

A DEFINITION AND THE CONCEPTS OF AGRICULTURAL LITERACY

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The virtues of education about agriculture have gained considerable attention since the release of the National Academy of Science (NAS) agricultural education report entitled, "Understanding Agriculture - New Directions for Education" (1988). The Committee of Agricultural Education in Secondary Schools felt that "agriculture was too important a topic to be taught to only a relatively small percentage of students considering careers in agriculture and pursuing vocational agriculture studies" (1988, p. v). The publication recommended that agricultural education go beyond the scope and content of traditional programs. Thus, the committee developed the idea of "agricultural literacy" – the goal of education about agriculture.

The NAS committee (1988) provided their definitions of an agriculturally literate person to illustrate what the construct of agricultural literacy means. Two definitions of agricultural literacy were furnished: the first was found in the preface and consumed thirteen lines; a shorter version was found in Chapter 1. Before the NAS report, one other definition of agricultural literacy had been presented (Douglass, 1984).

Although the NAS committee has furnished its definitions of agricultural literacy, the substantive nature of the term has not yet been established. Stewart (1989) recommended that the profession devise an operational definition of agricultural literacy. Russell, Miller, and McCracken (1990) echoed Stewart's contention when they asked "How much of what information is needed to achieve agricultural literacy?"

The NAS Committee (1988) recommended that 1) the subject matter of instruction in and about agriculture be broadened and 2) beginning in kindergarten and continuing through twelfth grade, all students receive some systematic instruction about agriculture. It also suggested that colleges of agriculture, particularly in land-grant universities, become more involved in curriculum reform and the development of instructional materials and media. To facilitate systematic instruction, curriculum reform, and the development of instructional materials and media, the definition, subject areas, and concepts constituting an agricultural literacy curriculum need to be determined. Providing a consensus definition and identifying the concepts constituting agricultural literacy can expedite the development of effective educational strategies.

The lack of education about agriculture and the implications of such a lack were noted years before the NAS study was released. Mayer and Mayer (1974, p. 84) stated that "The failure of our secondary schools and liberal arts colleges to teach even rudimentary courses on agriculture means that an enormous majority, even among well-educated Americans, are totally ignorant of an area of knowledge basic to their daily style of life; to their family economics, and indeed to their survival." Little (1987) stressed the importance of making agricultural courses mandatory for students at the high school and college levels. He believed agriculture, like physics, zoology, and geology, was worthy of scientific study for its own sake.

Only one research effort has been conducted to assess students' knowledge of agriculture. Horn and Vining's 1986 finding that less than 30 percent of a sample of 2,000 Kansas students could give correct answers to basic agricultural questions indicates the magnitude and seriousness of the task before us.

Purpose and Objectives

The purpose of this investigation was to develop a document that could provide educators with the agricultural concepts that every U.S. citizen should know. The study was concerned with three primary objectives:

1. To refine a group definition of agricultural literacy.
2. To identify those subject areas falling within the framework of agricultural literacy.
3. To identify those agricultural concepts that every U.S. citizen should know.

Procedures

The investigation entailed the solicitation of opinion regarding the study's objectives from nominated panelists. The Delphi technique was selected as the main method of inquiry. A questionnaire was subsequently developed from the initial use of this technique. According to Helmer, variants of the Delphi can be applied to all phases of educational planning, including curriculum reform (1966, p. 6). Regarding the use of the Delphi in determining curriculum content, Finch and Crunkilton noted that "Obviously, this technique would be of much value when persons desire to reach consensus regarding the content of a particular curriculum" (1979, p. 132).

Selection of Delphi Panelists

After the literature and related research had been reviewed, a letter requesting a minimum of three nominees to the Delphi panel was sent to faculty members of agricultural education departments at land-grant universities. The letter asked that nominees possess an interest in agricultural literacy, have the time to devote to the study as estimated by the nominator, and not be faculty members of any agricultural education department. The total number of individuals nominated by 48 agricultural education faculty members was 147. Table 1 represents the participation of panelists by state. Of the 147 nominated, 100 initially agreed to participate in the study. The demographic data collected from 67 panelists indicated that 30% of the panelists represented agricultural industry, 34% represented elementary and secondary education, 36% represented higher education. The panel consisted of 59 males (88%), 7 females (10%) and one nonrespondent. From the initial 100 panelists, two asked to be removed from the panel because of other commitments.

Instrument Development: Two questionnaires were developed and employed. The design of the first questionnaire was based on the recommendation by Stewart (1989) that an operational definition of agricultural literacy is needed before undertaking agricultural literacy initiatives. The first questionnaire asked panelists to submit their definition of agricultural literacy. Quantitative content analysis was conducted on 78 definitions to form a definition upon which consensus was arrived. Besides providing a behavioral definition of agricultural literacy, the consensus definition identified 11 broad agricultural subject areas constituting the framework of agricultural literacy.

The design of the second questionnaire was based on the 11 agricultural subject areas identified in the consensus definition. These subject areas accompanied the second questionnaire sent to the panelists. Although the subject areas are a result of questionnaire one, they are reported here since they were the subject of the second questionnaire. These areas were 1) agriculture's important relationship with the environment, 2) processing of agricultural products, 3) public agricultural policies, 4) agriculture's important relationship with natural resources, 5) production of animal products, 6) societal significance of agriculture, 7) production of plant products, 8) economic impact of agriculture, 9) marketing of agricultural products, 10) distribution of agricultural products, and 11) global significance of agriculture. The questionnaire asked panelists to react to the subject areas by submitting one concept for each of the eleven agricultural knowledge areas identified. The 590 concepts submitted were compiled under their broad subject area, and duplicate concepts were eliminated. The concepts generated were refined by the researcher by combining related concepts. The great number of concepts made refinement of concepts and consensus by the panelists difficult. Because the researchers felt that the great number of concepts would inhibit participation in subsequent rounds, further questionnaire development ceased. Concepts under each area were reviewed and placed in subcategories.

Collection of Data: The two questionnaires described in this study were used to develop a consensus definition of agricultural literacy, identify the subject areas making up the framework of agricultural literacy, and solicit agricultural literacy concepts from participating panelists. Questionnaires were printed and mailed with an appropriate cover letter to each panelist. Each individual receiving the questionnaire was sent a follow-up letter if a response had not been received a week after the stated deadline. As noted in Table 1, 78 (78%) participants responded to the first questionnaire and 58 (58%) participants responded to the second questionnaire.

Data Treatment: Because of the nature of the chosen research procedures, the treatment of data involved the use of quantitative content analysis. According to Lindkvist (1981), content analysis is principally a technique for quantitative analysis of extensive texts within the framework of a communication model. In this particular study, quantitative content analysis concerned frequencies and percentages.

Table 1
Distribution of Panelists by Region and State

Region	No. of panelists Questionnaire #1	No. of panelists Questionnaire #2
Central Region		
Illinois	3	2
Indiana	3	2
Iowa	1	0
Kansas	1	1
Michigan	2	1
Minnesota	3	3
Missouri	7	6
Nebraska	2	2
North Dakota	0	0
Ohio	0	0
South Dakota	1	1
Wisconsin	1	0
Region Total	24	18
Eastern Region		
Connecticut	3	3
Delaware	1	1
Maine	1	1
Maryland	1	1
Massachusetts	1	1
New Hampshire	2	2
New Jersey	0	0
New York	2	1
Pennsylvania	2	2
Rhode Island	0	0
Vermont	0	0
Region Total	13	12
Southern Region		
Alabama	2	1
Arkansas	2	2
Florida	2	2
Georgia	1	0
Kentucky	1	1
Louisiana	3	3
Mississippi	1	0
North Carolina	3	2
Oklahoma	0	0
South Carolina	0	0
Tennessee	1	0
Texas	2	1
Virginia	3	1
West Virginia	2	1
Region Total	23	14

Note: Table 1 continues on next page.

Table 1
Distribution of Panelists by Region and State

Region	No. of panelists Questionnaire #1	No. of panelists Questionnaire #2
Western Region		
Alaska	0	0
Arizona	2	1
California	3	2
Colorado	2	2
Hawaii	0	0
Idaho	1	1
Montana	2	1
Nevada	2	2
New Mexico	1	1
Oregon	3	1
Utah	1	1
Washington	1	2
Wyoming	0	0
Region Total	18	14
Grand Total	78	58
State Participation	41	36

The statistical analysis of questionnaire #1 involved the calculation and reporting of frequencies of recurring text found in the 78 definitions submitted. Behavioral area and subject-area text found in greater than 25 percent of all submitted definitions was included in the consensus definition. The 25% level was set by the researchers.

A statistical analysis of questionnaire #2 was not conducted. Concepts submitted in each of the 11 categories were subdivided and duplicates deleted to refine the concepts.

Results and Conclusions

Consensus Definition of Agricultural Literacy: Data in Table 2 reveal the frequencies and percentages of recurring text found in 78 definitions submitted by panelists. Quantitative content analysis was performed to calculate frequencies and percentages of each recurring text. From Table 2, a group definition of agricultural literacy was developed.

Two behavioral terms and 11 broad agricultural subject areas were observed in over 25% of the 78 definitions submitted. These 13 terms were used to form the consensus definition of agricultural literacy. The 11 broad agricultural areas identified were incorporated into the second questionnaire which asked panelists to identify a concept for each of the 11 broad agricultural areas that every citizen should know.

The definition was returned to panelists for their comments. Because none of the panelists made any comments regarding the definition, consensus was reached. The panelist definition of agricultural literacy follows:

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.

Agricultural Literacy Subject Areas: Data in Table 2 also presented the frequencies and percentages of recurring text found in 78 completed questionnaires submitted by panelists. From Table 2, the 11 subject areas of agricultural literacy were developed. The 11 broad agricultural areas identified

Table 2
Quantitative Content Analysis Results From Questionnaire # 1 (N=78)

Behavioral Area Text	Frequencies	Percentages
An Understanding of Agriculture	42 **	53.85
Knowledge of Agriculture	34 **	43.59
Appreciation of Agriculture	13	16.67
Awareness of Agriculture	7	8.97
Educated about Agriculture	4	5.13
Educated in Agriculture	2	2.56
Ability to interpret	2	2.56
Conceptual Area Text	Frequencies	Percentages
Societal significance of agriculture	47 **	60.26
Production of plant and animal products *	46 **	58.97
Food and fiber system	40	51.28
Economic impact of agriculture	35 **	44.87
Natural resources and the environment *	34 **	43.59
Marketing	29 **	37.18
Processing	28 **	35.90
Public ag policies	22 **	28.20
Global significance	21 **	26.92
Distribution	20 **	25.64
Communication skills	15	19.23
The science of agriculture	15	19.23
The history of agriculture	11	14.10
Nutrition and Health	11	14.10
Biology	11	14.10
Agricultural Management	10	12.82
Careers and Occupations	10	12.82
Soil/land use	9	11.54
Technology	9	11.54
Outdoor environments	7	8.97
Food supply	6	7.69
Chemical use	5	6.41
Sustainable agriculture	5	6.41
Horticulture	5	6.41
Research of agriculture	5	6.41
Water/groundwater use	5	6.41
Retailing	5	6.41
Financing	5	6.41
Mechanics/engineering	4	5.13
Animal physiology	3	3.85
Farming	3	3.85
Forestry	3	3.85
Pleasure animals	3	3.85
Art of farming	3	3.85
Aesthetics of agriculture	3	3.85
Standard of living	3	3.85
Marine animals	2	2.56
Rural development	2	2.56
Risks of farming	2	2.56
Biotechnologies	2	2.56
Conservation Practices	2	2.56

** Retained as subject areas and used in Questionnaire #2

* Divided into separate subject areas in Questionnaire #2

were incorporated into the second questionnaire, which asked panelists to identify a concept for each of the 11 broad agricultural areas that every citizen should know.

Agricultural Literacy Concepts: The subject areas identified in the consensus definition led to the development of questionnaire #2 and, subsequently, to the generation of agricultural literacy concepts. The concepts were generated by panelists for each of the 11 agricultural literacy concept areas identified in the agricultural literacy definition. A total of 590 concepts were submitted by 58 panelists (Table 3). The list of concepts was refined by deleting duplicate concepts and combining related concepts, thereby reducing the number of concepts to 394 (Table 3). Some concepts remained in more than one subject area because of their broad relevance.

Fifty-two subareas of the 11 agricultural literacy concept areas emerged from the raw list of panelists' concepts. The subareas surfaced when a number of the concepts' content focused on a topic related to a broader subject area. The 11 agricultural literacy subject areas and their respective subareas are reported in Table 4.

Table 3
The 11 Agricultural Literacy Concept Areas by the Total Number of Generated and Refined Number of Concepts.

Subject area	Number of concepts generated	Refined number of concepts
-Agriculture's important relationship with the environment	55	39
-The processing of agricultural products	51	31
-Public agricultural policies	53	41
-Agriculture's Important relationship with natural resources	56	34
-Production of animal products	52	29
-Societal significance of agriculture	55	35
-Production of plant products	55	37
-Economic impact of agriculture	56	34
-The marketing of agricultural products	53	43
-The distribution of agricultural products	49	35
-The global significance of agriculture	55	36
Total	590	394

Implications

Agricultural literacy describes the understanding and knowledge necessary to synthesize, analyze, and communicate basic information about agriculture. Agricultural literacy knowledge encompasses 11 broad agricultural subject areas which include: 1) agriculture's important relationship with the environment, 2) processing of agricultural products, 3) public agricultural policies, 4) agriculture's important relationship with natural resources, 5) production of animal products, 6) societal significance of agriculture, 7) production of plant products, 8) economic impact of agriculture, 9) marketing of agricultural products, 10) distribution of agricultural products, and 11) global significance of agriculture. The NAS Committee recommended that the curriculum of education

Table 4
Eleven Agricultural Literacy Subject Areas and Their Respective Subareas .

Agriculture's important relationship with the environment

- The agriculturalist's role in protecting the environment
- The effect of agriculture on the environment
- Opinions and perceptions
- Chemicals
- Positive effects of agriculture on the environment
- Negative effects of agriculture on the environment
- The environment's close relationship with agriculture
- Sustainable agriculture

The processing of agricultural products

- Steps and complexities of processing
- Importance of processing and value added products
- Food safety
- Product development & technology

Public agricultural policies

- Government policy impact on the industry
- The unaware public / consumer
- The government's role and limitations regarding agricultural policy

Agriculture's important relationship with natural resources

- Conservation of natural resources
- Sustainable agriculture
- Stewardship of agriculture
- Pollution and depletion of our natural resources
- Codependent relationship between agriculture and natural resources
- Importance for agriculture

Production of animal products

- Consumer concerns
- The uses and roles of various animal species
- Biotechnology and genetics
- Animal husbandry

Societal significance of agriculture

- Society's lack of awareness
- Agriculture's effect on society
- Rural life
- Social benefits
- Food efficiency

Production of plant products

- Greenhouse/gardens
- Use and care of plants
- Agronomic practices
- Biotechnology, biology, and genetics
- Profit
- Society

Note: Table 4 continues on next page.

Table 4 (continued)
Eleven Agricultural Literacy Subject Areas and Their Respective Subareas.

Economic impact of agriculture

- Macroeconomics / microeconomics
- Farm management
- Economic benefits and food costs

The marketing of agricultural products

- Marketing plan and strategy
- Global marketing
- Agriculture's function in a market-oriented economy
- Public perception

The distribution of agricultural products

- The distribution system and its importance
- Global distribution and hunger
- Cost of distribution
- Efficiency of distribution
- Distribution sector employment

The global significance of agriculture

- Global food economics
 - Global hunger and food distribution
 - Technology and university research
 - Global politics / sociology
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about agriculture and education in agriculture be broadened. The 11 agricultural subject areas identified from this study can provide the framework for expanding agricultural education's curriculum.

The 394 concepts remaining after refinement demonstrate the vast amount of knowledge from other disciplines that agriculture applies to produce food and fiber. The breadth and scope of agriculture's applications exclude few school subjects. The 52 sub-areas identified provide further structure for curriculum development. The sub-areas can be used to develop modules about specific agricultural topics that can be integrated into the K-12 curriculum.

Recommendations

The concept lists should be further refined by subject matter specialists and educators interested in incorporating aspects of agriculture into their curricula. The manner in which concepts can be integrated into the existing curriculum should be identified.

The 11 broad agricultural subject areas identified in this study increase the familiarity of educators with the use of agricultural applications based on various disciplines. Instructional materials developed should reflect the breadth and scope of the agricultural discipline. The subject areas and concepts identified provide contemporary information for education in agriculture. The 11 broad agricultural subject areas and their concepts should be used by secondary agricultural education programs attempting to reform their curricula.

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