

Integrating Agricultural Science into Middle School, High School, and Alternative School Science Curricula

Abstract

Middle school and high school student's classroom experiences are very influential in determining their future educational interest. Female students are typically in the minority in traditional university agricultural science programs. The Rural Alliance for Improving Science Education was initiated at Oklahoma State University in cooperation with three rural school districts where scientist were teamed with middle school and high school science, mathematics, technology, and agriculture teachers to integrate geographic information systems, global positioning systems, and remote sensing technologies into their respective curricula. A similar project was initiated at the University of Wyoming in cooperation with the Wyoming Girls Reform School. The objective of this portion of this study was to assess the perceptions of female high school students ($n = 50$) towards agriculture in general and agricultural science as a post-secondary education major before and after completing a semester of agricultural science lesson plans that were integrated into their high school science curricula. Initial results indicate that the students in this study agreed that studying agriculture is important, is a scientific area of study, and is not only for males or for those with farm backgrounds. Students were unsure if majoring in agriculture in college was easier than other majors, but disagreed that agriculture was better suited for under-achieving students. After completing the agricultural science lessons plans, students perceptions of agriculture did not significantly change.

Introduction

About sixty-million people live in rural America, but only about two-million people are directly engaged in production agriculture and this number is continually declining (Goecker et al., 2005). Many high school students do not realize that studying agriculture involves the disciplines of science, technology, engineering, and mathematics. Hansen et al. (2007) noted the steady enrollment decline in soil and crop science university programs during the last twenty years. In their survey of land-grant institutions, the researchers found that less than one-third of College of Agriculture students are enrolled in traditional agricultural production programs. In addition, female students are typically in the minority in university agricultural science majors. Two projects were initiated to broaden the horizons of students interested in general science, technology, engineering, and mathematics by exposing them to agricultural science and research.

The Rural Alliance for Improving Science Education (RAISE) was a partnership between Oklahoma State University (OSU) and Perkins/Tryon, Morrison, and Hennessey, OK Public Schools. The RAISE program partnered ten OSU graduate students with ten K-6-12 science, math, and agriculture program teachers to improve science education by integrating GIS technology (Geographic Information Systems, the Global Positioning System, and remote sensing) into classroom curricula (Figure 1).

A similar project was initiated at the University of Wyoming (UW) in cooperation with the Wyoming Girls Reform School (grades 9-12). A UW scientist integrated agricultural science concepts and lesson plans into the existing science curriculum (Figure 2).



Figure 1 (left). Morrison High School (OK) students collecting water quality samples the hard way.



Figure 2 (right). Wyoming Girls School students measuring soil pH.

Objective

The objective of this portion of the study was to assess the perceptions of female high school students towards agriculture in general and agricultural science as a post-secondary education major before and after completing a semester of agricultural science lesson plans that were integrated into their high school science curricula.

Methods

A descriptive survey was created and administered to female high school students ($n = 50$) before and after completing a series of agricultural science lesson plans that were integrated into their high school science curriculum. The survey consisted of three sections. Part one of the survey collected demographic information, part two of the survey assessed the attitudes of the respondents towards agriculture in general and agricultural science as a field of study. The survey was constructed similar to Dyer et al. (1999) and part two of the survey used a five-point Likert-type scale where 1 = strongly disagree, 2 = disagree, 3 = uncertain, 4 = agree, and 5 = strongly agree. The internal consistency reliability of part two of the survey was 0.71 using Cronbach's Alpha. Analysis of variance and measures of central tendency were used to analyze results of the survey.

Results and Discussion

Demographics

All 50 students surveyed in this study were female and 22% were in ninth grade, 14% were in tenth grade, 36% were in eleventh grade, and 28% were in twelfth grade. The students ages ranged from 14 to 18 years of age and 12% were 14 years old, 8% were 15 years old, 48% were 16 years old, 24% were 17 years old, and 8% were 18 years old. The majority of students reported Caucasian (54%) as their ethnicity/ancestry while 20% reported other, 10% reported bi/multi-racial, 6% reported Native American, 6% reported Hispanic, 2% reported African-American, and 2% reported Asian. The majority of students (84%) reported that they had never completed a high school agriculture class, 80% reported they did not have an agricultural background, 70% reported they were not involved in 4-H, and 92% reported they were not involved in FFA. Forty-percent of the students reported they planned on enrolling in a two-year college after high school while 32% reported they planned on enrolling in a four-year university, 12% reported they planned on entering the workforce, 8% reported they planned to enter the military, and 8% reported other or undecided.

Perception of Agriculture and Agricultural Science

Prior to completing agricultural science lesson plans, the students generally agreed that agriculture is a scientific area of study and that students do not need farm backgrounds to pursue careers in agriculture (Table 1). The students were unsure if agriculture is a highly technical field and if the perception of agriculture is improving (Table 1). After completing the agricultural science lessons plans, students perceptions of agriculture did not significantly change.

Table 1. Wyoming Girls School students ($n = 50$) perception of agriculture before and after completing agricultural science lesson plans with a University of Wyoming Department of Plant Sciences Faculty Member.

Statement	Pre-visit Score		Post-visit Score	
	Mean	SD	Mean	SD
Agriculture is a scientific area of study.	3.56	0.91	4.42 NS [†]	0.51
Agriculture is a blend of scientific principles and agricultural practices.	3.59	0.63	4.10 NS	0.70
Agriculture is a highly technical field of study.	3.24	0.58	3.76 NS	0.70
The perception of agriculture is improving.	3.34	0.72	3.81 NS	0.75
Only students with farm backgrounds should pursue careers in agriculture.	1.93	0.84	1.95 NS	0.92

[†] Scores are based upon a five-point Likert-type scale where 1 = strongly disagree, 2 = disagree, 3 = uncertain, 4 = agree, and 5 = strongly agree
[‡] NS = not significant

Results and Discussion Continued

Prior to completing agricultural science lesson plans, the female high school students were unsure if college-bound students should enroll in high school or college agriculture programs (Table 2). The students did not believe that high school and college agriculture classes were better suited for males and/or under-achieving students (Table 2). Students were unsure if majoring in agriculture in college was easier than other majors (Table 2). However, the students agreed that the study of agriculture is important. After completing the agricultural science lessons plans, students perceptions of agriculture did not significantly change.

Table 2. Wyoming Girls School students ($n = 50$) perception of agriculture science as a field of study before and after completing agricultural science lesson plans with a University of Wyoming Department of Plant Sciences Faculty Member.

Statement	Pre-visit Score		Post-visit Score	
	Mean	SD	Mean	SD
College-bound students should be encouraged to enroll in high school agricultural courses.	3.21	0.76	3.91 NS [‡]	0.76
High school agriculture classes are better suited for male students.	1.93	0.86	1.50 NS	0.61
High school agriculture classes are better suited for under-achieving students.	2.00	0.76	1.70 NS	0.73
More students should be encouraged to enroll in college or university agriculture programs.	3.11	0.87	3.76 NS	0.62
College or university agriculture classes are better suited for male students.	2.67	0.66	3.43 NS	0.66
College or university study in agriculture is easier than most other majors.	2.82	0.55	2.52 NS	0.68
College or university study in agriculture is easier than majoring in math or science.	2.86	0.53	2.57 NS	0.81
Only students majoring in college or university agriculture should take agriculture classes.	2.72	0.84	2.89 NS	0.87
Studying agriculture is important.	3.56	0.84	3.81 NS	0.98

[†] Scores are based upon a five-point Likert-type scale where 1 = strongly disagree, 2 = disagree, 3 = uncertain, 4 = agree, and 5 = strongly agree
[‡] NS = not significant

Literature Cited

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