Science Curricula Codebook

This codebook is designed to instruct raters how to code science textbooks and curriculum programs. Each variable is defined below based on its use in this study and corresponds to the associated **Science Curricula Code-Sheet**.

Objective:
This study's purpose is to examine the content of current upper elementary U.S. adopted science textbooks and curriculum programs to determine the extent that agricultural literacy concepts are presented to students in primary education. According to McReynolds (1985), "[t]he earlier in life that we present information [about agriculture] to children, the more receptive they are to accepting and applying wholesome concepts about the topic for the rest of their lives" (p. 17) as consumers and students. This content analysis of the most widely adopted basal science textbooks and modular curriculum programs explored the following research questions:

    (1) To what degree are accepted agricultural literacy concepts embedded in upper elementary science textbooks and curriculum programs?
    (2) What role does agricultural literacy play within the upper elementary science curricula?

Definitions:
Curriculum, in this investigation, is identified as having a scope and sequence of learning activities designed around a science topic. Traditional basal textbooks and curriculum programs or kits not centered on textbooks, such as FOSS and DSM, are included in the study.

A list of agricultural topics, themes, and concepts was generated using the *A Guide to Food and Fiber Systems Literacy [henceforth, FFSL]* (Leising et al., 1998), *A Framework for K-12 Science Education [henceforth, Framework]* (NRC, 2012), and was loosely framed around Frick and colleague's (1991) "11 broad agricultural subject areas" (p. 54) (see Table 1 below).

Table 1. *Code-Sheet Categories Framed Around Frick et al.'s (1991) Subject Areas*

Frick, Kahler, & Miller (1991) Subject Areas	Code-Sheet Overarching Categories
The processing of agricultural products	General Agriculture
Public agricultural policies	General Agriculture
Societal significance of agriculture	General Agriculture
Economic impact of agriculture	General Agriculture
The marketing of agricultural products	General Agriculture
The distribution of agricultural products	General Agriculture
The global significance of agriculture	General Agriculture
The processing of agricultural products	Food & Nutrition
Production of animal products	Livestock, Meat, & Poultry; Dairy; Fiber; Work Animals & Machines
Production of plant products	Plants, Agronomy, & Horticulture; Fiber
Agriculture's important relationship with natural resources	Land & Natural Resources
Agriculture's important relationship with the environment	Environment & Sustainability Agriscience & Biotechnology

Note. Adapted from "A Definition and the Concepts of Agricultural Literacy," by M. Frick, A. Kahler, & W. Miller, W., 1991, *Journal of Agricultural Education*, 32, p. 54.

The *FFSL* was developed and extensively tested over the period of four years to address the need for a guiding U.S. framework for agricultural literacy in K-12 education; however, it has not been updated to include changes experienced over the past decade. Therefore, additional concepts related to biotechnology and the future of agricultural science were added to align to agricultural topics included in the *Framework.* Overarching agricultural categories and their subsequent topics, themes, and concepts are listed on the code-sheet and were used to determine to what degree agricultural literacy concepts are embedded upper elementary science textbooks and curriculum programs.

Materials will also be reviewed to examine the role in which agricultural concepts are presented. To understand how agricultural literacy is incorporated into upper elementary science curricula, the materials will be coded to include whether each concept is introduced to: 1) provide content knowledge, 2) teach a related skill, or 3) influence an attitude or change a belief.

The definitions of knowledge, skills, and attitudes/beliefs were derived from Merriam-Webster's dictionary and Bloom's taxonomy of learning domains. The taxonomy was designed for "classifying statements of what we expect or intend students to learn as a result of instruction" (Krathwohl, 2002, p. 212) and can be helpful here in understanding how elementary science textbooks and curriculum programs are presenting agricultural concepts. The Association of Schools of Public Health [ASPH] (2012, 2013) used the taxonomy to design several guiding documents for faculty and curriculum developers that offered levels for developing competencies and learning while providing examples of each as they related to public health. Since these are competencies ASPH believes students should gain in public health curricula and not materials presented directly to students, it is not anticipated that science textbooks and curriculum programs in this study will include such comprehensive illustrations. However, ASPH's examples can still be used to demonstrate how knowledge, skills, and attitudes/beliefs may be presented. Text examples provided were taken from this study's pilot.

	Knowledge	Skills	Attitudes/Beliefs
Definitions	• complex process of learning concepts, principles, and information, and remembering, relating, and judging ideas or abstract phenomenon[1] • the fact or condition of knowing something with familiarity gained through experience or association; acquaintance with or understanding of a science, art, or technique[2]	• proficient manual, verbal or mental manipulation of data or things that allow for the execution of well-specified tasks that refer to the ability of using knowledge and applying it in a context[1] • the ability to use one's knowledge effectively and readily in execution or performance; a learned power of doing something competently : a developed aptitude or ability[2]	• a state of mind, feelings, or beliefs about a particular matter[1] • a mental position with regard to a fact or state; a feeling or emotion toward a fact or state[2] • conviction of the truth of some statement or the reality of some being or phenomenon especially when based on examination of evidence[2]
Action Verbs[3]	analyze, categorize, classify, compare, deliver, describe, differentiate, discuss, distinguish, explain, generate, identify, interpret, justify, prioritize, recall, recognize, summarize, understand, use, verify	act, adapt, analyze, apply, assess, categorize, clarify, communicate, compare, compose, construct, cooperate, create, demonstrate, detect, develop, differentiate, distinguish, document, employ, encourage, evaluate, express, implement, maintain, manage, organize, participate, prepare, prioritize, propose, recommend, respond to, select, use, utilize	active listener, adhere to, adopt, appreciate, assume responsibility, assure, be conscientious, be ethical, demonstrate composure, develop, endorse, express, justify, maintain awareness, maintain empathy, participate, recognize, resolve, respect, value, willing

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[1] Adapted from "Knowledge, Skills, and Attitudes (KSAs) for the Public Health Preparedness and Response Core Competency Model," by CDC, 2012, p. 25.
[2] Taken from www.merriam-webster.com.
[3] Adapted from "Learning Taxonomy Levels for Developing Competencies and Learning Outcomes," by ASPH, 2013, pp. 1-2.

	Knowledge	Skills	Attitudes/Beliefs
ASPH Examples[4]	• Recognize emergency conditions and the resulting problems. • Summarize the means, methods, and processes for solving the problems. • Explain how different personality types impact performance during emergency situations. • Recognize the ethical and moral implications of decisions made through a chain of command.	• Evaluate the level of hazard or risk. • Prioritize problems based on level of hazard and degree of risk. • Analyze dysfunctions within a public health emergency response system. • Assess information, resources and procedures necessary to address the problems in emergency situations.	• Assure responsibility for responding when needed in the event of a public health emergency. • Assume responsibility for taking specific actions that further organizational mission or population health in the presence of a public health emergency. • Maintain awareness of one's own tolerance for risk.
Text Examples	A text discussed the use of ethanol as an alternate, renewable energy source, only in a section highlighting a chemist whose specialty was studying fuel cells.	A curriculum program identified organic agricultural production when considering the reduction of pollution and how students could participate, but did not define it or mention how it reduced pollution.	A text promoted the negative attitude that farming practices, such as land clearing and plowing, as human environmental manipulations that cause habitat and ecosystem destruction.

Below are examples of knowledge, skills, and attitudes/beliefs presented by the *Framework's* companion document *Next Generation Science Standards* (2013) and *FFSL* that will also guide the content analysis of the materials in this study.

	Knowledge	Skills	Attitudes/Beliefs
***Framework*[5]**	• Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space.	• Obtain and combine information about ways individual communities can use science ideas to protect the Earth's resources and environment.	• Individuals and communities are doing things to help protect Earth's resources and environments.
***FFSL*[6]**	• Students will identify major agricultural commodities produced in their state. • Students will analyze how early inhabitants mostly relied on hunting and gathering	• Students will compare commodity output at state and national levels. • Students will trace the origins of food, fiber, and natural resources early European explorers traded	• Students will explain the need for government regulation in agriculture. • Students will discuss how the desire to obtain exotic foods… motivated European exploration.

How to Code the Materials:
To code the textbooks and curriculum programs using the preceding definitions, each time a topic, theme, or concept appears on a page in the materials, it should be circled and then entered on the code-sheet in the column of the role in which it appears (i.e., knowledge, skill, or attitude/belief). A star (*) should be placed next to any page number that serves as a particularly good example of the role that can be used as an example in the study's findings. Any time a topic appears more than one time on a page, it should be recorded only one time unless it appears in more than one context (presenting content knowledge and teaching a skill, for instance), then each context should be recorded individually.

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[4] Taken from "Knowledge, Skills, and Attitudes (KSAs) for the Public Health Preparedness and Response Core Competency Model," by CDC, 2012, pp. 8-18.

[5] Taken from "Next Generation Science Standards," Achieve, Inc., 2013, www.nextgenscience.org/5-ess3-1-earth-and-human-activity.
[6] Taken from "A Guide to Food and Fiber Systems Literacy," J. Leising, C. Igo, A. Heald, D. Hubert, & J. Yamamoto, 1998, pp. 36-44.

Terms that are specific representations of a concept, such as dog (type of animal), butterfly (an insect), mushroom (a fungus), or kudzu (a plant) that appear in the materials should be coded as the concept they represent. If a similar representation appears on the same page, such as wolf as well as dog, animal should only be counted one time (unless, of course, they are presented in different contexts).

Tables of contents, glossaries, vocabulary insets, chapter overviews and end-of-chapter review quizzes, and supplemental guides or references (e.g., Harcourt's "Health Handbook") will not be included in this analysis (see examples below taken from *Scott Foresman Science* grade 4).
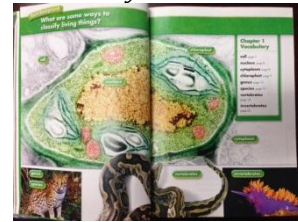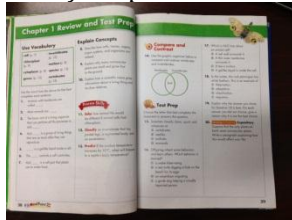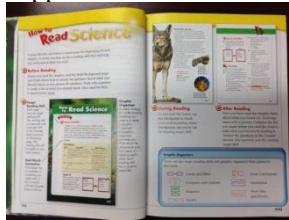
Table of Contents
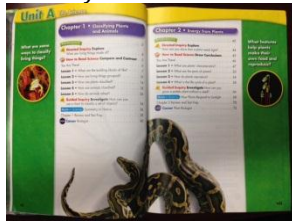
Glossary
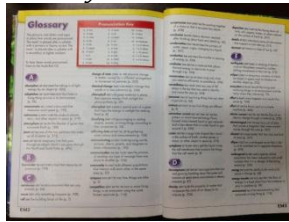
Vocabulary Inset

End-of-Chapter Review

Supplemental Guide

When the entire text or program has been analyzed, the total number of knowledge, skills, and attitudes/beliefs will be placed in the far right column.

In this study's pilot, textbooks and curriculum programs often presented knowledge in chapter content, reading passages, and examples that demonstrate scientific ideas. Skills were presented in form of critical thinking questions, activities, and investigations students were assigned, while attitudes/beliefs were often presented in supplemental reading passages. While this was the trend found in the pilot, it is not guaranteed that examples of knowledge, skills, or attitudes/beliefs about the attached concepts will be presented in this study accordingly.

Basic Coding Information:
At the top of each code-sheet is a section to identify the coder and material being analyzed to keep the information organized.
1. **Coder** – Identification of individual responsible for coding the advertisement

2. **Text or Program Title** – Title of the textbook or curricula modular program

3. **Author(s) or Publisher** – The author and/or publisher of the textbook or modular program.

4. **Date Published** – The date the textbook or modular program was published

5. **Grade Level** – Most textbooks are designed for a specific grade level. However, some modular programs are designed to include more than one grade level (e.g., FOSS groups grades 3 and 4 together, and 5 and 6 together).

Agricultural Concepts:
The concepts collected from the *Framework* (2012) and *FFSL* (1998) are listed on the attached Code-Sheet. Please use a new code-sheet for each text or curriculum program.