What Do College Freshmen Know About Agriculture? An Evaluation of Agricultural Literacy

Sue A. Colbath[1] and Douglas G. Morrish[2]
Texas State University
San Marcos, TX 78666

Abstract

The purpose of this study was to evaluate the agricultural literacy of college freshmen at a central Texas university. A score of 70% was considered acceptable; however, the mean overall score on the agricultural literacy test was fairly low (50.4%). A comparison of the overall mean literacy scores based on gender showed that male literacy scores (M = 51.3%) were significantly different ($p < .05$) than female scores (M = 49.9%). Students majoring in science (M= 54.0%) achieved an overall literacy score which was significantly ($p < .05$) higher than undecided majors (M = 47.4%). The mean literacy scores of students previously enrolled in high school agriculture classes (M = 54.1%) were noticeably higher than those students who were not enrolled in high school agriculture (M = 49.6%), but the overall scores were not significantly different ($p < .05$). Agricultural literacy should be considered a critical aspect of general education throughout the public school system. Additionally, colleges and departments of agriculture should consider the results of the study and start discussions about what the profession should do about agricultural illiteracy.

Introduction

In 1988, the National Research Council (NRC) recommended that students in grades K-12 receive some systematic instruction in agriculture (NRC, 1988). This recommendation was heartily endorsed by agricultural literacy experts, citing that as voters, policy makers, and consumers, Americans should be well informed about their food and fiber system. The apparent lack of agricultural literacy among the general population in 21st century America is an ongoing concern (Leising et al., 2003; Pense and Leising, 2004; Bellah and Dyer, 2007).

Previous research indicates that nearly 90% of the American population is two to three generations removed from production agriculture (Leising et al., 1998). Today less than 2% of the population is living or working on farms (Womochil, 2007). The result of this separation from agriculture is a population that knows little about its food supply, a situation which agricultural educators consider potentially dangerous. Agriculture determines a nation's general welfare and standard of living, yet in 21st century America, the population knows little about the production, processing, marketing, distribution, regulation, and research that make up its food and fiber supply (Leising et al., 1998). Lack of understanding about agriculture can also lead to public misunderstandings about agricultural issues, such as the environmental impact of agriculture, the utilization efficiency of resources in agriculture, and the safety of our food supply (Nordstrom et al., 2000).

Agricultural products are abundant and critical to American lifestyles, and a strong case can be made for consumer awareness regarding understanding of agricultural systems (Terry, 2004). Bellah et al.,(2004) suggest that agricultural literacy must be viewed as lifelong learning. Furthermore, the educational system must make a conscious effort to address agricultural literacy and redesign curricula to include more agricultural literacy competencies.

Many agriculture producer organizations provide educational materials for teachers to use in the classroom. Two programs, Agriculture in the Classroom (AITC), and A Guide to Food and Fiber Systems Literacy (FFSL), stand out in providing helpful materials and guidelines to promote literacy in agriculture nationwide. These programs, while not formally connected, provide teachers with valuable information, including lesson plans and curriculum, to integrate agriculture into core academic areas. The integration of material other than that following state-based standards has been extremely difficult for teachers due to concerns about high stakes testing and educational accountability mandated by No Child Left Behind legislation (USDE, 2010). Teachers are pressured to teach only competencies related to high stakes test items and information required by state standards. Deviation from this practice is avoided due to concerns about non-renewal of teaching contracts or contribution to loss of school funding due to low test scores. As a result, the agricultural literacy curricula offered by AITC and FFSL are often overlooked. General education faculty members at college and universities experience similar problems. Faculty members with an agriculture background find it hard to deviate from the syllabus to discuss pertinent agricultural issues.

The AITC program was established in 1981, and

[1]M. Ed., Department of Agriculture
[2]Assistant Professor, Department of Agriculture

is the "largest public effort to educate people about agriculture" (Leising et al., 2003, p. 1). Its goal is "to help students gain a greater awareness of the role of agriculture in the economy and society, so that they may become citizens who support wise agricultural policies" (AITC).

During the 2002 school year, the USDA, in association with the Department of Agricultural Education at Oklahoma State University, conducted a study to evaluate agricultural literacy among high school students. The study took place in Arizona, Montana, Oklahoma, and Utah, and concluded that AITC trained teachers had a positive influence on student cognition regarding agriculture. Students demonstrated more agricultural knowledge compared to students in classrooms with no AITC training (Leising et al., 2003).

In another response to the NRC mandate suggesting that students receive "systematic instruction in agriculture" (C. Igo, personal correspondence), an intercollegiate group of researchers created standards to assist educators in evaluating student knowledge about agriculture. The final result was A Guide to Food and Fiber System Literacy, A Compendium of Standards, Benchmarks, and Instructional Materials for Grades K-12 (Leising et al., 1998).

FFSL "summarizes what America's youth should know about Food and Fiber Systems to be agriculturally literate by the time they graduate from high school" (Leising et al., 1998, p. 4). The guide defines agricultural literacy as "possessing knowledge and understanding of food and fiber systems. An individual possessing such knowledge can synthesize, analyze, and communicate basic information about agriculture" (Leising et al., 1998). Prior to the FFSL guide the emphasis in the education sector was on the development of educational materials (Leising and Pense, 2001). Although the guide contains suggestions for using the FFSL, and bringing the food and fiber curriculum to the classroom, the emphasis is on providing standards for measuring agricultural knowledge based on five themes:

1. Understanding Food and Fiber Systems
2. History, Geography, and Culture
3. Science, Technology, and Environment
4. Business and Economics
5. Food, Nutrition, and Health

In 1999, a research project was developed to "assess food and fiber knowledge of selected students in kindergarten through eighth grade before and after receiving instruction based upon the Food and Fiber Systems Literacy Framework standards and benchmarks" (Igo et al., 1999, p. 50). The study concluded that the FFSL was an effective guide for instruction in agriculture for grades K-8. In the years following the K-8 study, Pense and Leising developed and tested a measurement instrument for students in grades 9-12 based on the FFSL standards and benchmarks for that age group (Pense and Leising, 2004). A study was conducted in Oklahoma among students from six high schools who were expected to graduate in the spring of 2002 (Pense and Leising, 2004). It concluded that students did have some agricultural knowledge, but in overall agricultural knowledge "did not demonstrate that they were agriculturally literate, as defined by the FFSL Framework" (Pense and Leising, 2004, p. 94).

Purpose and Objectives

The purpose of this study was to evaluate the agricultural literacy of college freshmen at a central Texas university using the FFSL Assessment developed by Leising et al. (2003).

Specific objectives of the study were to:

1. Determine if college freshmen could achieve a score of at least 70% on the FFSL student assessment.

2. Determine the mean overall scores of each of the five thematic areas on the FFSL student assessment.

3. Determine if overall test scores differed among gender, college major, and previous enrollment in high school agriculture courses.

Materials and Methods

The instrument used in this study was a criterion-referenced multiple-choice test designed for a study associated with Oklahoma State University in 2001 (Leising et al., 2003). The instrument had previously been validated and pilot tested (Pense and Leising, 2004). The resulting instrument was known as the FFSL student assessment.

The sample population for this study consisted of the freshman class at a central Texas university. The university had 27,485 registered students, 4,571 of whom had completed zero to 29 credit hours and were considered freshmen. The ease and availability of electronic mail made it possible to include the entire freshmen population in the sample, and it was decided to invite all of them to participate.

Students who opted to respond did so voluntarily. After comparing the demographic makeup of the respondents to the non-respondents, it was noted that the participants accurately represented the freshmen student population at the university (Dillman, 2000). The freshman class consisted of 2066 males (45%) and 2505 females (55%); 194 males and 307 females responded to the survey. The most popular major of the freshman class was students who were undecided (28.2%). Similarly, 27.9% of the respondents classified themselves as undecided. Similar findings were recorded for other college majors.

The data was analyzed using descriptive statistics, analysis of variance (ANOVA), and t-tests in SPSS. Descriptive statistics included mean, standard deviation, aggregate mean, and frequencies. FFSL

mean scores were also computed for gender, college major, and prior enrollment in agriculture classes in high school.

Results and Discussion

Of the 501 participants in the study, a majority (61%) were female. Eighty-eight of the respondents indicated that they had been enrolled in agriculture courses while attending secondary school. As shown in Table 1, 140 (27.9%) of the respondents indicated that their current major was "undecided." Science was the next most common major indicated by respondents (21.8%). Additional majors included Arts (19.2%), Education (16.4%), Social Science (9.7%), and Pre-Law (5.0%).

Although the original FFSL authors did not determine a test score that represents an adequate level of agricultural literacy for college freshmen, we used a score of 70% on the assessment to indicate that the participant was minimally literate in agriculture. The overall mean score in our study was fairly low ($M = 50.4\%$) and very few students (14%) scored 70% or higher (Table 3).

Sub-scores for all participants based on the five thematic areas of the FFSL were calculated and ranged from a low of 40.2% for Theme 5 "Food, Nutrition, and Health" to a high of 57.1% for Theme 2 "History, Geography, and Culture" (Table 2).

Table 1. Major Areas of Study of Study Participants

College Major	*n*	%
Undecided	140	27.9%
Science	109	21.8%
Arts	96	19.2%
Education	82	16.4%
Social Science	49	9.7%
Pre-Law	25	5.0%

Table 2. Mean Agricultural Literacy Scores of Study Participants

	All Participants	
Agricultural Themes	Mean	*SD*
Overall	50.4	16.6
(1) Understanding Agriculture	55.7	19.9
(2) History, Geography & Culture	57.1	25.5
(3) Science & Environment	52.3	23.2
(4) Business & Economics	45.4	22.9
(5) Food, Nutrition, & Health	40.2	15.9

Table 3. Overall Agricultural Literacy Test Scores Above and Below 70 Percent

Overall Test Score	*n*	%
Students Scoring Below 70 %	429	85.6
Students Scoring Above 70 %	72	14.4

The observation that the mean for Theme 5 was nearly 10 points lower than the overall mean score, was discouraging since topics related to this theme are generally included in school curricula and appear frequently in the news media (Table 2). However, the mean score for Theme 2 was somewhat encouraging in the sense that history is a required subject throughout high school. Students should have a basic understanding of history in general, and might logically apply that understanding to the historical and geographical questions relating to agriculture. The relatively high score of 55.7% for Theme 1 "Understanding Agriculture" indicated that there might be a general understanding that agriculture plays a role in everyday life among the respondents. The fact that Theme 3 "Science, Technology, and Environment" scores were higher than Theme 4 "Business and Economics" scores may be related to the fact that more science majors responded than students in majors related to business and economics. Additionally, many agricultural competencies are science based, strengthening the ongoing argument and effort to offer high school agriculture as science credit.

Table 4. Mean Agricultural Literacy Test Scores Based on Gender

Gender	*N*	*M*	*SD*	Minimum Score	Maximum Score
Male	194	51.3 a[1]	17.7	14	86
Female	307	49.9 b	15.8	10	86

[1] $t = 0.372$, $p = 0.016$*

Table 5. Differences between Overall Agricultural Literacy Test Scores Based on College Major

College Major	*n*	Mean	*SD*
Science	109	54.0 a[1]	16.8
Social Science	49	52.2 ab	16.3
Arts	96	52.1 ab	16.8
Education	82	48.6 ab	16.1
Pre-Law	25	47.6 ab	18.3
Undecided	140	47.4 b	15.9

[1] Means followed by the same letter are not statistically different at the 0.05 probability level.

Table 6. Differences between Overall Agricultural Literacy Test Scores Based on Prior Enrollment in High School Agriculture

Enrolled in Agriculture Classes in High School	*n*	Mean	*SD*
Yes	88	54.1 a[1]	17.8
No	413	49.6 b	16.2

[1] $t = 2.3$, $p = 0.22$

The mean score for male participants was 51.3% with a range of 14% to 86% (Table 4). Female participants achieved an average score of 49.9% with and range of 10% to 86%. A t-test indicated that the difference between male and female mean scores was statistically significant ($p < .05$).

When comparing the agricultural literacy scores between college majors, science majors had the highest mean score (54%) and undecided students had the lowest (47.4%). The difference was statistically significant ($p < .05$). There were no other statistically significant differences among majors (Table 5).

The final comparison examined how students who were enrolled in agriculture classes in high school scored on the FFSL evaluation compared to those who did not participate in high school agricul-

ture. Study participants were asked if they had taken agriculture classes during high school, without indicating how many classes, type of classes, or how many semesters classes had been taken. Table 6 shows that very few (n= 88) of the freshmen participated in agriculture classes while in high school. The overall score of those participants had taken agriculture classes in high school (M = 54.1%) was higher than the mean score of those who did not take agriculture classes (M = 49.6%). There was no statistical difference between the two groups. However, students who had some initial background in agriculture appear to be better equipped to discuss and make decisions related to agricultural issues.

Summary and Recommendations

The primary conclusion drawn from this study is that college freshmen at one central Texas university know little about the systems that provide their life sustaining food and fiber. Agriculture is a critically important component of Texas' economy so it is surprising that students were so agriculturally illiterate. It is important for other institutions to perform similar studies to determine if their results concur with our findings.

Agricultural literacy should be considered a critical aspect of general education throughout the public school system. Additionally, colleges and departments of agriculture should consider the results of this study and start discussions about what the profession can do to battle agricultural illiteracy. Based on the findings of this particular study, colleges and/or departments might consider offering a general agriculture course as part of the core curriculum for the university. The general agriculture course(s) could satisfy several core curriculum areas, including natural science, social science, or international perspective. Such an implementation could potentially have an added benefit of increased student enrollment in agriculture by sparking student interest and thus increase student credit hours generated. Implementation at the college level would also help close the gap of agricultural illiteracy since it is sometimes difficult for public school teachers to implement such a curriculum due to accountability measures.

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