2002) identified three subcategories of relational analysis: affect extraction, proximity analysis, and cognitive mapping.

The affect extraction approach attempts to explore the emotional or psychological state of the speaker or writer (Palmquist, 2002). Neuendorf (2002) notes this method is gaining popularity in the area of psychology as it seeks to offer a psychological diagnosis for individuals by analyzing their written or verbal messages. Gottschalk (1995) expanded on this as an individual's written behavior can be analyzed and assigned numeric values which can be statistically tested which can then be used to provide an emotional or psychological diagnosis.

Proximity analysis is concerned with co-occurring or interrelated concepts within the text (Foltz, 1996). To analyze the text a window, or specified length of words, is scanned throughout the text to check for the occurrence of similar concepts (Palmquist, 2002). From this, a concept matrix is developed that is composed of related concepts that may be used to suggest an overall meaning of the text (Foltz).

Cognitive mapping is based on the assumptions that mental models can be drawn from texts to relate concepts (Carley, 1990). This method of research uses content analysis of text to locate patterns of linguistic concepts in messages (Neuendorf, 2002). This can be accomplished by the construction of conceptual networks, which are a set of concepts and the pair wise relationships between them (Palmquist, Carley, & Dale, 1997). From these networks a graphic "map" that represents the relationships between the concepts can be generated (Palmquist, 2002).

Analysis of Bias

Overview of Analysis of Bias

Bias can be defined as simply as, the collective influences of the entire context of a message (Cline, 2005). Bias exists in textbooks (Sargent, 2002; Vitz, 1986) and the news media (Cline, 2005; Rongstad, 2001). These formats are used to disseminate information to various populations. Through these formats, bias towards or against various beliefs, populations, and educational theories have been documented.

Sargent (2002) suggested that textbooks generally contain accurate information about historical events. However, Sargent contends, the manner in which the information is depicted or the lack of page space afforded each topic can lead to distorted understanding by the reader. Cline (2005) asserted that news media are money-making businesses and need customers. Therefore, Cline argued, news must be tilted toward what will draw the most viewers so that the customers (i.e. business advertisers) can reach the largest population possible and, therefore, make a profit.

Religious beliefs are routinely discussed in the media and textbooks (Rongstad, 2001; Sargent, 2002). Sargent (2002) argued that textbooks do not provide the readers with opportunities to draw their own conclusions in regards to religion. Sargent noted that textbook authors and publishers promote freedom of religion while downplaying the idea of freedom from religion. Rongstad (2001) reported that religious left beliefs and ideals are not afforded the same reporting opportunities as the religious right in news media.

Various populations are not exempt from bias either. According to The American Society of Newspaper Editors (2005) African-Americans, Hispanics/Latinos, conservatives, and the poor do not get fair or adequate coverage in news media. These

researchers also noted that white, middle class, citizens receive overly favorable coverage. The research findings of bias toward various human populations were expanded by Baker (1996). Baker argued that the basic educational system is biased against women. Specifically, Baker noted that the science component of education is geared toward the male student and researcher. This, according to Baker, creates a glass ceiling for those females wishing to pursue careers and further education in science.

Omitting various historical events or educational theories is also a form of bias. Stotsky (2004) noted that textbook publishers, especially during state adoption years, do not allow potentially offensive topics be included in history textbooks. Furthermore, Stotsky noted that supplemental materials used in education are also biased. Many of these materials are produced and distributed by various organizations promoting their beliefs and ideals using a biased, rather than objective writing style (Stotsky). According to Calvert (2002) the controversy over creationism versus evolutionary theory is also an area associated with bias. Calvert argued that textbooks simply "teach" that humans are a product of an evolutionary process. Calvert also contended that creationism is not provided at least a mention in textbooks as a theory for students to draw their own conclusions. Therefore, according to Calvert, science textbooks are biased toward evolutionary theory.

Bias in Textbooks

Knowing that bias exists, who influences it in textbooks? Politics have a direct or indirect influence on the material published in textbooks (Donaldson-Evans, 2002). Spring (1991) noted the political conflicts of the twentieth century forced textbook

publishers to avoid topics that might be deemed radical or offensive to any major social group. Vitz (1986) argued that the biases found in textbooks can be attributed to a generally secular and liberal mindset in the leadership of the educational world. Furthermore, pressure groups such as women's organizations, "patriotic" organizations, and religious groups play a role in shaping and influencing the content in textbooks (Shribman, 1989).

According to Vitz (1986), religion, family values, and conservative political and economic positions are common exclusions in textbooks. Snyder (1993) noted, in a study by Vitz, that not one of 40 reviewed social studies textbooks had any text reference to religion in contemporary American life. As documented by Shribman (1989), the "religious right" lobbied to include the doctrine of creationism with the theories of evolution in textbooks. This topic influenced textbook companies to make compromises like providing "evolution supplements" to textbooks or to include disclaimers, which suggest evolution is no more or less valid than other theories about life (DelFattore, 1992).

Bias Toward Agriculture

Studies have been conducted to assess bias towards agriculture in news media (Terry, Dunsford & Lacewell, 1996; Whitaker & Dyer, 1998; Whitaker & Dyer, 2000). The Hayakawa-Lowry (Lowry, 1971) method was used to determine the bias of each article. The conclusions of these articles were similar. Terry, Dunsford and Lacewell (1996) concluded that agriculture receives very little coverage in the three most popular national news magazines, *Newsweek*, *Time*, and *U.S. News and World Report*. According

to Whitaker and Dyer (1998), bias occurred in reporting environmental and food safety issues in news and agricultural magazines, however, it was present to a greater extent in news magazines. These researchers also concluded that articles from agricultural periodicals were more factual and less biased than articles from news periodicals. In addition they found agricultural articles found in *Time* magazine were more likely to be biased than articles found in *Successful Farming* and *Progressive Farmer*. When compared to articles of other subject areas (i.e., government, politics, business), Terry, Dunsford & Lacewell (1996), found that agriculturally based articles were found to be more negatively biased.

Agricultural Literacy

Agricultural Literacy Definitions

In order to understand agricultural literacy one must understand the word literacy. Merriam-Webster Dictionary defines literacy as "1) educated; 2) able to read and write; 3) polished" (p. 433). Therefore, according to Wright (1992), "If literacy is the condition or quality of being literate, and if the definition knowledgeable or educated is used, then literacy is the condition or quality of being knowledgeable or educated" (p. 15).

In *Cultivating Agricultural Literacy: Challenge for the Liberal Arts*, Douglass (1985) attempted to address the concepts that should be included in an agricultural literacy program. The concepts included:

> …a description of the place of agriculture in human history; a philosophical investigation of the purposes of agriculture, with some attention to ethical considerations; and an examination of the links

> between nutrition and human development form the perspective of social science. It also includes a basic introduction to the biochemistry of agroecosystems; a comparative analysis of agricultural technologies, including an assessment of their impacts on ecological and social communities; a description of the institutions of political and economic power that shape agricultural decision in different societies; and a basic treatment of the demographic transition from higher to lower rates of population growth and the roles that the consumption and production of food play in that transition. (p. 18)

Later, the National Research Council (1988) noted that an agriculturally literate person is someone whose "understanding of the food and fiber system includes its history and current economic, social, and environmental significance to all Americans" (p. 1) in addition to "some knowledge of food and fiber production, processing, and domestic and international marketing" (p. 1). This definition was also expanded to include "enough knowledge of nutrition to make informed personal choices about diet and health" (p. 2). The Council (1988) described agriculture as:

> …the production of agricultural commodities, including food, fiber, wood products, horticultural crops, and other plant and animal products. The term also includes the financing, processing, marketing, and distribution of agricultural products; farm production supply and service industries; health, nutrition, and food consumption; the use and conservation of land and water resources; development and maintenance of recreation

> resources; and related economic, sociological, political, environmental, and cultural characteristics of the food and fiber system. (p. vi)

Russell, McCracken, and Miller (1990) expanded upon the Council's (1988) definition to include "historical understanding, social significance, economic contributions, scientific understanding, and awareness and understanding of agricultural careers. Frick and Spotanski (1990) noted that functional agricultural literacy is a minimum level of knowledge a person should have about agriculture. They then explained that "agricultural literacy concerns an understanding of the impact of agriculture on society and on the daily life of individuals as consumers and citizens" (p. 13).

In 1990, researchers linked agricultural literacy to "academic core" areas (Law & Pepple, 1990; Leising, 1990). Law and Pepple (1990) concluded that agricultural literacy can be defined:

> … as the development of the individual in the principles and concepts underlying modern agricultural technology. As defined here, it applies to producing, processing, distributing, marketing, and consuming the products of the food and fiber system. It also includes an awareness of the impact agriculture has on the environment, on society, and on everyday living of the individual. (p.10)

Leising (1990) noted that agricultural literacy is an "opportunity to integrate agricultural knowledge across the curriculum in an effort to create a truly agricultural literate population and motivate more students to pursue agricultural careers" (p. 4).

Other scholars built upon previous definitions or developed a condensed definition. Williams and White (1991) noted that:

> An agriculturally literate person has a basic understanding of the food and fiber system, its history and current economic, social, and environmental significance to all of society. Agricultural literacy also includes enough knowledge of nutrition to enable an individual to make informed personal choices about one's diet and health. (p. 9)

Frick, Kahler, & Miller (1991) attempted to define agricultural literacy and identify those subject areas that fall within the framework of agricultural literacy. Frick, and et. al utilized a Delphi study that included 78 individuals that represented the agriculture industry, elementary and secondary education, and higher education. Their definition of agricultural literacy was:

> 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. Basic agricultural information 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. (p. 52)

Finally, Stewart (as cited in Harris, 1993) attempted to condense previous definitions and concluded that agricultural literacy would include "a working knowledge of the food chain as it relates to the production of food and fiber in our country and to relate the importance of a strong agricultural economy to the national well being of our country." (p. 21)

The Need for Agricultural Literacy

The American society is agriculturally ignorant (Terry & Lawver, 1995). This is not a new idea. When discussing early American settlers, Bricker (1914) noted that American farmers exhausted the soil and lacked the skills needed to feed the population. Harris (1993) pointed out "As agriculture became more efficient it became less important for everyone to understand how to raise crops and livestock" (p. 12). Furthermore, Sorenson (1987) concluded that as the typical American becomes more urban he or she is less likely to have any direct contact with farming or farmers. Douglass (1985) substantiated this when it was stated that the American population has been ninety percent non-farm for over thirty years. Swan and Donaldson (1970) noted "Rank and file Americans do not see farming as one of their most successful industries, which is assuredly is, and oddly they do not consider the unique abundance provided by farms to be a blessing" (p. 283). Ironically, this attitude towards agriculture may stem from the success of American agriculture, Terry (1990) pointed out:

> The tremendous success of our agricultural industry may also be a cause for the public's low appreciation and understanding of the food and fiber

system. People in the United States generally do not have to worry about the supply of high quality, low cost agricultural products. (p. 14)

Pope (1990) argued that "the real need for an agriculturally literate society is knowledge of the impact the industry, as a whole, has upon our daily lives" (p. 23). Mawby (1984, as cited in Harris, 1993) noted that many negative decisions affecting food production can be trace to the policy makers' lack of understanding of agriculture. Brown and Coffey (1992) specified that people need a high level of agricultural literacy as it is "imperative that consumers and government policy-makers alike understand the role of science in agriculture so that they may utilize scientific facts rather than emotions in making decisions concerning food" (p. 169). Lichte and Birkenholz (1993) noted an increased trend in the public's interest in agriculture and food issues. However, according to Lichte and Birkenholz, the public's beliefs, attitudes, and actions are often misinformed or mis-guided. Frick, Birkenholz, and Machtmes (1995a) explained "The notion of agricultural literacy, since its inception, has been based on the premise that every person should possess a minimum level of knowledge of the industry which produces and markets food needed for human survival" (p. 44). Flood and Elliot (1994) suggested a conceptual framework to outline the factors that influence knowledge and attitudes about agriculture. Figure 2 is an illustration of their framework that included three factors: personal characteristics, education, and participation in agricultural activities.

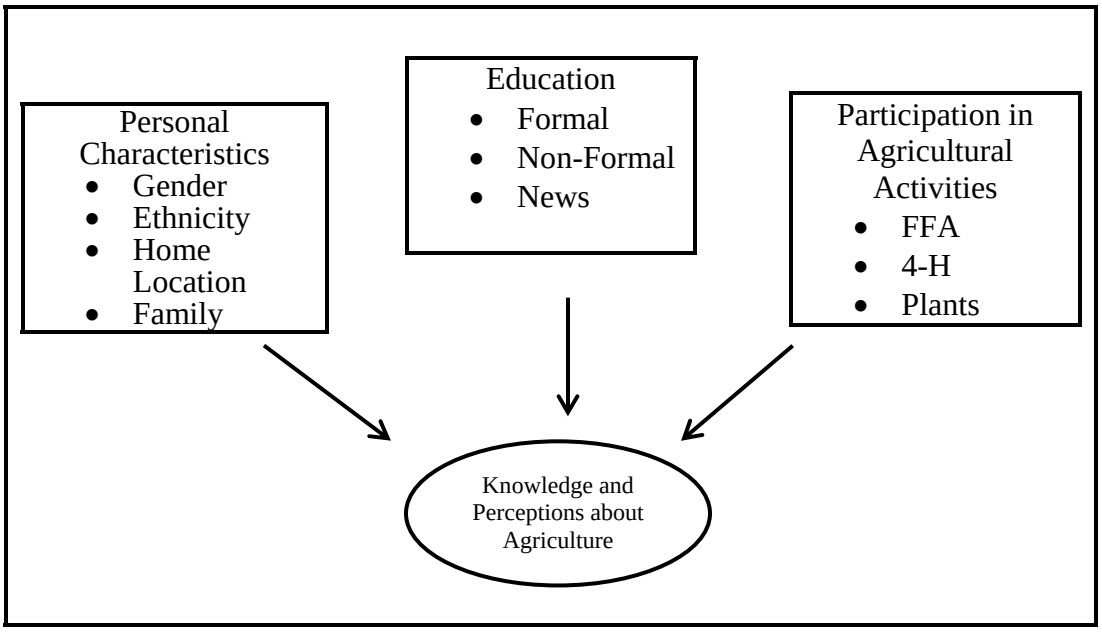

Figure 2. Conceptual Framework for Agricultural Literacy. Source: Flood and Elliot, 1994.

Decisions that are made concerning agriculture policy is another topic for debate among researchers. As early as 1962 the need for the public to be educated about agriculture was documented. Hamlin (1962) summarized the need when he wrote:

> They must accept the fact that the public policy which governs and controls agriculture is policy they make, not policy which farmers make. They must be sufficiently aware of the revolution in agriculture and its implication to approve policies which will sustain and improve agriculture and be fair to the people who engage in it, recognizing that in their blindness they could "kill the goose that laid the golden egg." (p. 58)

Law and Pepple (1990) agreed stating, "America cannot afford the consequences of individuals with little or no agricultural knowledge making policy decisions affecting our food and fiber supply" (p. 10). Mawby (1985) concurred with Law and Pepple when he wrote:

> Few issues are of greater importance to the world than adequate food supplies, proper food use, and knowledge about the components of the agriculture industry. Yet today most people, including those in key positions of public decision-making, do not understand the complexities of America's food system; nor do they fully comprehend its relationships. (p. 7)

Wright, Stewart, and Birkenholz (1994) noted, "A positive knowledge of and perception about agriculture has been suggested as a prerequisite to the development of good policy decisions related to agriculture" (p. 59).

Terry, Dunsford, & Lacewell (1996) stated that the general public needs to be knowledgeable about agriculture "…because of the role citizens play in policy decisions, people need to understand the impact of agriculture upon society, the economy, and the environment" (p. 215). Mawby (1984, as reported in Lichte & Birkenholz, 1993) stated "many bad decisions affecting food production can be traced to a lack of understanding about agriculture on the part of the …people who don't live on farms" (p.15). Further, Tisdale (1991) said "Agriculturally literate people can make personal informed decisions about agriculture related topics such as food safety, genetic engineering and pesticide versus non-pesticide issues" (p. 11). Finally, Williams and White (1991) stated "A basic knowledge of agriculture is especially important where it is the major industry in the state and the lack of agricultural knowledge and experience impedes economic development" (p. 9).

It has been clearly documented that American society needs to be agriculturally literate. However, it has been clearly documented that society is not agriculturally literate. Agricultural education scholars have conducted numerous studies to determine

the agricultural literacy level of various populations including: university educators (Frick & Elliot, 1995), elementary and secondary educators (Harris & Birkenholz, 1996; Igo, Leising, & Frick, 1999; Terry, Herring, & Larke, 1992; Trexler, 2000), adults (Frick, Birkenholz, & Machtmes, 1995a), news reporters (Terry, 1994), university students (Flood & Elliot, 1994; Horn & Vining, 1986; Humphrey, Stewart, & Linhardt, 1994), elementary and secondary students (Frick, Birkenholz, Gardner, & Machtmes, 1995; Leising, Pense, & Igo, 2001; Pense & Leising, 2003; Williams & White, 1991; Wright, Stewart, & Birkenholz, 1994), and 4-H members (Frick, Birkenholz, & Machtmes, 1995b).

In the studies conducted by Harris and Birkenholz (1996), and Humphrey, Stewart, and Linhardt (1994), the researchers found that students who attended schools that offered courses in agriculture education possessed more agricultural knowledge than students who attended schools without agriculture education programs. Additionally, these researchers also noted that highly educated adults displayed more agricultural knowledge, as compared to their less educated contemporaries. Frick, Birkenholz, and Machtmes (1995b) found that 4-H members displayed high overall mean scores in regards to agricultural knowledge.

However, other studies exist that fail to agree with the previous studies' results. Frick, Birkenholz, Gardner, & Machtmes (1995) noted, after a study of agricultural knowledge of that rural and inner-city high school students, there is a significant need to develop programs to increase the agricultural knowledge level of their studied population. Horn and Vining (1986) concluded that the most effective description of student knowledge of agricultural concepts could be best defined by the most common answer on

their survey, “I don’t know.” Furthermore, as a result of their study, Frick, Birkenholz, Gardner, & Machtmes (1995) concluded that enough evidence was gathered that suggests that the general public needs to be further educated about the agricultural industry.

Educational Programs for Increasing Agricultural Literacy

“All students should receive at least some systematic instruction about agriculture beginning in kindergarten or first grade and continuing through twelfth grade” (National Research Council, 1988, p. 10). The Council attributed the need for agricultural instruction to the fact that, “Agriculture is too important a topic to be taught only to the relatively small percentage of students considering careers in agriculture and pursuing vocational agriculture studies” (National Research Council, p. 1). As noted by Terry (1990), the ideas of Davenport (1914), Everett (1985), and Shively (1934) were combined to develop specific objectives for agricultural literacy programs and grew into the following list:

1. Develop an awareness of, and an appreciation for the significance of agriculture, food, and food production.
2. Develop an awareness of the importance of agriculture to the world, nation, state, and local economies, and to the individual.
3. Develop an awareness of the types of jobs available in all phases of agriculture.
4. Develop an awareness of the environment in which agricultural jobs are performed.

5. Develop an awareness that different jobs in agriculture require workers with different talents, abilities, attitudes, characteristics, and education and professional preparation.
6. Provide children with opportunities to develop a positive image of agriculture as a way of life and as a career.
7. Provide opportunities for children to have hands-on experiences, making them aware of the unique satisfaction in different agricultural related jobs.
8. Develop an awareness of the role of agriculture in meeting basic human nutritional, clothing, and shelter needs required for everyday living. (p. 19)

With these concepts in mind, national programs of agricultural literacy have been developed and implemented. In 1981 the Agriculture in the Classroom (AITC) program was established by the United States Department of Agriculture (USDA) to help students develop awareness about agriculture's impact on the economy and society (AITC, 2003). The program was developed from the recommendations of a task force comprised of representatives from the agriculture industry (AITC, 2003). The task force emphasized seven areas of agricultural education: "1) Agriculture and History; 2) The Geography of Agriculture; 3) Agricultural Science and Technology; 4) Agricultural Economics and Society; 5) Agriculture and the World; 6) Careers; and, 7) Agriculture and Public Policy" (Ag in the Classroom Fact Sheet, as quoted in Terry, 1990, p. 28).

The task force recommended that the USDA be the coordinator and help states organize their own programs according to their needs (AITC, 2003). According to Traxler (1990) "each state … is responsible for organization,

funding, public outreach, materials development, and teacher training" (p.9). This practice has lead to some subtle differences between each state. Some employ an all-volunteer force that is responsible for materials distribution and teacher training (AITC, 2003). Some states created nonprofit organizations, which utilize tax-deductible status, to distribute materials (AITC, 2003). Leadership is also varied from state to state. Departments of education, agriculture, or other agencies provide leadership in some states; other states use agriculture organizations or commodity groups; some get leadership through colleges or universities; and in some states one or two dedicated individuals serve as the leaders (AITC, 2003).

Food, Land & People (FLP) is an organization, established in 1988, that is committed to educating people about the interrelationships between agriculture, the environment, and people of the world (FLP, 2003). Food, Land & People provides a science and social science-based curriculum that consists of 55 hands-on lessons that rang in subject matter from "environmental science and stewardship to human populations and land use issues" (FLP, 2003). The lessons are based on a similar framework utilized by Agriculture in the Classroom (FLP, 2003. These topics of instruction include:

1. Awareness and appreciation of food, land and people.
2. Historical perspectives of food, land and people.
3. Agricultural base of food, land and people.
4. Economics of food, land and people
5. Images and attitudes about food, land and people.
6. Decisions about food, land and people.

7. Food, land and people and the future. (FLP, 2003)

Food and Fiber Systems Literacy (FFSL) is a program developed to give core area teachers instructional materials to incorporate agriculture into their classrooms (Leising, 1998). Similar to previous agricultural literacy programs themes were developed to establish a conceptual framework for the program. Different from Agriculture in the Classroom and Food, Land & People, Food and Fiber Systems Literacy only utilizes five thematic areas: 1) Understanding Food and Fiber Systems; 2) History, Geography, and Culture; 3) Science, Technology, and Environment; and 5) Food, Nutrition, and Health (FFSL, 1998).

To ensure that students gain awareness of the agricultural literacy themes, benchmarks were developed to help teachers monitor student learning (FFSL, 1998). As a result of the work done with the Food and Fiber Systems Literacy program Pense and Leising (2003) developed a model for addressing agricultural literacy. The model is shown in Figure 3.

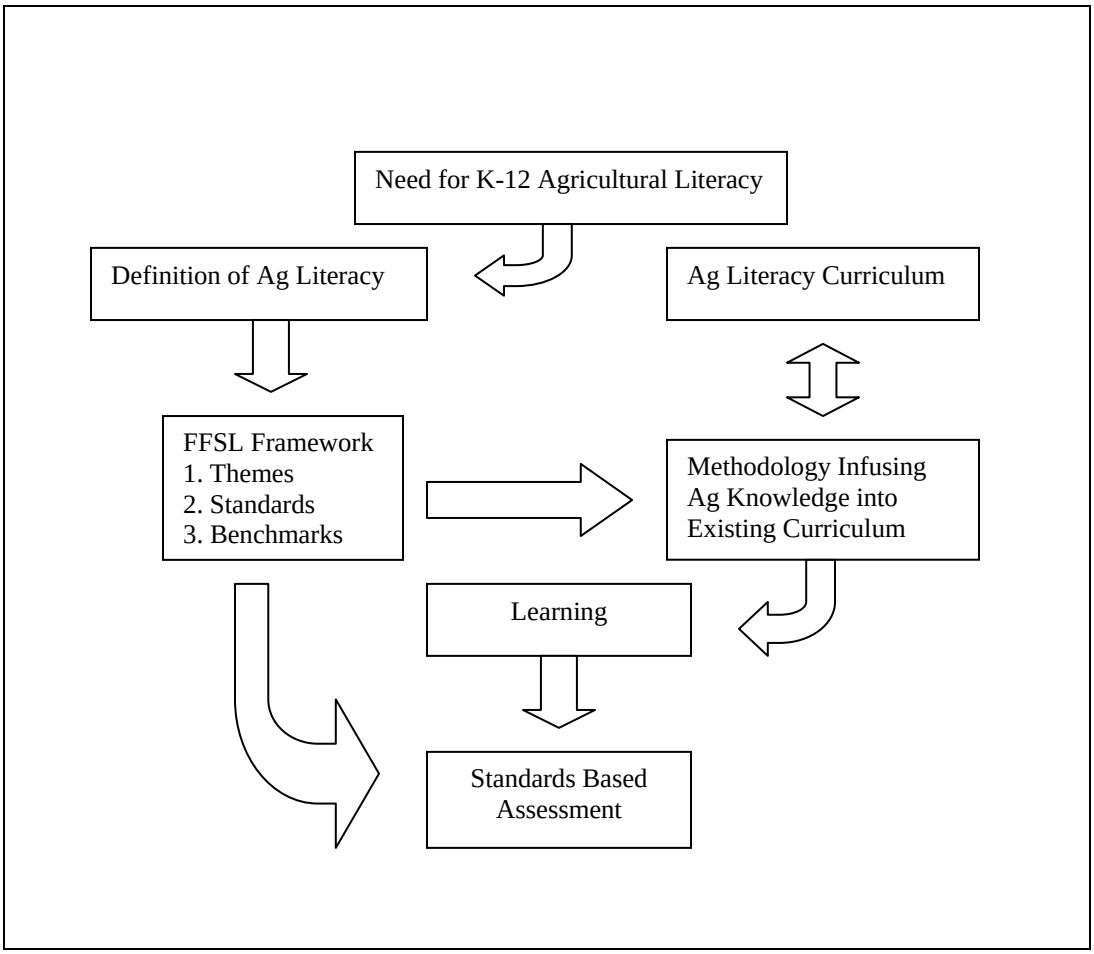

Figure 3. Conceptual model for addressing agricultural literacy. Pense and Leising, 2003

Science as a Context to Teach Agriculture

Mayer and Mayer (1974) stated that agriculture created some of the first interest and the need to understand biology, biochemistry, physiology, meteorology, and physics. Harris (1993) noted that the relationship between science and everyday life helped create an interest in the sciences. Harris built upon this idea when he said that agriculture has a direct relationship with other areas of education and can provide an alternate context to teach concepts within those core academic areas. Furthermore, Law (1990) found that academic areas such as history, social science, science, mathematics, language arts, and

fine arts had relationships to agriculture and would places to incorporate agricultural examples.

Bottoms, Presson, and Johnson (as noted by Harris, 1993) discussed how students have been expected to learn complex concepts in abstract settings. Yet, Harris argued that students learn better if the information is taught in context. Russell, McCracken, and Miller (1990) agreed. They stated that agricultural examples could be used in mathematics, reading, science, and social science. Unfortunately, agriculture has been segregated from traditional core classes in the public school sector (National Research Council, 1988).

However, scholars have made suggestions about how to expose all students to agriculture. Blackburn (1999) noted that student participation in agriculture science fairs would be an opportunity for student to become exposed to agriculture. In 1988 The National Research Council recommended that agriculture could be incorporated into existing curriculum. A realistic way to teach agriculture through science is to introduce modules or units of instruction that supplement or replace current lessons (National Research Council, 1988). Law and Pepple (1990) described a framework utilized by the state of Illinois that describes the role and function of agricultural education in the general education plan for students in that state. In the framework, the agricultural literacy objective could be met incorporating agricultural concepts into the basic subject areas (Law & Pepple). The National Academy of Sciences (2000) suggested that agricultural concepts be promoted by developing a framework which would address the issues yet still be attractive to both teachers and students. Pense and Leising (2003) later developed such a framework.

Summary of Review of Literature

In this review of literature, the underlying concepts of the agriculture literacy were evaluated. Educational textbooks, content analysis, bias, and agricultural literacy were outlined. The role, use, and design of textbooks and the uses and procedures of content analysis were established. An analysis of bias was performed, as well, the areas where bias influences the world we live in were documented. Finally, the definitions of agricultural literacy were examined and the need for an agriculturally literate society and the educational programs used to increase the agricultural knowledge of students were acknowledged.

Textbooks are literature assembled by several sources for educators to use to teach students. This form of compiled information has been used by teachers for several decades. These books have become a self-contained curriculum in which today's schools rely upon heavily. They employ a variety of graphic devices to organize and display ideas, theories, and other information for teachers and students to utilize. Textbooks are used in the transmission of knowledge from teacher to student as well as a resource from which students interpret the information and construct their own ideas.

Content analysis is a technique used to analyze the substance of a message. Content analysis has been used to perform quantitative analyses of newspaper articles, measure themes in stories and letters, and assess bias in school textbooks. Various researchers have documented two basic methods of text analysis, conceptual analysis and relational analysis. Conceptual analysis can be defined as a breakdown of concepts within a selected text. Relational analysis is an examination of the relationships among various concepts in a text.

The abilities for humans to think, feel, and draw personal conclusions about various topics creates decisions that may create bias. Bias occurs in a variety of formats. Textbooks can be biased towards a diverse group of topics such as religion, ideologies, and whole societies or populations. In addition to textbooks, newspapers, magazines, and other forms of media can take on a biased tone towards different concepts, including agriculture.

There always has been and always will be a need for society to have an understanding of agriculture. Agricultural educators have developed a variety of definitions of what agricultural literacy is. However, a basic definition can be derived from the multitude of descriptions of this concept: one who is agriculturally literate should have a basic understanding of the production, processing, distribution, marketing, and consumption of the products of the food and fiber system.

Several programs have been developed to promote agricultural literacy. Education consortiums, governmental agencies, and agricultural organizations have developed a wide array of programs to teach children about agriculture. Food, Land & People, Ag in the Classroom, and Food and Fiber Systems Literacy have been developed and promoted as programs to develop the perceptions and knowledge of agriculture of children. These programs have been designed in such a manner so that they may be modified to fit the needs of students in various educational and geographic settings. Furthermore, these programs were developed so that they may be included in the general curriculum without much modification. They have also been noted to enhance other disciplines while teaching agriculture.

As early as 1974 there was documentation that agriculture created the need to understand biology, biochemistry, physiology, meteorology, and physics. It has also been noted that students need a concrete setting to understand abstract ideas. It has been recognized that theoretical ideas can be taught, successfully, using agricultural examples. This concept has led to the use of agriculture as a context to teach science. However, there is no documentation of any research that has studied the use of core subject areas to teach agricultural concepts.

This review of literature yielded no evidence of research on the exposure of students to agriculture through core subject area textbooks. Furthermore, no research was found that documented any bias toward agriculture in these same textbooks. Therefore, as a result, it was concluded that research was needed to assess the exposure level of agricultural concepts to students within a core area textbook and to determine what bias, if any, existed towards references to agriculture.

CHAPTER III

METHODOLOGY

Introduction

This chapter introduces the basic methodology that was used to achieve the purposes of the study, including the design of the research, procedure to select an appropriate textbook, collection of data, and establishment of validity and reliability. The purpose of this study was to assess the agricultural references made in a middle school science textbook and determine if there is any bias towards agriculture in the text. The objectives were to:

The following objectives were developed to accomplish the purpose:

5. Identify each instance where agriculture is referenced in a selected textbook used for science instruction in the middle grades.
6. Assess the literary formats used in each reference to agriculture in the textbook.
7. Categorize the references to agriculture found the in the textbook according to category of agricultural literacy.
8. Determine what bias, if any, exists in the references to agriculture in the textbook.

Research Design

The research design utilized in this study was content analysis. Content analysis can be applied to examine any piece of writing or occurrence of recorded communication. Additionally, content analysis can be used to detect the existence of propaganda and to identify the intentions, focus or communication trends of an individual (Berelson, 1952).

Case

The science textbook used for this study was *Glencoe Science Integrated Series: Level Blue Teacher Wraparound Edition* (2003) published by Glencoe/McGraw-Hill. The following procedure was used to select this textbook. First, utilizing the Internet, companies that wrote and produced textbooks were identified. Glencoe/McGraw-Hill, Holt, Rinehart and Winston, Kendall/Hunt Publishing, Pearson Education, Thompson/Wadsworth, and Harcourt publishing companies were identified. Second, companies that produced a general science textbook for middle grade students were identified. Glencoe/McGraw-Hill, Holt, Rinehart and Winston, Kendall/Hunt/Hunt Publishing, Pearson Education, and Thompson/Wadsworth met the previous criteria. Kendall/Hunt was eliminated as a possibility because no general science texts were published. Pearson Education and Holt, Rinehart and Winston were eliminated as these companies incorporated a textbook series model as a middle school science text option. Through personal contact with Thompson/Wadsworth publishing company (Beeman, personal communication April 27, 2004) the researcher determined that the market share between the pair of textbooks was inferior to that of the Glencoe/McGraw-Hill textbook. A reserve copy of the text was requested from Glencoe/McGraw-Hill. Michael Oster,

science education representative at Glencoe/McGraw-Hill, was contacted to determine the market share of the *Glencoe Science Integrated Series: Level Blue* textbook. According to Oster (personal communication, April 27, 2004) it is used by 24% of all middle school science students in the United States.

Data Collection

Data regarding text bias were collected using the Hayakawa-Lowry method (Lowry, 1971). S. I. Hayakawa developed a system to categorize incidences of based upon a trichotomy of sentences discussed in *Language in Thought and Action* (Hayakawa, 1978). Hayakawa defined the three basic categories of sentences as reports, inferences and judgments (1978). "Reports adhere to the following rules: first, they are verifiable; second; they exclude as far as possible, inferences, judgments, and the used of 'loaded' words" (Hayakawa, 1978, p.23). According to Hayakawa (1978), an inference "is a statement about the unknown based on the known" where a writer or speaker "draws inference from some set of observable data" (p. 24) Hayakawa (1978) defined judgments as "expressions of the writer's approval or disapproval of the occurrences, person, or objects he is describing." (p. 25)

While conducting a content analysis of television news during the Richard Nixon presidency, Dennis Lowry (1971) expanded on Hayakawa's work. His work developed into the Hayakawa-Lowry News Bias Categories (Lowry, 1971). Later, Lowry (1985) developed more specific definitions of reports, inferences, and judgments. He wrote, "Reports sentences are factual and verifiable … Inference sentences are subjective and are not immediately verifiable," and, "Judgment sentences contain expressions of the

writer's or speaker's favorable or unfavorable opinions about whatever is being described" (Lowry, 1985).

The Hayakawa-Lowry news bias categories are:

1. Report sentence/attributed;
2. Report sentence/unattributed;
3. Inference sentence/labeled;
4. Inference sentence/unlabeled;
5. Judgment sentence/attributed/favorable;
6. Judgment sentence/attributed/unfavorable;
7. Judgment sentence/unattributed/favorable;
8. Judgment sentence/unattributed/unfavorable; and
9. All other sentences.

Lowry, 1985 p. 574

Validity and Reliability

Establishing validity and reliability for this study were done using traditional content analysis methods. Reliability refers to the quality of a measurement method that suggests that the same data would have been collected each time in repeated observations of the same phenomenon (Babbie, 2002). Reliability for this study was established using the aid of check-coders. Check-coders are individuals, in addition to the researcher, who will read, identify, and classify instances of agricultural references (Babbie, 2002). Two check-coders assisted the researcher to identify, and classify all agricultural references.

The check-coders for this study were not randomly selected. They were selected based on various criteria. Check-coder one was a female journalism student. She was chosen to ensure that a female perspective was represented in the study. Furthermore, check-coder one was selected because she did not have an agricultural background, contributing to objectivity in data collection. Additionally, her background ensured a journalistic approach when examining the textbook.

Check-coder two was a female nursing student. She, like check-coder one, was selected to provide female representation in the study. Since objectivity toward agriculture was emphasized, check-coder two was selected because she was reared in a metropolitan area with minimal agricultural experiences. Finally, due to her course of study, check-coder two was able to provide a science perspective when analyzing the textbook.

Validity refers to measure that accurately reflects the concept it is intended to measure (Babbie, 2002). To establish construct validity of the Hayakawa-Lowry news bias categories, Lowry (1985) used a two-part study conducted at Liberty University and Ohio University.

The assumptions underlying the Hayakawa-Lowry category system were twice put to the test, and a group of subjects ranging from college freshmen to Ph.D. professors…for the most part evaluated the news stories and sentences as predicted. Thus, the results strongly suggest that the differences measured by researchers in content analysis studies are differences that do indeed make a meaningful difference to news consumers. (Lowry, 1985, p. 580)

Data Analysis

While conducting a content analysis of *Glencoe Science Integrated Series: Level Blue* (2003) textbook, a frequency count was taken of all references made to agricultural topics. The agricultural literacy topic areas were defined by Frick, Birkenholz, and Machtmes (1995a). The categories include: 1) Societal and Global Significance of Agriculture, 2) Public Policy in Agriculture, 3) Agriculture's Relationship with the Environment and Natural Resources, 4) Plant Science, 5) Animal Science, 6) Processing of Agricultural Products, and 7) Marketing and Distribution of Agricultural Products (Frick, Birkenholz, & Machtmes, 1995a). In addition to being coded according to agricultural literacy topic area, references were categorized according to their literary format. The literary formats used in the textbook included pictures/diagrams, text, student activities, assessment components, auxiliary materials (transparencies), and unit background information for teachers. To achieve Objective 4, each text reference was coded using the Hayakawa-Lowry news bias categories:

1. Report sentence/attributed;
2. Report sentence/unattributed;
3. Inference sentence/labeled;
4. Inference sentence/unlabeled;
5. Judgment sentence/attributed/favorable;
6. Judgment sentence/attributed/unfavorable;
7. Judgment sentence/unattributed/favorable;
8. Judgment sentence/unattributed/unfavorable; and
9. All other sentences.

Lowry, 1985 p. 574

Two “check-coders,” in addition to the researcher, coded the textbook to ensure coder reliability. Prior to coding the textbook, the check-coders were trained by the researcher. The check-coders were educated about the agricultural literacy categories and what topics were included in each. Second, the literary formats that existed within the textbook were described and examples from other textbooks were used to give the check-coders experience identifying them. Finally, the check-coders were trained to code text references using a modified version of the coding manual developed by Lowry. The coding manual can be found in Appendix H. The researcher and each assistant coded all references. The two initial coding sets were compared and all discrepancies were noted. The percent agreement between the check-coders and the researcher can be found in Appendix G. The check-coders and researcher reviewed the discrepancies until a consensus was reached on the code assigned to each reference.

Descriptive statistics were calculated for each variable. To determine a mean score (level of objectivity) for each reference, the researcher valued all report sentences as “1,” all inferences as “2,” and all judgment sentences as “3.” Therefore, according to Hayakawa’s procedures, the higher the mean, the less objective the textbook (more biased). The sentences were group according to their assigned agricultural literacy category and an objectivity mean was calculated for each. The resulting frequencies and corresponding percentages were used to determine the level of bias in order to meet objective 4.

Summary of Methodology

The study of agricultural references and bias in a middle grade science textbook was conducted during the spring and summer of 2004. The case was *Glencoe Science Integrated Series: Level Blue Teacher Wraparound Edition* (2003) published by Glencoe/McGraw-Hill. The teacher edition was used so that all potential references to agriculture could be identified.

A content analysis of the textbook was used to collect the necessary information to complete the study. The textbook was analyzed to determine the exposure level of middle grade science students, using the textbook, to agricultural concepts. The agricultural concept areas were defined by Frick, Birkenholz, and Machtmes (1995a) and include 1) Societal and Global Significance of Agriculture, 2) Public Policy in Agriculture, 3) Agriculture's Relationship with the Environment and Natural Resources, 4) Plant Science, 5) Animal Science, 6) Processing of Agricultural Products, and 7) Marketing and Distribution of Agricultural Products.

In addition to providing a frequency count of agricultural references, the literary formats that were used to display the references were also analyzed. First, all references were categorized according to the agricultural concept areas. Second, the same references were grouped according to the literary formats that were throughout the textbook. The literary formats used included pictures/diagrams, text, student activities, assessment components, auxiliary materials (transparencies), and unit background information for teachers.

Finally, all text references were coded according to sentence type. The sentence types were defined by Hayakawa (1978). These sentence types include reports,

inferences, judgments, and other. Once all text references were assigned to a sentence type a bias score for each sentence could be determined. When all sentences were coded an overall bias score for the text, in regards to agricultural concepts, could be established. The resulting data were compiled and analyzed by the researcher and are presented and discussed in Chapter IV.

CHAPTER IV

ANALYSIS OF DATA

This chapter discusses the findings of the study as they relate to the objectives. The purpose of this study was to assess the agricultural references made in a middle school science textbook and determine if there is any bias towards agriculture in the text. The objectives were to:

The following objectives were developed to accomplish the purpose:

1. Identify each instance where agriculture is referenced in a selected textbook used for science instruction in the middle grades.
2. Assess the literary formats used in each reference to agriculture in the textbook.
3. Categorize the references to agriculture found the in the textbook according to category of agricultural literacy.
4. Determine what bias, if any, exists in the references to agriculture in the textbook.

Findings Related to Objective One

Objective 1 was to identify the instances of references to agriculture in a selected textbook used for science instruction in the middle grades. Two hundred sixty-five agricultural references were identified within the 770 pages of the textbook. These references can be found in Appendices A through F.

Findings Related to Objective Two

Objective 2 was to assess the literary formats used to reference agriculture in the textbook. Of the 265 agricultural references 150 (57.0%) were labeled as text references, 82 (31.0%) were identified as a picture/diagram, ten (4.0%) were classified as unit background information, eight (3.0%) were labeled as student activities, eight (3.0%) were classified as an assessment component, and six (2.0%) were labeled as auxiliary material. These data are illustrated in Table 1.

Table 1

Instances of Agricultural References by Literary Format

Literary Format	Frequency	Percent
Text	151	57.0
Picture/Diagram	82	31.0
Unit background information	10	4.0
Student activity	8	3.0
Assessment Component	8	3.0
Auxiliary Material	6	2.0
Total of all references to agriculture	265	100.0

Findings Related to Objective Three

Objective 3 was to categorize the references to agriculture found the in the textbook according to category of agricultural literacy, as defined by Frick, Birkenholz, and Machtmes (1995a). Of the 265 references 76 (28.7%) were classified as plant science and 72 (27.2%) were processing of agricultural products. Fifty-seven (21.5%) were agriculture's relationship with the environment and natural resources, 38 (14.3%) were societal and global significance of agriculture. Twenty-one (7.9%) were animal science, one (0.4%) was marketing and distribution of agricultural products, and zero (0.0%) were classified as public policy in agriculture. These data are illustrated in Table 2.

Table 3 provides further details regarding Objective 3. Found in Table 3 is each agricultural literacy category and number of agricultural references within each literary format. There were 38 references assigned to the Societal and Global Significance of Agriculture category. Of those references 31 were text, two were picture/diagram, two

were unit background information, one student activity, one assessment component, and one auxiliary material. Fifty-seven references were found in the Agriculture's Relationship with the Environment and Natural Resources category with 42 labeled as text, ten picture/diagram, three were unit background information, and two student activities. The Plant Science Category contained 76 references, forty were text, 24 were picture/diagram, four were unit background information, four student activities, two assessment components, and two auxiliary materials. Twenty-one references were assigned to the Animal Science category. Twelve references were classified as text, five were pictures/diagrams, two assessment components, and two auxiliary material. Of the seventy-two references in the Processing of Agricultural Products category 25 were text, 41 were pictures/diagrams, one unit background information, one was a student activity, three were assessment components, and one auxiliary material. One text reference was found in the Marketing and Distribution of Agricultural Products category.

Table 2

Frequency of Agricultural References According to Agricultural Literacy Categories

Agricultural Literacy Category	Frequency	Percent
Plant science	76	28.7
Processing of agricultural products	72	27.2
Agriculture's relationship with the environment and natural resources	57	21.5
Societal and global significance of agriculture	38	14.3
Animal science	21	7.9
Marketing and distribution of agricultural products	1	0.4
Public policy in agriculture	0	0.0
Total of all agricultural references	265	100.0

Table 3

Literary Format of Agricultural References according to Agricultural Literacy Category

Agricultural Literacy Category	Text	Picture/Diagram	Unit Background Information	Student Activity	Assessment Component	Auxiliary Material	Total
Global Significance	31	2	2	1	1	1	38
Public Policy	0	0	0	0	0	0	0
Relationship with Environment	42	10	3	2	0	0	57
Plant Science	40	24	4	4	2	2	76
Animal Science	12	5	0	0	2	2	21
Processing Products	25	41	1	1	3	1	72
Marketing & Distribution	1	0	0	0	0	0	1
Total	151	82	10	8	8	6	265

Findings Related to Objective Four

To determine an objectivity level, all sentences were coded according to Hayakawa's (Hayakawa, 1978) original categories: reports, inferences, and judgments. Sentences coded as a "report" were given a value of "1." Sentences coded as an "inference" were given a value of "2." Sentences coded as a "judgment" were given a value of "3." Sentences coded as "other" were not considered in this portion of the analysis because they were not in Hayakawa's original categories and were determined to be neutral. In reference to a continuum of objectivity, with a report sentence being more objective than an inference sentence and an inference sentence being more objective than a judgment sentence, the codes were used as numerical values to calculate a mean objectivity to all text references. In considering the objectivity mean for the textbook, a lower mean indicates more objective writing. Equally, a higher mean represents less objective writing.

Table 4 and figure 5 present data regarding the objectivity level of the text within each agricultural literacy category. Thirty-one sentences were classified within the global significance of agriculture category. Seventeen sentences were reports and 14 were inferences, creating an objectivity level of 1.77. There were no sentences noted in the public policy in agriculture category, thus, leaving an objectivity level of 0.00. Agriculture's relationship with the environment contained 42 sentences, all of which were reports; therefore, an objectivity level of 1.00 was determined. A total of 40 sentences were categorized as plant science. Thirty-seven were reports, one was an inference and two were other, consequently, a 1.03 objectivity level was reached. Animal science contained 12 sentences, ten reports, two inferences, and an objectivity level of

1.17. A total of 25 sentences were categorized under processing agricultural processing, 23 reports, and two inferences, leaving an objectivity level of 1.08. There was one sentence classified in the marketing and distribution of agricultural products, therefore an objectivity level of 1.00 was determined. Within the textbook 151 sentences pertaining to agriculture were identified. One hundred thirty were reports, 19 were inferences, and two were others, thus, an objectivity level of 1.13 was reached. This data appears in Table 4.

Table 4

Objectivity Levels for Text References

Agricultural Literacy Category	Frequency of Sentences in Each Hayakawa Bias Category				Total	Objectivity Level (Mean)*
	Report	Inference	Judgment	Other		
Global Significance	17	14	0	0	31	1.77
Public Policy	0	0	0	0	0	0.00
Relationship with Environment	42	0	0	0	42	1.00
Plant Science	37	1	0	2	40	1.03
Animal Science	10	2	0	0	12	1.17
Processing Products	23	2	0	0	25	1.08
Marketing & Distribution	1	0	0	0	1	1.00
Total	130	19	0	2	151	1.13

*Note: 1=report; 2=inference; 3=judgment.

Of the 151 sentences, 130 (86.1%) were reports, 19 (12.6%) were inferences, zero (0.0%) were judgments, and two (1.3%) were other (sentence fragments, questions, etc.). This data appears in figure 5.

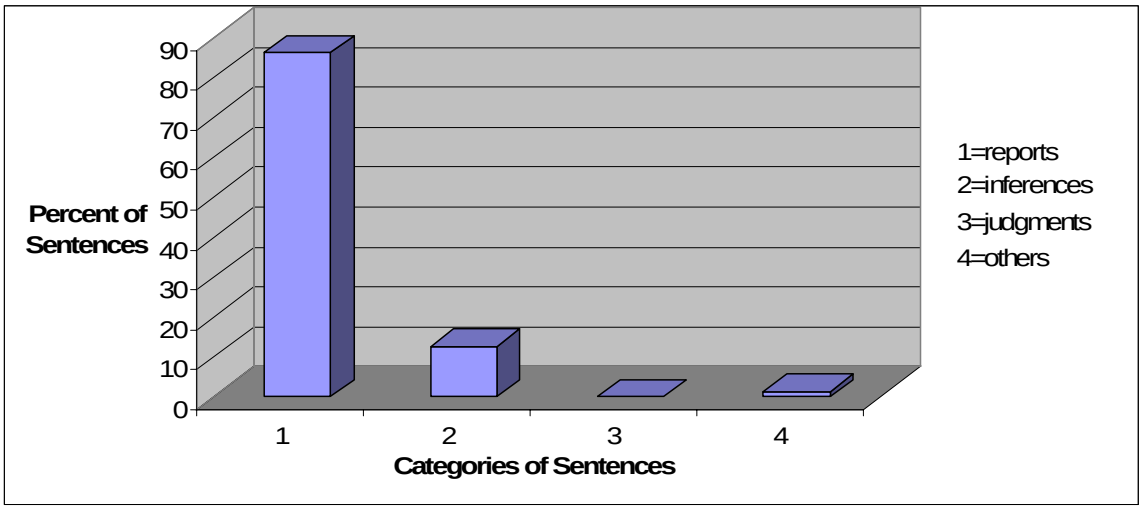

Figure 4. Sentence percentage according to category.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

The purposes of this study were to evaluate a middle grade science textbook with reference to agricultural literacy. The objectives were as follows:

1. Identify the instances of references to agriculture in a selected textbook used for science instruction in the middle grades.
2. Assess the literary formats used to reference agriculture in the textbook.
3. Categorize the references to agriculture found the in the textbook according to category of agricultural literacy.
4. Determine what bias, if any, exists in the references to agriculture in the textbook.

This study implemented a content analysis of the *Glencoe Science Level Blue* (2003) textbook. Two hundred sixty-five references to agriculture were identified in the study. All references were labeled according to Categories of Agricultural Literacy (Frick, Kahler, & Miller, 1991). Additionally, all references were labeled according to their literary format. One hundred fifty-one references were identified as text references and were coded according to the Hayakawa-Lowry news bias categories (Lowry, 1985).

Frequencies and percentages were calculated from the resulting data and used to meet the study's previously mentioned objectives. A summary of the major findings is presented in the following sections.

Findings Related to the Identification of References to Agriculture

Objective 1 was to identify the instances of references to agriculture in a selected textbook used for science instruction in the middle grades.

1. A total of 265 references to agriculture were identified in the textbook.

Findings Related to Literary Formats Used to Reference Agriculture

Objective 2 was to assess the literary formats used to reference agriculture in the textbook.

1. A majority of the agricultural references (57.0 %) were coded as text references.
2. Pictures and diagrams were the formats used for 31.0 % of the agricultural references.
3. Auxiliary materials, assessment components, student activities, and unit background information made up only 12.0 % of all references.

Findings Related to Agricultural Literacy

Categories of Coded References

Objective 3 was to categorize the references to agriculture found the in the textbook according to category of agricultural literacy.

1. An overwhelming majority (70.2 %) of the references were coded in the plant science, processing of agricultural products, societal and global significance of agriculture literacy categories.
2. References coded in the agriculture's relationship with the environment and natural resources literacy category comprised 21.5 % of all references.
3. Only 8.3 % of all references were coded in the animal science, and marketing and distribution of agricultural products literacy categories.
4. There were no references coded in the public policy in agriculture literacy category.

Findings Related to Bias

Objective 4 was to determine what bias, if any, exists in the references to agriculture in the textbook.

1. The majority (86.1 %) of the sentences were report sentences.
2. There were more inference sentences (12.6 %) than judgment sentences (0.0 percent).
3. Text references coded in the global significance of agriculture literacy category were the most biased (1.77 objectivity score).
4. Of the categories that contained text references, the category of agriculture's relationship with the environment and natural resources was the least biased (1.00 objectivity score).
5. The overall objectivity score of all text references was 1.13.

Conclusions

Based on the findings of this study, the following conclusions have been reached:

1. Due to the number of references found, students using the textbook are exposed to agricultural concepts approximately once every three pages.
2. Written text, pictures, and diagrams are the most common formats used to reference agriculture. These formats made up 88% of all references within the textbook.
3. Written text is the most common way to incorporate references to agriculture's relationship with the environment.
4. Plant science is most conveniently referenced through pictures/diagrams.
5. The agricultural references tend to focus on plants, processing agricultural products, and agriculture's effect on the environment, as they made up 70% of the references within the textbook.
6. This textbook is not an effective medium to reference public policy in agriculture concepts.
7. The agricultural text references were mostly report style in nature. Reports made up 86% of all text references.
8. Including agricultural examples may not be appropriate in every topic area within the textbook.
9. As compared to studies that focused on agricultural bias in the news media, the textbook is generally unbiased in its portrayal of agricultural concepts.

Recommendations

The following are general recommendations are based on the findings and conclusions:

1. Agricultural educators should contribute to the development of science text books to ensure accurate and appropriate references to agriculture are included.
2. Agricultural references should be presented in a greater variety of formats including auxiliary materials, student activities, and assessment components.
3. To incorporate agriculture with critical thinking skills, more open-ended assessment questions should be included in the textbook.
4. Perspectives of agriculturists should be included in chapters focusing on biodiversity and conservation of natural resources.
5. Agricultural concepts, such as animal and plant production practices, should be used more frequently as examples to illustrate scientific theories and laws.
6. References to agriculture in science text books should be “reports” in nature to guard against biased statements toward or against agriculture.

Recommendations for Further Research

The following are general recommendations are based on the findings and conclusions:

1. Replicate this study using other middle grade science textbooks so that all texts can be compared.
2. Replicate this study using textbooks from other core education areas such as social science, mathematics, and English/literature.
3. Research should be conducted to investigate the relationships between agricultural references in text books and students' knowledge and perceptions of agriculture.
4. Reevaluate the categories of agricultural literacy most recently proposed by Frick, Birkenholz and Machtmes (1995). From this study it is apparent that one or more categories should be added, specifically food science and technology.

Appendix A

Animal Science References

Reference

1. page 82, text, “During a solar eclipse, many animals act as if it is nighttime”.
2. page 82, text, “Cows return to their barns and chickens go to sleep.”
3. page 170-171, picture/diagram
4. page 213, auxiliary material
5. page 318, picture/diagram
6. page 324, text, “In 1997, it was announced that an adult Finn Dorset sheep had been cloned.”
7. page 324, text, “The new sheep, named Dolly, was the first successfully cloned mammal.”
8. page 324, text, “The real value of Dolly is that scientists now have a better understanding of how cells reproduce.”
9. page 335, picture/diagram
10. page 335, text, “Dairy cattle are bred selectively for the amount of milk that they can produce.
11. page 335, text, “Nearly all breeding of animals is based on their observable traits and is controlled, instead of being random.”
12. page 335, text, “For many years cattle, like the one in Figure 16, have been bred on the basis of how much milk they produced.”
13. page 335, text, “Racehorses are bred according to how fast they run.”
14. page 335, text, “It eventually was learned that in a few generations, breeding closely related animals produced an increased percentage of offspring with the desired traits.”

15. page 340, assessment component, “Selective breeding allows favorable traits of organisms to be passed from one generation to the next. *What trait might these horses have been bred selectively for?*

16. page 340, picture/diagram

17. page 342, assessment component,

    How are specialized breeds of dogs, cats, horses, and other animals produced?

    A) regeneration

    B) asexual reproduction

    C) selective breeding

    D) budding

18. page 346, auxiliary material

19. page 360, picture/diagram

20. page 360, text, “In some mammals, such as horses, these muscles are large.”

21. page 360, text, “They allow a horse to turn its ears toward the source of a sound.”

Appendix B

Agriculture’s Relationship with the Environment

References

Reference

1. page 19, text, “Investigations also take place outside the lab, in streams, farm fields, and other places.”
2. page 274, text, “Manufacturing, mining, transportation, and farming produce chemical wastes.”
3. page 274, unit background information, “Agricultural chemicals build up in our waterways.”
4. page 275, text, “Dioxin is dangerous chemical found in small amounts of herbicides.”
5. page 275, student activity
6. page 331, text, “The environment can affect the expression of traits in every kind of organism, including bacteria, fungi, plants, and animals.”
7. page 380, picture/diagram
8. page 389, text, “The forest has more species and is richer in biodiversity than a wheat field.”
9. page 383, text, “Disease has spread from one grapevine to another in this vineyard.”
10. page 383, text, “Consider what might happen if a disease infects one grapevine in a vineyard…”
11. page 383, text, “The vines grow close together, and a disease could move easily form one plant to the next.”

12. page 383, text, “Many farmers and gardeners have found that planting alternate rows of different crops can help prevent disease and reduce or eliminate the need for pesticides.
13. page 385, text, “By the year 2000, nearly two thirds of the koala’s habitat had been lost to logging, agriculture, cities, and roads.”
14. page 388, text, “Biodiversity can be reduced when a habitat is divided by roads, cities, or farms.
15. page 389, text, “Soil that is contaminated with oil, chemicals, or other pollutants can harm plants or limit plant growth.”
16. page 389, text, “Water-dwelling organisms are easily harmed by pesticides, chemicals, oil, and other pollutants that contaminate the water.
17. page 389, text, “Water pollutants often come from factories, ships, or runoff from roads, lawns, and farms.”
18. page 395, unit background information, “The banning of DDT led to the recovery of some species, including the bald eagle and the brown pelican.”
19. page 397, text, “In the mid-twentieth century, DDT – a pesticide banned in 1972 in the U.S. – was used widely to control insect pests.”
20. page 397, text, “It [DDT] eventually ended up in the food that pelicans ate.”
21. page 397, text, “Because of DDT, the pelican’s eggshells were so thin that they would break before the chick inside was ready to hatch.”
22. page 400, unit background information, “In a common technique called *slash-and-burn* agriculture, land is cleared and trees are burned to produce nutrient rich ash.”

23. page 400, text, “Farmers who live in tropical areas cut the trees to sell the wood and farm the land.”
24. page 400, text, “After a few years, the crops use up the nutrients in the soil and more land must be cleared for farming.”
25. page 400, text, “The logging and mining industries also contribute to the loss of valuable rain forest resources.”
26. page 401, text, “Teach farmers alternative farming methods to decrease the damage to rain forest land.
27. page 401, text, “Farmers who clear land to plant crops are concerned about their daily survival.”
28. page 401, text, “I have ten children and we must eat,” said a farmer from the Ivory Coast, an African nation.
29. page 401, text, “He [Pedro Sanchez] specializes in research to find ecologically beneficial ways to farm tropical soils.”
30. page 401, text, “Soil management provides an exciting challenge to find ways to feed the hungry world.”
31. page 403, picture/diagram
32. page 403, picture/diagram
33. page 403, picture/diagram
34. page 407, student activity
35. page 421, picture/diagram
36. page 421, text, “Rain can wash agricultural pesticides and fertilizers into lakes, streams, or oceans.”

37. page 421, text, “For example, chemical pesticides sprayed on farmland can wash into lakes and streams.”
38. page 423, text, “When a farmer plows a field or a forest is cut down, soil is left bare.”
39. page 423, text, “Contour plowing reduces the downhill flow of water.”
40. page 423, text, “On steep hillsides, flat areas called terraces reduce downhill flow.”
41. page 423, text, “In strip cropping, cover crops are planted between rows to reduce wind erosion.”
42. page 423, text, “In no-till farming, soil is never left bare.”
43. page 423, picture/diagram
44. page 423, picture/diagram
45. page 423, picture/diagram
46. page 423, picture/diagram
47. page 424, text, “They [hazardous wastes] include dangerous chemicals, such as pesticides, oil, and petroleum-based solvents used in industry.”
48. page 429, text, “Ranchers and dairy farmers sometimes used shredded paper instead of straw for bedding in barns and stables.”
49. page 429, picture/diagram
50. page 438, text, “At the time, a pesticide called DDT was being used by farmers to protect their crops from pests.”
51. page 438, text, “Ecologists realized that after farmers sprayed DDT, it was traveling into lakes and rivers and eventually was entering the groundwater.”

52. page 493, text, “Forests…are cleared for mining, roads, buildings, and grazing cattle.”

53. page 529, text, “In the environment, tracers such as phosphorus-32 are injected into the root system of a plant.”

54. page 529, text, “In the plant, the radioactive phosphorus behaves the same as the stable phosphorus would.”

55. page 529, text, “A detector then is used to see how the plant uses phosphorus to grow and reproduce.”

56. page 529, text, “Radioisotopes also can be placed in pesticides and followed to see what impact the pesticide has as it moves through an ecosystem.”

57. page 529, text, “Plants, streams, insects, and animals can be tested to see how far the pesticides travel and how long they last in the ecosystem.”

Appendix C

Plant Science References

Reference

1. page 17, picture/diagram
2. page 32-33, student activity
3. page 32-33, picture/diagram
4. page 75, unit background information, “In Alaska, the growing season is short, but the long hours of summer sunlight are good for the production of oats, barley, potatoes, hay, and cool-climate vegetables.”
5. page 204, text, “Fiber, such as cellulose, is found in the cell walls of plant cells.”
6. page 208, text, “The roots of the wheat take in phosphorus from the soil.”
7. page 280, picture/diagram
8. page 320, auxiliary material
9. page 324, picture/diagram
10. page 324, text, “Gardeners clone plants when they take cuttings of a plant’s stems, leaves, or roots.”
11. page 324, text, They can grow many identical plants from one as shown in …”
12. page 327, picture/diagram
13. page 327, picture/diagram
14. page 327, picture/diagram
15. page 327, picture/diagram
16. page 327, text, “Plants can reproduce sexually.”
17. page 327, text, “How this occurs is different for each plant group.”
18. page 327, text, “But in every case, a sperm and an egg join to create a new cell that eventually becomes a plant.”

19. page 327, text, “It may seem that flowers are just a decoration for many plants, but flowers contain structures for reproducing.”
20. page 327, text, “Male flower parts produce pollen, which contains sperm cells.”
21. page 327, text, “Female flower parts produce eggs.”
22. page 327, text, “In most flowers, rapid changes begin soon after fertilization.”
23. page 327, text, “The cell divides many times and becomes enclosed in a protective seed.”
24. page 327, text, “The petals and most other flower parts fall off.”
25. page 327, text, “A fruit that contains seeds soon develops.”
26. page 329, auxiliary material
27. page 330, picture/diagram
28. page 330, text, “Pea flowers can be purple or white.”
29. page 330, text, “The chromosome pair from a pea plant shows that both chromosomes have an allele for the flower color trait.”
30. page 330, text, “A pea plant with this chromosome pair would have purple flowers.”
31. page 331, text, “For instance, if a pea plant has one purple-flower allele and one white-flower allele or two purple-flower alleles, its flowers will be purple.”
32. page 331, text, “Purple is the dominant flower color in pea plants.”
33. page 332, picture/diagram
34. page 332, text, “Suppose a hybrid purple-flowered pea plant (one with two different alleles fro flower color) is mated with a white-flowered pea plant.”
35. page 332, text, “What color flowers will the offspring have?”

36. page 332, text, “The traits that a new pea plant will inherit depend upon which genes are carried in each plant’s sex cells.”
37. page 332, text, “Because the purple-flowered plant in Figure 14 is a hybrid, half of its sex cells contain the purple-flower allele and half contain the white-flower allele.”
38. page 332, text, “On the other hand, the white-flowered plant is recessive pure.”
39. page 332, text, “The gene pair for flower color has two white alleles.”
40. page 332, text, “In the case of the pea plants, the chance was equal that the new pea plant would receive either the purple-flower allele or the white-flower allele from the hybrid plant.”
41. page 333, unit background information, “The color yellow is dominant in peas, but most of the peas we eat are green.”
42. page 334, text, “Many mutations, such as a four-leaf clover, have a neutral effect.”
43. page 342, assessment component, This photo shows a picture of a spider plant. Why is this plant an example of asexual reproduction? How could the plant reproduce through sexual reproduction?
44. page 342, picture/diagram
45. page 343, assessment component, A pure, purple-flowered pea plant is crossed with a pure, white-flowered pea plant as illustrated below. What flower color trait would be in the sex cells of each plant? What color of flowers will the resulting pea plant have?
46. page 343, picture/diagram

47. page 343, picture/diagram
48. page 359, text, “Plant breeders observe evolution when they use cross-breeding to produce genetic changes in plants.”
49. page 366-367, student activity
50. page 366, picture/diagram
51. page 378, picture/diagram
52. page 382, text, “During the 1970s, plant diseases wiped out much of the corn crop in the United States.”
53. page 382, text, “Plant breeders discovered a small population of wild corn, called maize, growing in Mexico.”
54. page 382, text, “By crossbreeding the wild maize with domestic corn, they developed strains of corn that are resistant to many diseases.”
55. page 382, text, “Crossbreeding with wild plants also has been used to produce disease-resistant wheat and strains of rice that grow well under drought conditions.”
56. page 382, picture/diagram
57. page 383, picture/diagram
58. page 383, unit background information, “George Washington Carver (1865-1943) is best known for helping southern farmers diversify their crops. He helped them understand that growing only one crop could deplete nutrients in the soil, and encouraged growing crops that would add nitrogen to the soil (i.e. peanuts, peas, soybeans).”
59. page 383, student activity

60. page 388, picture/diagram
61. page 398, student activity
62. page 398, picture/diagram
63. page 408, picture/diagram
64. page 408, text, “A new crop of cotton can be grown every year.”
65. page 408, text, “It will take 20 years for these young trees to grow large enough to harvest.”
66. page 423, text, “Fertile topsoil is important to plant growth.”
67. page 449, text, “Water also is transferred into the atmosphere form plant leaves in a process called transpiration.”
68. page 482, picture/diagram
69. page 487, picture/diagram
70. page 548, picture/diagram
71. page 548, text, “Magnesium is found in the chlorophyll of green plants.”
72. page 550, text, “Bacteria in the soil must first change nitrogen gas into substances that can be absorbed through the roots of plants.”
73. page 550, text, “Plants also need phosphorus, so it is one of the nutrients in most fertilizers.”
74. page 550, picture/diagram
75. page 550, text, “Nitrogen and phosphorus are required for healthy green plants.”
76. page 601, unit background information, “Chlorophyll and carotenoids are present in the leaves throughout the growing season.”

Appendix D

Processing of Agricultural Products

References

Reference

1. page 8, student activity
2. page 202, auxiliary material
3. page 202, picture/diagram
4. page 202, picture/diagram
5. page 202, text, “Eggs, milk, cheese, and meat contain complete proteins.”
6. page 202, text, “If you are a vegetarian, you can get all of the essential amino acids by eating a wide variety of protein-rich vegetables, fruits, and grains.
7. page 202, text, “The amount of protein in a food is not the same as the number of calories in the food.”
8. page 202, text, “A taco has nearly the same amount of protein as a slice of pizza, but is usually has about 100 fewer calories.”
9. page 204, text, “However, fruits, honey and milk also contain forms of sugar.”
10. page 204, text, “Starch is found in potatoes and foods made from grains such as pasta.”
11. page 204, text, “Foods like whole-grain breads and cereals, beans, peas, and other vegetables and fruits are good sources of fiber.”
12. page 204, picture/diagram
13. page 205, picture/diagram
14. page 207, picture/diagram
15. page 207, picture/diagram
16. page 207, picture/diagram
17. page 207, picture/diagram

18. page 207, picture/diagram

19. page 207, picture/diagram

20. page 208, text, “Then the mature wheat is harvested and used in bread and cereal.”

21. page 208, picture/diagram

22. page 208, picture/diagram

23. page 208, picture/diagram

24. page 209, picture/diagram

25. page 210, picture/diagram

26. page 215, picture/diagram

27. page 224, picture/diagram

28. page 225, picture/diagram

29. page 226, assessment component

    From which food group should the largest number of servings in your diet come from?

    A) fruit

    B) vegetable

    C) milk, yogurt, and cheese

    D) bread, cereal, rice, and pasta

30. page 226, assessment component

    Which food group contains yogurt and cheese?

    A) dairy

    B) grain

    C) meat

    D) fruit

31. page 256F, unit background information, “Before the causes of diseases were discovered, various methods were used to prevent foods from spoiling. Foods were dried, smoked, pickled, or salted to prevent the growth of microorganisms. Establishment of the germ theory led to the use of chemicals and Pasteur’s idea of the use of heat to destroy pathogens. Additional modern methods of safeguarding food include the use of extreme cold, steam, and radiation.”

32. page 272, picture/diagram

33. page 276, picture/diagram

34. page 278, picture/diagram

35. page 296, picture/diagram

36. page 305, picture/diagram

37. page 310, picture/diagram

38. page 377, picture/diagram

39. page 377, text, “In the 1850s, the first oatmeal mill began operation in the United States.”

40. page 377, text, “But the processing of oats and corn for cereal leaves behind waste products – oat hulls and corncobs.”
41. page 377, text, “In 1922, a cereal company discovered it could do something useful with these waste products.”
42. page 377, text, “The company used oat hulls to make a substance called furfural.”
43. page 377, text, “Today, furfural also is made from corncobs and other cereal waste products.”
44. page 377, text, “Manufacturers use furfural in the production of synthetic rubber, plastic, and nylon – including the nylon that goes into carpets.
45. page 382, text, “If you eat meat or fish, you meals probably include beef, chicken, pork, tuna, shrimp, or clams.”
46. page 382, text, “Rice, peanuts, green beans, strawberries, or carrots are plant foods you might enjoy.”
47. page 382, text, “Furniture and buildings are made from wood and bamboo.”
48. page 382, text, “Fibers from cotton, flax, and wool are woven into clothing.”
49. page 382, text, “Most of the medicines that are used today originally cam from wild plants…”
50. page 408, text, “Cotton cloth is used for rugs, curtains, and clothing.”
51. page 408, text, “Wood is used for furniture, building materials, and paper.”
52. page 427, picture/diagram
53. page 430, picture/diagram

54. page 532, text, “Food irradiation is a process by which spices, gains, seafood, meats, poultry, fruits, and vegetables are treated with ionizing radiation to keep them fresher longer and to eliminate harmful bacteria.”
55. page 547, picture/diagram
56. page 606, picture/diagram
57. page 610, picture/diagram
58. page 612, text, “Many cereal boxes contain the compound butyl hydroxytoluene, BHT.”
59. page 612, text, “The BHT in the packaging material slows the spoiling of the cereal and increases shelf life.”
60. page 614, picture/diagram
61. page 614, text, “The enzymes in meat tenderizer break down protein in meat, making it more tender.”
62. page 620, picture/diagram
63. page 620, assessment component, “What is the role of BHT in these cereal boxes?”
64. page 735, picture/diagram
65. page 738, picture/diagram
66. page 739, picture/diagram
67. page 739, picture/diagram
68. page 740, picture/diagram
69. page 740, picture/diagram
70. page 741, picture/diagram

71. page 741, picture/diagram

72. page 741, picture/diagram

Appendix E

Global Significance of Agriculture

References

Reference

1. page 9, text, “Some other examples of careers that use life science include biologists, zookeepers, botanists, farmers, and beekeepers.”
2. page 66-67, picture/diagram
3. page 67, student activity
4. page 78, unit background information, referring to why schools in the United States are not in session during the summer, “This custom dates back to when the United States was an agrarian society and children were needed to help with farm work in the late spring and summer.”
5. page 97, text, “One calendar, called the *Tzolkin* (tz uhl KIN), was based on the planting, harvesting, drying, and storing of corn – the main crop of the Mayans.”
6. page 97, text, “Just as important, the Mayans used the *Tzolkin* for timing their planting and harvesting.”
7. page 210, text, “Because no naturally occurring food has every nutrient, you need to eat a verity of foods.”
8. page 210, text, “Nutritionists have developed a simple system, called the food pyramid, to help people select foods that supply all the nutrients needed for energy and growth.”
9. page 210, text, “Foods that contain the same type of nutrient belong to a food group.”
10. page 210, text, “Foods have been divided into five groups – bread and cereal, vegetable, fruit, milk, and meat.”

11. page 210, text, “The recommended daily amount for each food group will supply your body with the nutrients it needs for good health.”
12. page 210, text, “Using the food pyramid to make choices when you eat will help you maintain good health.”
13. page 211, text, “Each day you should eat six to eleven servings from the bread and cereal group, three to five servings from the vegetable group, two to four servings from the fruit group, two to three servings from the milk group, and two to three servings from the meat and beans group.”
14. page 211, text, “Only small amounts of fats, oils, and sweets should be consumed.”
15. page 211, text, “…a slice of bread or one ounce of ready-to-eat cereal is a bread- and cereal-group serving.”
16. page 211, text, “One cup of raw leafy vegetables or one-half cup of cooked or chopped raw vegetables make a serving from the vegetable group.”
17. page 211, text, “One medium apple, banana, or orange is a fruit serving.”
18. page 211, text, “A serving from the milk group can be one cup of milk or yogurt.”
19. page 211, text, “Two ounces of cooked lean meat, on-half cup of cooked dry beans, or one egg counts as a serving from the meat and beans group.”
20. page 211, text, “The nutritional facts found on all packaged foods make it easier to make healthful food choices.”
21. page 211, text, “these labels can help you plan meals that supply the daily recommended amounts of nutrients and meet special dietary requirements (for example, a low-fat diet).”

22. page 262, text, “These antibodies usually are from humans but can be from horses or cattle if human antibodies are not available.
23. page 264, unit background information, “The drug streptomycin comes from the mold *Streptomyces griseus*, and was discovered in 1943 after many years of research on soil microorganisms.”
24. page 264, text, “Soil contains many microorganisms – some that are harmful, such as tetanus bacteria, and some that are helpful. Some infections are treated with antibiotics made from bacteria and molds found in the soil.”
25. page 274, text, “Chemicals are everywhere – in your body, the foods you eat, cosmetics, cleaning products, pesticides, fertilizers, and building materials.”
26. page 324, text, “In the past most cloning was done with plants.”
27. page 324, text, “Only since the 1990s has cloning animals become possible.”
28. page 359, text, “Entomologists have noted similar rapid evolution of pesticide-resistant insect species.”
29. page 382, text, “Eating a variety of foods is a good way to stay healthy.”
30. page 382, text, “Hundreds of species help feed the human population all around the world.”
31. page 382, text, “Biodiversity can help improve food crops.”
32. page 484, auxiliary material
33. page 500, assessment component, “How can planting vegetation like the tree shown here help decrease greenhouse gases in the atmosphere?”
34. page 500, picture/diagram

35. page 529, text, “Fertilizers containing small amounts of radioactive isotopes are used to see how well plants absorb fertilizers.”

36. page 529, text, “This technique has been used in many developing countries that are located in arid regions as they search for sources of water.”

37. page 532, text, “The ionizing radiation, even stronger than X rays, kills molds, bacteria, and small insects by destroying their DNA.”

38. page 532, text, “The Centers for Disease Control and Prevention, a U.S. government agency, claims that the process kills bacteria and parasites that cause food-borne disease.”

Appendix F

Marketing & Distribution of Agricultural Products

References

Reference

1. page 377, text, “By the early 1900s, oatmeal was getting some stiff competition from newly invented cold breakfast cereals such as corn flakes.”

Appendix G

Percent Agreement of Categorized References

Between Researcher and Check-Coders

Table 5

Percent Agreement of Categorized References between Researcher and Check-Coders

Agricultural Literacy Category	Researcher	Check-Coder #1	Percent Agreement	Check-Coder #2	Percent Agreement	Total Percent Agreement
Global Significance	37	38	97.4	38	97.4	97.4
Public Policy	0	0	100.0	0	100.0	100.0
Relationship with Environment	57	57	100.0	55	96.5	98.3
Plant Science	74	79	93.7	76	97.4	95.6
Animal Science	21	21	100.0	21	100.0	100.0
Processing Products	72	71	98.6	73	98.6	98.6
Marketing & Distribution	1	0	0.0	0	0.0	0.0
Total	262	266	98.5	263	99.6	99.0

Appendix H

Check-Coder Training Manual

CODING INSTRUCTIONS

for

MIDDLE GRADE SCIENCE TEXTBOOK

The following coding instructional manual is based upon the coding procedures defined by Lowry which was used to determine the bias levels of the 1984 presidential campaign news bias study. When necessary, Lowry's methods were modified to meet the needs of the given study.

Background

The method of this study is content analysis. The content I have coded consists of the Reagan/Mondale/Bush/Ferraro news items contained in a sample of 75 network TV newscasts from the Campaign '84 period (25 newscasts from each network). Your function as a check-coder will be to re-code the political news items in a sample of the 75 newscasts.

The purpose of using check-coders is to obtain a measure of the objectivity or explicitness or reliability (or whatever term you want to use) of my system of content categories and my coding. In other words, were these categories explicitly defined and consistently applied, or were they simply vague, loosely-defined categories that I had in my head and applied inconsistently? This is the question that must be answered.

The Content Categories

The system of categories I have developed is based upon a trichotomy of sentence types discussed by S. I. Hayakawa in Language in Thought and Action (1978, Ch. 3).

According to Hayakawa, the report is the basic symbolic act that enables people to exchange information on what thy have seen, heard, and felt. “Reports adhere to the following rules: first, they are capable of verification; second, they exclude, as far as possible, inferences and judgments.” I have expanded Hayakawa’s trichotomy of reports, inferences and judgments into the system of 21 categories listed on page 3, and it is these 21 categories that you will be using. Thus, you will be placing each sentence in the Regan/Mondale/Bush/Ferraro news items into one, and only one, of the 21 categories, and I will then compare your coding with the coding I have already done. The detailed explanation of each of the categories begins on page 4.

I should point out that the system of categories I am using is only one possible system that might have been used, and probably not the same system you would have chosen if this was your study. Given this restriction, then, the important question is: how well did I operationalize the categories that I did choose to use?

Types of Sentences

1. Report sentence/attributed
2. Report sentence/unattributed

3. Inference sentence/attributed
4. Inference sentence/unattributed

5. Judgment sentence/attributed/favorable to Reagan*
6. Judgment sentence/attributed/favorable to Mondale**
7. Judgment sentence/attributed/favorable to Bush*
8. Judgment sentence/attributed/favorable to Ferraro**

9. Judgment sentence/attributed/unfavorable to Reagan*
10. Judgment sentence/attributed/unfavorable to Mondale**
11. Judgment sentence/attributed/unfavorable to Bush*
12. Judgment sentence/attributed/unfavorable to Ferraro**

13. Judgment sentence/unattributed/favorable to Reagan*
14. Judgment sentence/unattributed/favorable to Mondale**
15. Judgment sentence/unattributed/favorable to Bush*
16. Judgment sentence/unattributed/favorable to Ferraro**

17. Judgment sentence/unattributed/unfavorable to Reagan*
18. Judgment sentence/unattributed/unfavorable to Mondale**
19. Judgment sentence/unattributed/unfavorable to Bush*
20. Judgment sentence/unattributed/unfavorable to Ferraro**

21. All other sentences

* This includes his campaign, the Regan administration, his policies, aids, etc., but does not include statements about the Republicans in general or about Reagan/Bush family members.

** This includes his/her campaign, policies, aids, etc., but does not include statements about the Democrats in general or about Mondale/Ferraro family members.

Category 1 --- Report sentences/attributed

"Reports adhere to the following rules: first, they are capable of verification; second, they exclude, as far as possible, inferences and judgments." A report sentence, then, is one which states verifiable facts --- facts which are out in the open and observable, not things which are matters of personal opinion or inside somebody's head.

Even though the receiver may not always be able to spend the time, money and energy to verify it himself, the important thing is that a report sentence is of such a form that is capable of being verified. On of the tests you, as a coder, should apply to each sentence to determine whether it is a report sentence is: "Is the information in this sentence verifiable?"

Rule 1: A report of an inference someone else is making is still a report sentence/attributed, and should be placed in category 1. (But a report of a judgment sentence someone else is making is a judgment sentence/attributed. See rule 6.)

Rule 2; Attribution can take the form of a direct quote or an indirect quote, and can be to a specific source or a general source (e.g., "Informed sources said…").

Rule 3: A news source's on-air report sentence should be coded as a report sentence/attributed (category 1).

Rule 4: When a correspondent signs on or off (e.g., "Sam Donaldson, ABC News, with the Reagan campaign in California"), this should be coded as a report sentence/attributed (1). The rationale is that the correspondent is reporting about himself in these statements and, by making the sign-off statement on-air, the attribution to himself is implicit even though the normal forms of attribution are not used.

The following are example of report sentences/attributed taken from newscasts you will not be coding:

- President Nixon said today that the nation faces a national crisis in health care. (This illustrates Rule 1. IF the correspondent said, "We are facing a national crisis in health care," this would be an inference on his part. Bust since the correspondent said the president said it, this makes it a report of an inference.)
- Secretary Laird said draft call for the rest of this year will average less than 10,000 a month.
- He said the pas pledges to Thailand will be honored.
- Involved preparations, we are told, would require more time.
  (This illustrates Rule 2. The attribution is not specific here, but the correspondent is pointing out that the information came form someone else; he is not simply making the statement on his own.)

Category 2 --- Report sentences/unattributed

The only difference between category 1 and this category is that report sentences/unattributed are simply straight-forward reports that the correspondent makes without citing someone else as being the source of that statement or information.

Some actual examples:

- It was the 19th visit every by a president of the United States to our contiguous neighbor. (Either it was, or it wasn't.)
- The Mexican president, Gustavo Diaz Ordaz, is retiring in December. (Either he is, or he isn't.)
- President Nixon will fly to Louisville, Kentucky tomorrow for a meeting the 13 governors representing the states of Appalachia. (This is a future event, but it can be safely assumed that the White House released this information and it can be verified.)
- Alexander Herd, the Chancellor of Vanderbilt University, is President Nixon's advisor on student dissent. (Either he is, or he isn't.)
- Secretary of State Rogers is in Tokyo. (Either he is, or he isn't.)
- Members voted to cut the Bureau of Indian Affairs budget by six-and-a-half million dollars. (Either they did, and the figure is correct, they didn't and the figure is not correct.)
- There's been more school desegregation action in the past three days than in the past six months, sing the Administration took office. ("Action" was defined elsewhere in this news item as being law suits; otherwise this would be an inference sentence if "action" could not be verified.)
- After the arrival ceremonies, there was a motorcade into town.
- On his way back to Washington form San Clemente today, President Nixon stopped in Denver to talk to a meeting of law enforcement officials.

Category 3 --- Inference sentences/labeled

Inferences are not capable of verification, at leas not at the time they are made. As Hayakawa defines them, they are "statements about the unknown made on the basis of the known." Some of the characteristics of inferences are:

- They rely on personal or subjective opinions, conclusions, beliefs, feelings
- They attempt to interpret events
- They talk about the implications of an event
- They attempt to make generalizations
- They attempt to make predictions (This refers to predictions the correspondent attempts to make himself, as opposed to (a) reports of up-coming events which can be verified and (b) predictions attributed to someone else.)
- They attempt to tell what a certain event means
- They attempt to evaluate
- They attempt to say what other people think or feel, as opposed to a report of what other people say they think or feel
- They attempt to explain someone's reasons or motives for doing something

Labeled inferences are a particular kind of inference. When the correspondent uses a labeled inference, he is giving his viewer a tip-off that he is using an inference, that what he is reporting has not been confirmed. For example, when the correspondent says, "It appears…," he is saying parenthetically, "It appears (to me)…" While a number of inference words could be considered tip-off words, only the following common ones will be coded as such in this study:

- appear, appears, appeared, apparently, appearing, apparent
- could
- look, looks, looked, looking
- may, maybe
- might
- perhaps, possible
- probable, probably
- seem, seems, seemed, seemingly
- sound, sounds, sounded, sounding
- think (in the sense of "I (the correspondent) think…"

The following are some actual examples of inference sentences/labeled:

- Other classmates recall Richard Nixon as hard-working, driving, serious and somewhat shy, which he certainly did not seem to be today.
- Until this week, presidential decisions seemed to be catering to conservatives on the right.
- Now, in three consecutive days, the White House has concentrated on liberal programs, in what appears to be a concerted effort by the Administration to swing back to the more solid political ground in the middle of the road.

Rule 5 : A news source's on-air inference should be coded as a report sentence/attributed (category 1). The rationale is as follows:

(a) The primary purpose of categories 3 and 4 is to measure inferences that the anchorman and correspondents are making, not inferences made by sources who are being quoted on-air.

(b) If the correspondent spoke those same words, prefaced or followed by the attribution, "he said," the sentence would be coded 1. It can be argued that the network is doing even better by letting people hear the candidate himself, in his own words.

(c) By putting the candidate's own words on-air, this is in effect providing verification --- the best kind of verification – that the candidate did indeed speak those words, The attribution is implicit, even though the correspondent doesn't use the words "he said."

Category 4 --- Inferences sentences/unlabeled

The characteristics of inferences described on the top half the previous page also apply here. In fact, all other inferences made by the correspondent or anchorman (except labeled inferences) are placed in this category. It should be repeated that inferences that are attributed to someone else are considered reports of inferences, and thus, placed in category 1. When you come across an inference you should ask yourself, "Who is making this inference, the correspondent or someone else?"

While thousands of words can be inference words, the following frequently-used words are almost always inferences:

- problem (What is a problem to one person my not be to another.)
- long (What is long to one person may not be long to another.)
- short What is short to one person may not be short to another.)
- big, small several, huge, few (Same as above.)
- only (A unit of X is simply a unit of x; using the "only" indicates that the speaker thinks it should have been more.)
- warned (when used as said) (when someone makes a statement, he makes a statement; whether that statement is a warning depends on how it is perceived.)
- charged, challenged, attacked, accused (when used as said) (Same as above.)
- about (specific numbers can be verified; "about 100" cannot be verified.)
- traditional (What is traditional to one person may not be to another.)
- routine (What is routine to one person may not be to another.)

Some actual examples of inference sentence/unlabeled follow:

- In the course of his remarks he made a statement about he current trial of Charles Manson in the Sharon Tate murder case that surprised those who heard it. (Whether they were surprised is an inference. If the correspondent had said "seemed to surprise," this would have been a labeled inference.)
- The Justice Department gave Georgia only fifteen days in which to come up with a desegregation plan for all of its 194 school systems. (The Justice Department gave Georgia fifteen days, not "only fifteen days.")
- The President is anxious to have the Midway conference interpreted as the beginning of a turning point in Viet Nam negotiations. (Any statement regarding the internal state of an individual, in this case anxiety, must of necessity be an inference, unless that individual has said what his internal state is.)
- Defense Secretary Melvin Laird argued that the one-and-a-half billion dollars spent on the MOL program was not wasted. (Laird said the money was not wasted; whether or not he was arguing can only be an inference.)

Categories 5 -20 were consolidated into four categories to meet the needs of the textbook bias study.

Category 5 --- Judgment sentence/attributed/favorable to agriculture
Category 6 --- Judgment sentence/attributed/unfavorable to agriculture
Category 7 --- Judgment sentence/unattributed/favorable to agriculture
Category 8 --- Judgment sentence/unattributed/unfavorable to agriculture

Judgment sentences, as Hayakawa defines them are "expressions of the writer's approval or disapproval of the occurrences, person, or objects he is describing." In other words, sentences that indicate approval/disapproval, like/dislike, good/ bad, and so on are classified as judgment sentences. When judgment sentences are found, they are further classified as to direction: favorable or unfavorable toward agriculture.

The attributed/unattributed factor is the same as used with report sentences. When favorable or unfavorable judgment is found, is the correspondent making this judgment himself, or is he merely reporting a judgment that someone else made?

Rule 6: A report of a judgment sentence someone else is making should be coded as a judgment sentence/attributed (categories 5 and 6). Note: This contrasts with the handling of reports of inference sentences; see Rule 1.

Rule 7: A news source's on air judgment sentence about [agriculture] should be coded as a judgment sentence/attributed (categories 5 and 6).

Rule 8: A news source's on-air judgment sentence about topics other than [agriculture] should be coded as a report sentence/attributed (category 1).

Rule 9: If the same sentence can be interpreted as either a favorable or unfavorable judgment sentence it should be coded as an unfavorable judgment sentence. (Note: Negative take precedence or positive.) Example: If Mondale says, "This country needs a president who cares for poor people, "this should be coded as an anti-Reagan statement rather than a pro-Mondale statement.

Rule 10: If a sentence contains two or more judgments aimed at [agriculture] only the first negative judgment will be coded. (Note: Negatives take precedence over positive.) If the two or more judgments are all positive or all negative, then only the first judgment in the series will be coded. Rationale: This type of sentence will be extremely rare and will have no significant effect upon the outcome of the study. The benefit of this rule is that it prevents the possibility of double-coding; each sentence will be placed in only one category.

Some examples of judgment sentences:

- The policies of the Reagan administration have been a disaster.
- Reagan favors the rich, but doesn't care about the poor.
- He showed his usual lackluster speaking style today.
- If I had a record like his, I wouldn't say much on this issue.

- His policies are based upon voodoo economics.
- He's too old to be president for another four years.
- Her foreign policy experience is minimal at best.

Category 10 --- All other sentences

This is simply a catch-all category that includes:

- rhetorical questions which the correspondent asks and then goes on to answer, e.g., "Why?"
- on-air questions asked by reporters or others (Note: Sometimes these "questions" during Q and A format are in the form of a declarative sentence rather than a question per se. However, they serve the function of a question in that the interviewee is expected to respond to them.)
- sentences which for other reasons do not fit one of the other 9 categories

The following rules should be used to classify those sentences which are "mixed" sentences:

Rule 11: If a sentence contains both a report/attributed and a report/unattributed, it should be coded as a Report sentence/unattributed.

Rule 12: If a sentence contains both statements of fact and inference, it should be coded as an inference sentence.

Rule 13: If a sentence contains both statements of fact and judgment, it should be coded as a judgment sentence.

Rule 14: If a sentence contains both an unlabeled inference and a labeled inference, it should be coded as an Inference sentence/unlabeled.

Rule 15: If a sentence contains both an inference and a judgment, or all three types of sentences, it should be coded as a judgment sentence.

Thus, the general principle in handling "mixed" sentences is that they should be placed in the highest-numbered appropriate category.

Some general suggestions

- Each sentence must be read in full before you code it. Frequently a sentence would be placed in one category based upon something said in the first part, but a single, word, phrase or quote at the end will require its being placed in another category.
- First decide the overall category of the sentence --- report, inference or judgment --- and then decide which sub-category.

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