Agricultural Literacy: Providing a Framework For Agricultural Curriculum Reform

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Abstract

A desired outcome for college of agriculture graduates is a broad understanding of the agriculture industry. Identifying agricultural literacy subjects that should be addressed within any college of agriculture curriculum can assist faculty in developing activities that promote a broader knowledge base of the food and fiber system. Ensuring student exposure to these subjects, regardless of the major, can better prepare graduates for work in today's agriculture industry.

Introduction

A national agricultural education study, conducted by the National Academy of Sciences (NAS) (1988) recommended that "new curriculum components must be developed and made available to teachers addressing the science basic to agriculture, food, and natural resources (Aldrich, et al., 1988, p. 35). The publication recommended that agricultural education go beyond the scope and content of traditional programs. According to the NAS committee, agriculture was too important a topic to be taught to such a very small percentage (4.5%) of high school students. Douglass (1984) also reported that 90% of our population has been off-farm for over 30 years. Thus, the NAS committee developed the idea of "agricultural literacy" -- the goal of education about agriculture.

The NAS (1988) study also suggested that faculty in colleges of agriculture should become more involved in teacher preparation, in-service education programs, curriculum reform, and the development of instructional materials and media. Colleges of agriculture addressing these recommendations can directly affect the "agricultural literacy" level of current and future students. Providing a consensus definition and identifying the concepts which constitute agricultural literacy can expedite the process of developing effective educational strategies to improve our nation's agricultural literacy level.

The magnitude and seriousness of the agricultural illiteracy within our society was substantiated in Horn and Vining's 1986 finding that less than 30 percent of a sample of Kansas students could give correct answers to basic agricultural questions. The public's misunderstanding of the mission or importance of publicly supported institutions such as the cooperative extension service, colleges of agriculture and U.S.D.A. research centers can be tied to the nation's low level of agricultural literacy. Thompson (1986, p. 1) stated, "If even well-informed citizens remain ignorant of basic facts about food, agriculture and natural resource sys-

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possible. This last point is not trivial given the demands of a large class with many grades to be handled.

5. Reassessment of the subject matter is necessary. Are the concepts, facts, skills, and behaviors being taught the ones that will contribute the greatest amount to attainment of student potential? Does the ever-present urge to "cover material" cause other important development activities such as problem-solving, writing, collaboration, and communication to receive inadequate attention?

Implications

In the opinion of the instructors, the course design described herein has provided effective, broad-based, improvement in student learning and development. Most of the changes made are supported by research in education. This system, of course, is not adapted to all courses. However, many parts, if not the whole, may be adapted to a wide range of learning situations.

References

Astin, Alexander W. 1984. Involvement in Learning: Realizing the Potential of American Higher Education. Study Group on the Conditions of Excellence in American Higher Education. National Institute of Education.

Johnson, David W., Roger T. Johnson, Edythe J. Holubec, Patricia Roy. 1984. *Circles of Learning*. Association for Supervision and Curriculum Development. 125 N. West Street, Alexandria, Virginia 22314-2798

Lawrence, Gordon D. 1982. *People Types and Tiger Stripes: A Practical Guide to Learning Styles*. Center for Applications of Psychological Type (CAPT). Gainesville, FL.

Mager, Robert F. 1975. *Preparing Instructional Objectives*. 2nd Edition. Fearon Publishers, Inc. Belmont, CA.

Wales, Charles E. and Robert Stager. 1977. *Guided Design*. Guided Design Center, Engineering Sciences Building, West Virginia University, Morgantown, WV 26506.

Wales, Charles E., Robert A. Stager, and Thomas R. Long. 1981. *Guided Engineering Design*. Project Book. 2nd Ed. West Publishing Company, 50 W. Kellogg Blvd., P. O. Box 3526, St. Paul, MN 55165.

tems, the activities of colleges of agriculture will increasingly be perceived as serving only the interests of a narrow (and dwindling) constituency.''

Purpose and Objectives

The purpose of this investigation was to develop a document that could provide educators with the agricultural concepts needed to guide effective educational initiatives directed at improving the agricultural literacy of our nation. The study was concerned with four 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 citizen should know;
4. To provide recommendations to faculty in colleges of agriculture.

Procedures

The investigation entailed the soliciting of nominated panelists, opinions regarding the study's objectives. The Delphi technique was selected as the main method of inquiry. It replaces direct confrontation and debate by submitting an expert panel to an orderly program of sequential individual interrogations in the form of questionnaires (Helmer, 1966). A questionnaire subsequently used in this study was developed from the initial use of this technique.

Selection of Delphi Panelists

Nominations for Delphi panelists were made by agricultural education faculty members at land-grant universities. Nominees possessed an interest in agricultural literacy, had the time to devote to the study as estimated by the nominator, and were not faculty members of any agricultural education department. The total number of individuals nominated by 48 agricultural education faculty members was 147. Of the 147 nominated, 100 initially agreed to participate in the study. From the initial 100 panelists, two asked to be removed from the panel because of other commitments, 78 submitted agricultural literacy definitions, and 58 submitted agricultural literacy concepts. Table 1 presents the three major categories and number of panelists by position.

Instrument Development

Two questionnaires were developed and employed. 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.

Table 1. Positions of three major occupational categories and number of panelists by position (n=67).

Agriculture industry (30%)	Elementary and secondary education (34%)	Higher education (36%)
Agricultural organizations (n=3)	State agricultural education staff (n=11)	University faculty (n=7)
Agribusiness (n=11)	Ag in the classroom coordinator (n=5)	University administration (n=12)
Farm bureau (n=2)	Vocational agriculture (n=4)	Extension (n=6)
Farmer (n=3)	High school instructor (n=1)	
	High school administration (n=2)	

The design of the second questionnaire was based on the 11 agricultural subject areas identified in the consensus definition 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,
11. global significance of agriculture.

These subject areas accompanied the second questionnaire sent to the panelists. 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.

Data Treatment

Because of the nature of the Delphi research procedure, 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. Therefore, the analysis of Questionnaire No. 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 were included in the consensus definition.

A statistical analysis of Questionnaire No. 2 was not needed. 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 calcu-

late 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 subject areas identified were incorporated into the second questionnaire, which asked panelists to identify a concept for each of the 11 broad agricultural subject 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.

Table 2. Quantitative Content Analysis Results From Questionnaire No. 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 syste	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 No. 2
* Divided into separate subject areas in Questionnaire No. 2.

Agricultural Literacy Subject Areas

From Table 2, the 11 subject areas of agricultural literacy were developed. 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.

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. The list of concepts was refined by deleting duplicate concepts and combining related concepts, thereby reducing the number of concepts to 394. Some concepts remained in more than one subject area because they were relevant to a number of subject areas.

Fifty-two sub-areas 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 the broader subject area (Table 3).

Implications

The following implications for faculty in agriculture were derived from the results:

The results of this study furnish college of agriculture faculty information that can assist them in providing teacher inservice programs and developing curriculum materials about agriculture for K-12 school use.

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: agriculture's important relationship with the environment, processing of agricultural products, public agricultural policies, agriculture's important relationship with natural resources, production of animal products, societal significance of agriculture, production of plant products, economic impact of agriculture, marketing of agricultural products, distribution of agricultural products, and global significance of agriculture. The NAS Committee recommended that the curriculum of education about agriculture and education in agriculture be broadened. The 11 agricultural subject areas identi-

Table 3. 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
- Co-dependent 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

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

fied from this study can provide the framework for expanding an agricultural 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 K-12 school subjects.

The subject areas and subareas identified provide information to college of agriculture faculty members who are interested in educational initiatives designed to improve the literacy level in their specific agricultural subject areas.

References

Aldrich, D. G., et al. (1988). *Understanding Agriculture - New Directions for Education.* Washington, D.C.: National Academy Press.

Douglass, Gordon K. (1984). *Cultivating Agricultural Literacy: Challenge for the Liberal Arts.* Battle Creek, MI: W.K. Kellogg Foundation.

Helmer, 0. (1966). *The Use of The Delphi Technique in Problems of Educational Innovations.* Santa Monica: The Rand Corporation.

Horn, J. & Vining, B. (1986). *An Assessment of Students, Knowledge of Agriculture.* College of Education, Kansas State University, Manhattan, KS.

Lindkvist, K. (1981). *Approaches to Textual Analysis.* In K. E. Kosengren (Ed.), Advances in Content Analysis (p. 26). Beverly Hills: Sage Publications.

Thompson, P. (1986). *Defining Agricultural Literacy.* Battle Creek, MI: W. K. Kellogg Foundation.