An Assessment of the Agricultural Literacy of Incoming Freshmen at a Land-Grant University

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Abstract

Because the world's population continues to escalate rapidly, producing an abundance of food and fiber is of utmost importance. This revelation has implications for Americans being agriculturally literate. Agricultural literacy research has been conducted primarily at the pre-college level; however, little exists at the post-secondary level. This study, therefore, sought to assess the agricultural literacy of incoming freshmen students at Oklahoma State University. It was found that students in the College of Agricultural Sciences and Natural Resources scored statistically significantly better than their counterparts in other colleges regarding their agricultural knowledge. However, they scored only 61% correct on the agricultural literacy test, resulting in a rather insufficient knowledge base. Collectively, incoming freshmen students across the university campus did not possess a passing knowledge (i.e., 70%) of basic agricultural principles. The findings of this study point to the imperative for higher education faculty to educate students about the importance of agriculture and its significance for the United States and the world.

Introduction

With the world population forecasted to reach nine billion by 2050, the need exists for increased agricultural production (Blackburn, 1999; Hodges, 2005; Johnson and Jorgenson, 2006; Sayers, 2011) and literacy among U.S. citizens. It is not the responsibility of one entity within the agricultural industry to meet this challenge; rather, the industry should be taking steps to promote and educate consumers about the source of their food and fiber.

Presently, more than 50% of the world's population lives in urban areas and does not produce their own food (Sayers, 2011). That number is projected to grow to more than 65% by the year 2050 (Johnson and Jorgenson, 2006). *"The steady rise of urbanization has transferred the future of agriculture to a group of people with an overwhelming lack of support for agricultural issues"* (Kovar and Ball, 2013). *"Consumers think about food production constantly, yet know very little about how food is brought to the dinner table"* (U.S. Farmers and Ranchers Alliance, 2011, para. 5). This gap between awareness and deeper understanding of the food and fiber system is an important area of research related to creating a basis for consumer education. With less than 1% of the U.S. population claiming farming as an occupation (Environmental Protection Agency, 2012), it is crucial that additional efforts be made to educate the public about agriculture and natural resources (Doerfert, 2011; National Research Council [NRC], 1988).

Because it is essential to human survival, everyone should have knowledge about agriculture (NRC, 1988). To achieve this goal, agricultural content is taught in public school systems beginning in the elementary grades as students are exposed to basic agricultural literacy, such as where their food is grown.

This study was grounded on the premise of the agricultural literacy movement initiated in the late 1980s, which assumes that each student will have sufficient knowledge in and about agriculture (NRC, 1988). According to the NRC (1988), students who have strong desires, passions and interests in agriculture should be offered education to prepare for careers in the industry. However, not all students have a desire to work in the agricultural industry. Although most will not be agricultural producers or food and fiber purveyors, they all will be consumers of food and fiber. Students,

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therefore, should receive education that helps them understand information and issues about agriculture (NRC, 1988).

Overall, agricultural literacy efforts during the past 20 years have focused on elementary students and educators (Balschweid et al., 1998; Kovar and Ball, 2013; Meischen and Trexler, 2003). Further, numerous agricultural literacy programs operate on a small scale reaching a narrow population (Kovar and Ball, 2013). Therefore, it is important for researchers, educators and extensions educators to determine areas in which citizens lack agricultural knowledge and concentrate on those aspects in future educational courses and programs (Frick, 1993; Kovar and Ball, 2013).

Unfortunately, little has been done to enhance agricultural literacy in post-secondary settings (Colbath and Morrish, 2010). Due to its mission of providing practical information to the population, the land-grant university system serves as one avenue for educating adults about agriculture (National Association of State Universities and Land-Grant Colleges [NASULGC], 2008; Renne, 1960). Land-grant universities (LGUs) have an important role to play in educating U.S. citizens about agriculture, especially as it relates to where their food sources originate as well as the transformative and allied processes making it ready for consumption. In an executive summary report written by agriculturists at Cornell University, it was recommended that LGUs *". . . provide public and private decision-makers with the information and tools they need to support an engaged food citizenry, a sound public food policy, and a vibrant food landscape"* ("The Future of American Agriculture," 2003, p. 7). To that end, faculty at LGUs should conduct practical, relevant, and applicable research with results that can be communicated easily to the general public (Fribourg, 2005; Nordstrom et al., 2000; Sandmann, 1991).

For years, the U.S. agricultural system has been regarded as the "most efficient and productive in the world" (Daly, 1981, p. 16). However, as environmental and economic issues continue to pose threats to a safe and sustainable food supply, it is imperative that people be knowledgeable about agriculture (Daly, 1981). For productivity to continue to meet the demand of the growing world, U.S. university graduates should be more knowledgeable about the agricultural industry. LGUs may need to increase their efforts to educate all students – regardless of their majors – about basic agricultural facts and concepts (NRC, 1988). The seminal question driving this study was, "What basic agricultural knowledge do incoming freshmen bring to a LGU?" The answer to this question will provide a reference point for how LGUs could respond to students' needs for learning basic agricultural knowledge to be educated and informed citizens after graduation.

Purpose and Objectives

The purpose of this census study was twofold: a) assess the agricultural literacy of all incoming freshmen (*N* = 4,081) at Oklahoma State University in the Fall semester of 2012, and b) determine the differences between students' scores on an agricultural literacy test by college. Three objectives guided the study:

1. describe the sex and race or ethnicity of the incoming freshmen;
2. determine the agricultural literacy levels of the incoming freshmen across colleges; and
3. determine the differences between students' levels of agricultural literacy by college for each Food and Fiber Systems Literacy theme.

Materials and Methods

The instrument used in the study was a condensed version of the criterion-referenced test, Food and Fiber Systems Literacy (FFSL), as developed by Pense and Leising (2004). The original FFSL test included 50 questions that measured 10 items each for five thematic areas: 1). understanding food and fiber systems, 2). history, geography and culture, 3). science, technology and environment, 4). business and economics and 5). food, nutrition and health (Pense and Leising, 2004).

Criterion-referenced tests are used in schools, industries and the armed services because they offer valuable information about the actual skills or knowledge an individual possesses, which differs from what a norm-referenced test examines (Hambleton, 1986; Wiersma and Jurs, 1990). A panel of three credentialed, agricultural education teachers and three agricultural education graduate students wrote the test items based on the standards and benchmarks of the FFSL framework (Pense and Leising, 2004). After the test was completed, the questions were *"validated by a panel of secondary school teachers of various disciplines to ensure each item addressed its corresponding FFSL benchmark content, the content was grade-level appropriate, and each item was language appropriate"* (Pense and Leising, 2004, p. 89). In the original study, two pilot tests were conducted; the first had a reliability coefficient of 0.846, using the Kuder/Richardson-20 (KR-20) method and the final pilot test yielded a reliability coefficient of 0.933 (Pense and Leising, 2004).

For the purpose of the study reported on here, the researchers modified the original instrument to update it and reduce its size. Edits were made and reviewed by a panel of two faculty members in the Department of Agricultural Education, Communications and Leadership and one faculty member in the Department of Plant and Soil Sciences at Oklahoma State University. Revisions were minor and dealt with modifying the language for clarity; the modifications did not affect the integrity of the test. The test used in this study was condensed to 25 questions, which assessed each of the five thematic areas with five questions apiece. Each of the five sections was worth a total of five points. Thus, mean averages were calculated and compared by college for the five constructs.

Popham and Husek (1969) suggested that because internal reliability estimates compare individuals to specific criteria and not to other individuals, such reliability

estimates are not suitable for criterion-referenced tests. Conversely, Kane (1986) indicated internal consistency of criterion-referenced tests is a critical concern and stated that internal reliability coefficients above 0.50 suggested the instrument accurately reflected students' accumulated mean scores. Therefore, the KR-20 formula was used to determine a post hoc reliability coefficient of 0.65 for the 25-item, criterion-referenced test used in the study, i.e., all 25 questions contributed appropriately to the internal consistency of the test.

Oklahoma State University is made up of six colleges consisting of the College of Agricultural Sciences and Natural Resources (CASNR); College of Arts and Sciences (CAS); College of Education (CoE); College of Engineering, Architecture and Technology (CEAT); College of Human Sciences (CHS); and Spears School of Business (SSB) [Institutional Research and Information Management (IRIM), 2012]. A total of 185 majors and options are offered across the six colleges at Oklahoma State University, 2013). The study's target population included students registered as incoming freshmen for the Fall semester of 2012 and who were at least 18 years old (N = 4,081).

The link to the instrument was transmitted to the participants electronically using students' campus electronic mail (email) addresses. A frame of the students and their email addresses was collected from the Oklahoma State University's Communications Department. The web-based, survey program, Qualtrics, was used to present the FFSL test for data collection.

The researcher followed a modified approach according to Dillman's (2007) four-contact data collection method. The first email message was sent to the entire population (N = 4,081) on August 30, 2012. A follow-up, reminder email message was sent on September 10, 2012. The third and final reminder email message was sent on October 2, 2012. The data collection period ended on October 23, 2012. In all, 711 students attempted portions of the questionnaire. However, complete data sets existed for 500 students, which resulted in an overall response rate of 12.25%.

To control for non-response error, the researcher compared early and late respondents, according to the recommendations by Miller and Smith (1983). The first 25% of the respondents were considered early respondents and the last 25% were considered late respondents. The two groups were compared statistically using a t-test based on their test scores and demographic information (Tables 1 and 2). Because no statistically significant differences were found, the data presented by the respondents may be generalized to the population of all incoming freshmen during the Fall semester of 2012 at Oklahoma State University (N = 4,081) (Miller and Smith, 1983).

After the data collection period ended, the responses were imported into the Statistical Package for Social Sciences (SPSS). The researchers used an SPSS 19.0 data file to analyze the data descriptively, including central tendency, variability and relative standing (Ary et al., 1996; Creswell, 2012). In addition, one-way Analyses of Variances (ANOVAs) were conducted to assess differences between more than two variables, as recommended by a statistician at Oklahoma State University, but were *"only interpreted to reflect this population and not to infer to other populations outside the one examined"* (M. Payton, personal communication, December 4, 2012). T-tests were used for the variables of interest with only two levels to describe interactions (Field, 2009).

Table 1. A Summary of Frequencies Comparing Early and Late Respondents' Selected Personal Characteristics

	Early Respondents		Late Respondents		
	f	%	*f*	%	*p*
Sex					0.238
Male	64	36.62	55	43.32	
Female	111	63.38	72	56.68	
Ethnicity					0.143
American Indian	9	5.23	11	8.73	
African American	3	1.71	6	4.82	
Pacific Islander	3	1.71	1	0.81	
Hispanic	10	5.82	5	4.03	
White	148	85.53	103	81.61	

Table 2. A Summary of Frequencies Comparing Early and Late Respondents' FFSL Test Scores

	Early Respondents				Late Respondents				
College	*f*	%	*M*	*SD*	*f*	%	*M*	*SD*	*p*
CASNR	39	22.59	15.24	2.93	27	21.41	14.23	3.06	0.126
CAS	40	23.30	13.71	3.50	40	31.72	12.63	4.21	
CoE	20	11.61	12.78	3.19	12	9.52	12.82	4.77	
CEAT	40	23.30	15.92	3.30	28	22.22	13.85	3.94	
CHS	17	9.89	11.88	4.22	7	5.61	14.00	2.71	
SSB	16	9.31	13.46	3.95	12	9.52	14.72	3.00	

Note.*p < .05; CASNR = College of Agricultural Science and Natural Resources; CAS = College of Arts and Sciences; CoE = College of Education; CEAT = College of Engineering, Architecture, and Technology; CHS = College of Human Sciences; SSB = Spears School of Business

Results

Objective one sought to describe the personal characteristics of incoming freshmen at Oklahoma State University during the Fall semester of 2012. Accordingly, 334 (62.82%) female and 198 (37.18%) male students identified their sex (Table 3). Of the students who opted to self-identify their race, 38 (7.19%) were American Indian, 17 (3.21%) were African American, 5 (0.90%) were Pacific Islander, 28 (5.29%) were Hispanic and 442 (83.41%) were White.

Objective two sought to determine the levels of agricultural literacy of incoming freshmen by college at Oklahoma State University in the Fall semester of 2012. On the 25-item, FFSL test, students in CASNR (n = 119, 23.83%) had the highest mean score (M = 15.33; SD =

Table 3. Selected Personal Characteristics of Incoming Freshmen at Oklahoma State University during the Fall Semester of 2012.

	f	%
Sex (n = 532)		
Male	198	37.18
Female	334	62.82
Ethnicity (n = 530)		
American Indian	38	7.19
African American	17	3.21
Pacific Islander	5	0.90
Hispanic	28	5.29
White	442	83.41

Table 4. Agricultural Literacy Test Scores of Incoming Freshmen at Oklahoma State University by College during the Fall Semester of 2012 (n = 500)

Rank	College	*f*	%	*M*	*SD*
1	CASNR	119	23.83	15.33	8.21
2	CEAT	110	22.01	15.15	3.52
3	SSB	49	9.82	13.82	3.81
4	CoE	49	9.83	12.80	3.82
5	CHS	44	8.83	12.66	4.63
6	CAS	129	25.84	12.46	3.82

Note. CASNR = College of Agricultural Science and Natural Resources; CAS = College of Arts and Sciences; CoE = College of Education; CEAT = College of Engineering, Architecture, and Technology; CHS = College of Human Sciences; SSB = Spears School of Business

Table 5. Analysis of Variance Summary Comparing Test Scores Between Students' Colleges during the Fall Semester of 2012

	SS	*df*	*MS*	*F*	*p*
College	528.82	5	105.84	3.83	0.00*
Error	13661.10	494	27.65		
Total	14189.86	499			

*$p < 0.05$.

Table 6. A t-Test of Freshmen Students' Sex and Test Scores during the Fall Semester of 2012

	n	*M*	*SD*	*t*	*p*
Male	189	15.27	3.32	4.33	0.00*
Female	317	13.45	6.15		

*$p < 0.05$.

Table 7. Analysis of Variance Summary Comparing Theme 1[a] Test Scores by Students' Colleges during the Fall Semester of 2012

	SS	*df*	*MS*	*F*	*p*
College	22.117	5	4.423	2.47	0.03*
Error	922.10	515	1.79		
Total	4642.00	521			

*$p < 0.05$; [a]Understanding Food and Fiber Systems theme

8.21) (Table 4). In contrast, students in CAS (n = 129, 25.84%) had the lowest mean score (M = 12.46; SD = 3.82). The average score for all students was 13.70.

Objective three sought to determine the differences between students' levels of agricultural literacy by college for each FFSL theme. A statistically significant difference was found between students' test scores and their college F (5, 494) = 3.83, p = 0.00 (Table 5).

Statistically significant differences were found between CASNR and CAS (p = 0.01), CASNR and CoE (p = 0.01), and CASNR and CHS (p = 0.00). To determine practical significance, *mean differences* (*MD*) were calculated by subtracting the mean scores of colleges, as listed in Table 4. The practical significance can be observed by the *mean differences* found between CASNR and CAS (*MD* = 1.87), CASNR and CoE (*MD* = 2.53) and CASNR and CHS (*MD* = 2.67).

An independent-samples t-test was conducted to compare the test scores of male and female students (Table 6). A statistically significant difference was found (p = .00) between males (M = 15.27, SD = 3.32) and females (M = 13.45, SD = 6.15). The males scored higher and with less variability.

A statistically significant difference was also found between students' theme 1 test scores in Understanding Food and Fiber Systems by college F(5, 515) = 2.47, p = 0.03 (Table 7). Statistically significant differences were noted between CEAT and CoE (p = 0.03), CEAT and

Table 8. A Description of Students' Test Scores for Theme 1[a] by College during the Fall Semester of 2012

Rank	College	*f*	%	*M*	*SD*
1	CEAT	115	22.52	2.95	1.33
2	CAS	133	25.31	2.75	1.42
3	CASNR	124	23.72	2.61	1.31
4	SSB	53	10.12	2.51	1.24
5	CoE	51	9.74	2.45	1.31
6	CHS	45	8.73	2.24	1.32

Note. CASNR = College of Agricultural Science and Natural Resources; CAS = College of Arts and Sciences; CoE = College of Education; CEAT = College of Engineering, Architecture, and Technology; CHS = College of Human Sciences; SSB = Spears School of Business; *M* = Mean score based on a scale of 0 to 5; [a]Understanding Food and Fiber Systems theme

Table 9. Analysis of Variance Summary Comparing Theme 2[a] Test Scores by Students' Colleges during the Fall Semester of 2012

	SS	*df*	*MS*	*F*	*p*
College	26.899	5	5.380	4.62	0.00*
Error	601.502	516	1.166		
Total	5037.000	522			

*$p < 0.05$; [a]History, Geography, and Culture theme

Table 10. A Description of Students' Test Scores for Theme 2[a] by College during the Fall Semester of 2012

Rank	College	*f*	%	*M*	*SD*
1	CEAT	115	22.0	3.13	1.0
2	CASNR	124	23.8	3.12	0.09
3	SSB	53	10.1	2.91	1.1
4	CAS	133	25.5	2.74	1.2
5	CHS	45	8.6	2.62	1.1
6	CoE	52	10.0	2.52	1.0

Note. CASNR = College of Agricultural Science and Natural Resources; CAS = College of Arts and Sciences; CoE = College of Education; CEAT = College of Engineering, Architecture, and Technology; CHS = College of Human Sciences; SSB = Spears School of Business; *M* = Mean score based on a scale of 0 to 5; [a]History, Geography, and Culture theme

Table 11. Analysis of Variance Summary Comparing Theme 3[a] Test Scores Between Students' Colleges during the Fall Semester of 2012

	SS	*df*	*MS*	*F*	*p*
College	25.587	5	5.117	3.09	0.01*
Error	851.182	514	1.656		
Total	6566.000	520			

*$p < 0.05$; [a]Science, Technology, and Environment theme

CHS (p = 0.00), CEAT and CoB (p = 0.04) and CAS and CHS (p = 0.03). The practical significance can be observed by the mean differences found between CEAT and CoE (*MD* = 0.50), CEAT and CHS (*MD* = 0.71), CEAT and CoB (*MD* = 0.44), as well as CAS and CHS (*MD* = 0.51) (Table 8).

A statistically significant difference was found between students' theme 2 test scores for History, Geography and Culture by college F(5, 516) = 4.62, p = 0.00 (Table 9). Statistically significant differences were revealed between CASNR and CAS (p = 0.01), CASNR and CoE (p = 0.00) and CASNR and CHS (p = 0.01). The practical significance can be observed by the mean differences found between CASNR and CAS (*MD* = 0.38), CASNR and CoE (*MD* = 0.60) and CASNR and CHS (*MD* = 0.50) (Table 10).

A statistically significant difference was found between students' theme 3 test scores in Science, Technology and Environment by college F(5, 514) = 3.09, p = 0.01 (Table 11). Statistically significant differences were found between CASNR and CAS (p = 0.01), CASNR and CoE (p = 0.02), and CASNR and CHS (p =

Table 12. A Description of Student Test Scores for Theme 3[a] by College during the Fall Semester of 2012

Rank	College	*f*	%	*M*	*SD*
1	CASNR	123	23.62	3.53	1.11
2	CEAT	114	21.92	3.53	1.23
3	SSB	53	10.21	3.36	1.51
4	CAS	134	25.82	3.12	1.32
5	CoE	51	9.81	3.04	1.31
6	CHS	45	8.73	2.96	1.62

Note. CASNR = College of Agricultural Science and Natural Resources; CAS = College of Arts and Sciences; CoE = College of Education; CEAT = College of Engineering, Architecture, and Technology; CHS = College of Human Sciences; SSB = Spears School of Business; *M* = Mean score based on a scale of 0 to 5; [a]Science, Technology, and Environment theme

Table 13. Analysis of Variance Summary Comparing Theme 4[a] Test Scores Between Students' Colleges during the Fall Semester of 2012

	SS	*df*	*MS*	*F*	*p*
College	14.936	5	2.987	1.11	0.35
Error	1355.499	505	2.684		
Total	1370.434	510			

Note. [a]Business and Economics theme

Table 14. A Description of Student Test Scores for Theme 4[a] by College during the Fall Semester of 2012

Rank	College	*f*	%	*M*	*SD*
1	CEAT	110	21.62	3.04	1.12
2	CASNR	121	23.61	2.83	1.10
3	SSB	52	10.33	2.75	1.21
4	CoE	51	10.11	2.71	1.22
5	CAS	131	25.72	2.67	1.31
6	CHS	44	8.72	2.52	1.23

Note. CASNR = College of Agricultural Science and Natural Resources; CAS = College of Arts and Sciences; CoE = College of Education; CEAT = College of Engineering, Architecture, and Technology; CHS = College of Human Sciences; SSB = Spears School of Business; *M* = Mean score based on a scale of 0 to 5; [a]Business and Economics theme

Table 15. Analysis of Variance Summary Comparing Theme 5[a] Test Scores Between Students' Colleges during the Fall Semester of 2012

	SS	*df*	*MS*	*F*	*p*
College	18.440	5	3.688	3.94	0.00*
Error	486.371	519	0.937		
Total	3166.000	525			

*$p < 0.05$; [a]Food, Health, and Nutrition

Table 16. A Description of Student Test Scores for Theme 5[a] by College during the Fall Semester of 2012

Rank	College	*f*	%	*M*	*SD*
1	CASNR	125	23.8	2.49	0.92
2	CEAT	115	21.9	2.37	0.91
3	CHS	45	8.6	2.20	0.90
3	SSB	54	10.3	2.20	1.21
5	CAS	134	25.5	2.10	1.01
6	CoE	52	9.9	1.91	1.00

Note. CASNR = College of Agricultural Science and Natural Resources; CAS = College of Arts and Sciences; CoE = College of Education; CEAT = College of Engineering, Architecture, and Technology; CHS = College of Human Sciences; SSB = Spears School of Business; *M* = Mean score based on a scale of 0 to 5; [a]Food, Health, and Nutrition

0.01). The practical significance can be observed by the mean differences found between CASNR and CAS (*MD* = 0.41), CASNR and CoE (*MD* = 0.49) and CASNR and CHS (*MD* = 0.57) (Table 12).

No statistically significant differences were found between students' colleges (Table 13) and theme 4 test scores in Business and Economics (Table 14).

A statistically significant difference was found between students' theme 5 test scores in Food, Health, and Nutrition and by college $F(5, 519) = 3.94$, $p = 0.00$ (Table 15). Statistically significant differences were noted between CASNR and CAS ($p = 0.00$) and CASNR and CoE ($p = 0.00$). The practical significance can be observed by the mean differences found between CASNR and CAS (*MD* = 0.39) and CASNR and CoE (*MD* = 0.58) (Table 16).

Summary

On the 25-question test, scores ranged from 12.46 to 15.33. CASNR's mean score percentage was 61.2 and was the highest mean score by college (Table 4). Overall, the freshmen mean score on the agricultural literacy test was 56%, indicating the students did not demonstrate a passing knowledge of agriculture, if 70% is considered the threshold. Unfortunately, this finding is not uncommon and is congruent with the findings of other researchers, e.g., Colbath and Morrish (2010) and Pense and Leising (2004).

Statistically significant differences were found between CASNR and CAS, CoE and CHS. Males scored higher than females on the agricultural literacy test, which supports Colbath's and Morrish's (2010) findings who also found that male students expressed more agricultural knowledge than did female students. CASNR students outscored their counterparts in other colleges regarding the Science, Technology, and Environment and Food, Health and Nutrition themes (Tables 12 and 16). CEAT students, however, scored higher than their counterparts in the CASNR for the Understanding Food and Fiber Systems (Table 8) and Business and Economics themes (Tables 8 and 14) and only very slightly in regard to the History, Geography and Culture theme (Table 10).

Recommendations for Additional Research

This study focused on the incoming freshmen class at Oklahoma State University during the Fall semester of 2012; however, additional research should be conducted to examine the literacy levels of other classes, including graduating seniors. More understanding about the role of antecedent variables and differences in performance of students by college, which was essentially a proxy for clusters and undergraduate majors, also may be in order, e.g., agriculture and science course-taking in high school and related out-of-school experiences. Further, these students should be followed and assessed periodically to determine the impact their education at a LGU has on their knowledge and understanding of agriculture as well as related attitudes and behaviors.

This study should be replicated at other institutions with different freshmen populations. Specifically, students at LGUs should be compared to students at non-LGUs to determine the amount of agricultural literacy they bring to and exit with from those institutions.

Recommendations for Practice

Because criterion-referenced tests are used often for credentialing, an introduction to agricultural literacy

course should be offered at Oklahoma State University for all incoming freshmen. Potential educational content areas should include history of agriculture, globalization of agriculture, animal agriculture practices and related ethical issues, environmental literacy, sustainable agriculture practices, food production and the economics of agriculture.

Although the overall mean scores for students were below average (Table 4), it is important to focus in on the areas and themes where more emphasis should be placed (Kovar and Ball, 2013). The highest mean score of the five themes was theme 3 – Science, Technology and Environment (*M* = 3.29). The lowest mean score was theme 5 – Food, Health and Nutrition (*M* = 2.25). New and existing agricultural literacy curriculum should increase its focus on improving students' knowledge in food, health and nutrition, as well as consider more ways to incorporate aspects of themes 1, 2 and 4 into the students' general education curricula.

Implications and Discussion

The improvement of agricultural literacy remains a work in progress. Even though an increase in providing more agriculturally infused curriculum for K-12 has occurred during the last three decades (Kovar and Ball, 2013; Pense and Leising, 2004), this study supports the fact that students are either not learning the concepts, or are not retaining this information. Why is that? With the overall mean scores on the agricultural literacy test being below average, it could be surmised that efforts to infuse agriculture into K-12 curriculum are either non-existent or not being done successfully. If agricultural concepts are to be taught in primary and secondary school settings, more emphasis should be exerted to ensure that future educators are attaining the content knowledge and pedagogical tools they need to create and teach lessons infused properly with agricultural facts, principles, and concepts. This could be an important role for agricultural educators at the institution studied, as well as at other universities with agricultural education programs. It also may be important to explore what role K-12 science education should play in improving the agricultural literacy of U.S. students, pre-college.

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