

A Comparison of Student Knowledge and Perceptions toward Agriculture Before and After Attending a Governor's School for Agriculture

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Abstract

The goals of this longitudinal study were to 1) identify the demographic profiles of students who attended the 2001 and 2003 Virginia Governor's School for Agriculture (VGSA); 2) identify students' knowledge and perceptions of agriculture before and after attending VGSA; and 3) identify students' perceptions toward current agricultural issues (i.e. biotechnology, animal rights/welfare, the environment, etc.) before and after completing VGSA. Results indicate an increase in the students' knowledge of agriculture after completing the VGSA each year data were collected (2001 and 2003). In addition to an increase in agricultural knowledge, students were more confident in their knowledge as indicated by a decrease in the number of "not sure" answers on the post-test. The class of 2003 differed from those in the 2001 class concerning their perceptions of biotechnology. Students in the 2003 class enrolled in a biotechnology course, unavailable in 2001, which may have altered their perceptions. Students in the class of 2001 also showed a stronger knowledge of general agricultural literacy in comparison to the 2003 class. This may be due to the fact that nearly 50% of the 2001 class had taken an agriculture course(s) versus only 20% of the 2003 class.

Introduction

Today's US population continues to become more suburbanized and less knowledgeable about the many aspects of agriculture. Many would agree with the need for a basic understanding of agriculture and its importance to our country and citizens (Frick et al., 1995). According to Fishbein and Ajzen (1975), students' and parents' personal experiences, observations, knowledge, and values about agriculture affect their attitudes and beliefs about agriculture. May (1969) concludes that people base their perceptions on past experience and knowledge; therefore, if a person has limited knowledge and experience about a topic, then he or she cannot accurately perceive it.

Several authors (Case, 1993; Coulter, 1985; Mallory & Sommer, 1986) have researched the lack of agricultural literacy and the relatively poor public image of agriculture. Horn and Vining's (1986) study found that fewer than 30% of a sample (n=2000) of Kansas students, primarily of European descent, could give correct answers to basic agriculture questions. Kansas is one of the top agricultural states in the U.S. If fewer than 30% of high school students in Kansas can give correct answers to agriculture-related questions, certainly students in more urban areas may have even poorer knowledge. Agricultural educators clearly need to increase students' knowledge of agriculture.

High school students' knowledge and perceptions about agriculture can be influenced by a number of factors including the media, family, involvement in agricultural clubs (i.e. 4-H and FFA). According to Whitaker and Dyer (2000), journalists have been trained in how to write but are ill equipped to fully understand their influence in the complex relationship between agricultural producers and consumers. If parents are influenced by ill-informed journalists, they may not encourage their children to enroll in a high school agriculture class or pursue an agricultural degree in college.

Only 31% of Virginia's middle school, high school, and technical centers offer courses in agricultural education (Virginia Association of Agricultural Educators, 2002). In addition to agricultural education classes, students can also gain agricultural experience through participation in the National FFA Organization and/or 4-H. In Virginia there are approximately 9,000 FFA members (National FFA, 2003). This figure represents only 1.6% of the total student population in grades 7 to 12 in Virginia's public school system. Approximately 28,800 (13.9%) of Virginia 4-H members are between the ages of 14 and 19 (Virginia Cooperative Extension, 2003). As indicated by the aforementioned statistics, a small percentage of students have the option of enrolling in an agricultural education course or are involved in

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FFA and 4-H. One of the primary goals of the Virginia Governor's School for Agriculture (VGSA), which was established in 2001, is to expose and educate students regarding the diverse field of agriculture, thus increasing their awareness of the importance of agriculture both locally and globally.

Faculty, staff, and administrators at Virginia Tech offer a four-week residential program during the months of July and August called the Virginia Governor's School for Agriculture (VGSA). The College of Agriculture and Life Sciences (CALs) serves as the administrative unit and host College. CALs also works collaboratively with the colleges of Liberal Arts and Human Sciences, and the Virginia-Maryland College of Veterinary Medicine to conduct the VGSA. The VGSA is designed to provide fieldwork, develop laboratory skills, and provide an intensive educational foundation for careers and further education in the area of agriculture. The School's mission is to provide experiential, advanced scientific and traditional instruction to future leaders and scientists to develop their understanding of the scope, opportunities, challenges, and both academic and scientific rigor of the broad field of agriculture.

The VGSA is intended for a highly selective group of rising juniors and seniors in public, private, and home schools throughout the Commonwealth of Virginia. To apply for admission to VGSA, students must be identified as gifted in their local school. Home schooled students must apply through the local public school serving their geographic areas. Students apply for admission and are screened at the local level based on a limited number of nominations allocated to the school division. Local schools submit nominated students to the Virginia Department of Education for a second round of evaluations.

Each student attending VGSA selects a "major." In 2001, majors included agricultural economics, animal science, natural resources, and plant science. In 2003, majors included agricultural economics, animal science, food science and technology, veterinary medicine, and plant science. Students in a given major for 2001 completed two specialized (in-major) courses not open to other students. Students attending the 2003 school completed one specialized course. Specialized courses provide more in-depth exposure to the disciplines related to that major. Students also took "core" courses in the agricultural sciences and "elective" courses in areas such as GIS/GPS, food safety, genetics, biotechnology, and leadership in 2001 and 2003. Students didn't receive college credit for completing VGSA courses.

Methods

The purpose of this longitudinal study was to identify high school students' knowledge and perceptions of agriculture before and after attending the 2001 and 2003 Virginia Governor's School for Agriculture (VGSA). Data was not analyzed for the 2002 class. Specific objectives were to identify:

1. The demographic profile of the students from the 2001 and 2003 classes
2. Students' knowledge of agriculture before and after completing the VGSA
3. Students' perceptions toward current agricultural issues (i.e. biotechnology, animal rights/welfare, the environment, etc.) before and after completing the 2001 and 2003 VGSA

This study used a descriptive survey design. The population for the study included all Virginia high school students (juniors and seniors) enrolled in the 2001 and 2003 Virginia Governor's School for Agriculture at Virginia Tech (2001 N=50; 2003 N=86).

The instrument was developed, based upon the aforementioned objectives and a literature review of prior studies (Moore et al., 1996; Frick & Wilson, 1996; Talbert, 1996) and was divided into three sections. Section I measured students' knowledge of agriculture using true/false statements. Section II measured students' perceptions toward specific agricultural issues (pesticides and the environment, soil erosion, animal rights/welfare and biotechnology) using questions based on a five-point Likert-type scale (5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, and 1 = strongly disagree). Section III consisted of questions to quantify demographic variables (gender; age; home location; relatives who work on a farm or in the agribusiness industry; completed a high school agriculture/horticulture course; and FFA and/or 4-H membership).

Face and content validity were established by the Academic Dean and Associate Dean in the College of Agriculture and Life Sciences, faculty in the Agricultural and Extension Education Department, and a former high school agriculture educator. Revisions were made based on recommendations from the group. A pilot study was conducted using eight randomly selected Virginia State FFA officers with varying experiences with agriculture. Cronbach's alpha reliability for Section II of the instrument was .74.

The Governor's School Assistant Director administered the pre-test to all participants at orientation and the post-test the final week of the Governor's School. Students and their families were informed of the study and assured that the data would be reported as group or summative means, and identification numbers would be held confidential. Descriptive statistics including means, standard deviations, frequencies, percentages, and cross tabulations were used to identify change in students' knowledge and perceptions.

Results and Discussion

The first objective was to identify the demographic characteristics of the VGSA participants. Over 60% of the respondents were female in both classes (Table 1). The number of

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students who live in a suburb increased from 24% (2001) to 45% (2003); the percentage of students living in a town or city remained constant; and the percentage of students from rural areas decreased from 24% (2001) to 19% (2003). Fifty-six percent of the 2001 class indicated that they had a relative(s) who own or work on a farm as compared to 48% in 2003. Forty-six percent of the 2001 class indicated that they had a relative(s) who work in the agribusiness industry as compared to 35% in 2003. Fifty percent of the 2001 class had taken a high school agriculture course. Only 20% of the 2003 class indicated taking a high school agriculture course. Forty-six percent of the 2001 class were 4-H members in comparison to only 19% of the 2003 class.

The second objective was to identify the students' knowledge of agriculture before and after completing the VGSA. For section I of the pre-survey, at least 90% of the students from 2001 and 2003 correctly answered six of the 21 statements (5, 8, 14, 15, 20, and 21) (Table 2). For each statement, students had three options for which to choose: true, false, or not sure. Of the aforementioned, statement 21 identified one's knowledge of food products; 5, 8, and 20 focused on global agriculture; and statements 14 and 15 identified knowledge of biotechnology. Statement 9 asked students if they agreed/disagreed that approximately 25 cents of every dollar spent on food in the U S goes to the farmer or producer, and 19 stated that animal welfare and animal rights are one and the same. Only 51% and 34% of the students from 2001 and 2003 respectively correctly answered statement 9, while 22% in 2001 and 44% in 2003 were "not sure" concerning statement 19, and just 8% in 2003 correctly answered the statement.

For the post-survey, at least 90% of the students from 2001 and 2003 correctly answered 10 of the 21 statements (3, 5, 7, 8, 10, 12, 14, 15, 20, and 21) on the

post-survey. Statement seven focused on animals as a source of medicinal products; statement 10 on soil erosion; and 12 focused on food safety. The largest percent increase in correct student responses on the post-survey were for statements 4, 9, 11, although fewer than 90% correctly answered each statement. The largest percent increase for the 2003 students (Table 2) is statement 19, concerning the difference between animal welfare and animal rights.

The third objective was to identify students' perceptions toward current agricultural issues before and after completing the VGSA. Students were asked to rate 19 statements using the following mean scale: Strongly Disagree (M=1.0-1.49), Disagree (M=1.5-2.49), Neutral (M=2.50-3.49), Agree (M=3.5-4.49), and Strongly Agree (M=4.50-5.0). On the pre-test (Table 3), the 2001 class agreed or strongly agreed with statements 1-4, 6, 8-10, and 14; were neutral concerning statements 11-13, and 15-16; and disagreed or strongly disagreed with statements 17-19. The 2003 class agreed or strongly agreed with statements 2-4, 6, 8-9, 13-14, and 18; were neutral concerning statements 5, 7-8, 11-12, and 15-17; and disagreed or strongly disagreed with statements 1 and 19. The perceptions of the 2003 class differed from those of the 2001 class concerning how much U.S. citizens spend for food in comparison to other countries; the belief that genetically modified foods should be labeled; livestock should have the same rights as people; farmers have no control over food prices; and agriculture is the greatest polluter of water supplies.

On the post-test (Table 3) the 2001 class did not agree with any additional statements mentioned in the previous section, but they did move from neutrality to disagreement with the following statements: 7, 11, 12, and 13. The 2003 class did not agree with any additional statements on the post-test, but they moved from agreement or neutrality to disagreement on a number of statements (2-4, 6, 8-10, 13, and 14). The class of 2003 displayed substantial differences between pre and post-test results concerning issues related to pesticides, organic production, and biotechnology.

The VGSA was designed for a select group of individuals who are identified as gifted by the local school system and recognized by the Virginia Department of Education. The 2001 and 2003 demographics revealed that as the Governor's School progresses, the student population is farther removed from agriculture. The number of students enrolled in a high school agriculture class has declined as has the number of students who live on farms. With

Table 1. Demographics of Governor's School Participants

Variable		2001	2003
		%	%
Gender	Female	62.0	63.0
	Male	38.0	37.0
Age	15	8.0	5.0
	16	44.0	42.0
	17	48.0	52.0
	18		1.0
Home	Farm	34.0	14.0
	Suburb	24.0	45.0
	Town or city	18.0	22.0
	Rural Area	24.0	19.0
Relative(s) on a farm	Yes	56.0	48.0
	No	44.0	52.0
Relative(s) in agribusiness	Yes	46.0	35.0
	No	54.0	65.0
High school agriculture	Yes	50.0	20.0
	No	50.0	80.0
FFA member	Yes	50.0	22.0
	No	50.0	78.0
4-H member	Yes	46.0	19.0
	No	54.0	81.0

Note: N=50 for 2001; N=86 for 2003.

Table 2. Students' Knowledge of Agriculture before and after Attending the VGSA

Statement	2001				2003			
	Pre		Post		Pre		Post	
	Correct	Not Sure						
	%	%	%	%	%	%	%	%
1. There are more farmers in the US than there were 10 years ago	90	8	96	0	80	11	89	3
2. Less than 3 percent of the US gross national product is from agriculture	76	10	54	12	71	11	69	7
3. E. Coli bacteria is found only in hamburger	88	4	92	6	90	5	94	4
4. The use of pesticides has increased the yield of crops	74	18	92	0	71	18	81	7
5. US research has improved farming methods in other countries	94	4	96	2	98	2	97	1
6. To kill E. Coli or Salmonella bacteria in meat, one must freeze it before cooking	86	8	86	12	87	7	78	5
7. Animals can be a valuable source of medical products	94	4	96	2	80	9	90	5
8. The US does not sell its feed grains (corn, soybeans, wheat, etc.) on the world market	90	6	92	6	93	7	91	6
9. For every \$1.00 consumers spend on food in the US, the farmer/rancher receives approximately 25 cents	51	22	68	14	34	44	56	17
10. Soil erosion does not pollute US lakes and rivers	90	6	100	0	88	5	93	2
11. One of every five jobs in the US is related to agriculture	70	14	86	8	58	21	75	9
12. Salmonella bacteria is most often found in eggs and poultry meat	84	8	90	6	84	6	91	3
13. Pesticides can't be used in organic food production	62	12	82	6	57	7	64	6
14. Biotechnology has increased the pest resistance of plants	94	2	96	0	95	4	93	2
15. Tomatoes that stay fresh longer are an example of biotechnology	94	4	96	2	90	7	90	5
16. The average US farm is larger than 500 acres	50	26	50	8	57	24	52	9
17. Grain exports are usually transported between continents by airplane	45	33	46	28	52	26	47	19
18. Biotechnology has increased animal production in the US	12	14	16	12	8	12	20	9
19. Animal welfare and animal rights are the same	80	8	82	8	8	12	78	7
20. Several countries depend on US agriculture exports for food and fiber	96	4	94	2	93	5	92	2
21. Hamburger is made from the meat of pigs	94	6	92	4	97	1	90	3

Note: N=50 for 2001; N=86 for 2003.

vet science, agribusiness, biotechnology, and various electives), research projects, field trips, and other experiences related to agriculture which increased their agricultural literacy. Not only did the students change their answers about agriculture during the four week period, but they also changed their answers from “not sure” to a definitive answer (agree or disagree). The number of statements that students responded “not sure” on the post-test decreased: 15 statements changed for the 2001 class and 20 statements changed for the 2003 class. This decisiveness may be due to a rise in confidence, as students gain more agricultural knowledge and experience. Finally, there was a slight decrease in correct responses on the post-test versus the pre-test on four statements for the 2001 class, and six statements for the 2003 class. This decrease may be due in part to the fact that, although students gained added knowledge about agriculture through the VGSA courses and therefore gained added confidence about agriculture, these courses did not cover specifically any of the statements to which the students responded in the pre and post-tests.

Perceptions of agricultural issues differed between the two classes. The 2001 class agreed on both the pre and post-test that pesticides can be used safely to produce food, whereas the 2003 class agreed on the pre-test but disagreed with the statement on the post-test. Similar results were also found when the 2003 class was asked if agriculture is the largest polluter of groundwater, with the 2001 class agreeing on both the pre and post-test that foods derived from

the decline in the number of students who have been directly exposed to agriculture, the researchers question the agricultural knowledge of the scholars prior to attending the VGSA.

During the four week interval for both classes (2001 & 2003), the students participated in coursework (agronomy, horticulture, animal science,

biotechnology should be labeled, and the 2003 class being neutral on the pre-test and disagreeing with the statement on the post-test. The 2003 Governor's School offered more courses in the area of biotechnology, an increase which may have provided more literacy on the topic. The 2001 Governor's

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Table 3. Students' Perceptions toward Current Agricultural Issues Before and After Attending the VGSA

Statement	2001				2003			
	Pre Test		Post Test		Pre Test		Post Test	
	M	SD	M	SD	M	SD	M	SD
1. US citizens spend a higher percentage of their income on food than in other countries	3.68	1.36	3.00	1.70	2.30	1.20	2.10	1.09
2. Agriculture employs a large number of people in this country	3.76	0.91	4.11	1.08	3.48	1.14	2.30	1.05
3. Pesticides can be used safely when producing food	3.52	0.90	3.86	0.81	3.51	1.01	2.13	0.90
4. Organic production methods are a realistic alternative to using pesticides	3.66	0.89	3.43	1.02	3.70	0.76	2.48	0.92
5. Confinement housing is an acceptable practice when raising livestock	2.66	1.22	3.13	1.01	2.75	1.07	2.74	1.10
6. Biotechnology has increased the yield of crops in the US	3.98	0.71	4.11	0.71	4.32	0.71	1.74	0.65
7. Agriculture is the largest polluter of groundwater	2.58	0.99	2.49	0.98	3.17	0.98	2.89	1.08
8. Farmers are concerned about the humane treatment of animals	3.82	0.91	3.94	0.87	3.54	1.10	2.35	0.97
9. The world food supply has increased as a result of improved technology	4.2	0.72	4.09	0.67	4.27	0.80	1.73	0.74
10. Foods derived from biotechnology should be labeled in US supermarkets	3.92	0.86	3.7	1.14	3.48	1.01	2.45	1.11
11. Only organic methods should be used to produce foods	2.6	0.88	2.19	0.90	2.53	.86	2.50	0.95
12. Farmers should not use chemicals in crop production	2.56	0.97	2.23	0.84	3.42	0.96	2.55	0.94
13. Livestock (cattle, pigs, etc.) have the same rights as people	2.92	1.10	2.45	1.11	3.61	1.09	2.36	1.08
14. Processing adds more to the cost of food than the raw product	3.7	0.76	4.09	0.70	3.69	0.75	2.15	1.04
15. Farmers have no control over food prices in the supermarket	3.4	1.01	3.62	1.03	3.05	1.17	2.70	1.13
16. Foods derived from biotechnology are safer than food grown by conventional practices	2.94	0.71	2.86	0.74	3.28	0.68	3.04	0.83
17. The government should exert more control over farming	2.42	0.83	2.29	0.97	3.39	0.98	2.81	0.92
18. Agriculture is the greatest polluter of our water supply	2.38	0.92	2.43	1.09	3.50	0.92	2.60	1.05
19. Livestock (cattle, pigs, etc.) should not be used for food	1.52	0.78	1.54	0.89	1.58	0.93	1.88	1.06

Note: N=50 for 2001; N=86 for 2003. 1 = Strongly Disagree to 5 = Strongly Agree.

School addressed biotechnology as a subunit, but did not offer a course that addressed the topic fully.

Perceptions about the use and management of farm animals varied greatly between the two classes. Both groups of students disagreed that animals should not be used for food; however, they had mixed perceptions about confinement of animals. The 2001 and 2003 classes were “neutral” on both the pre and post-test when asked if confinement housing is an acceptable practice when raising livestock. Richards et al. (2000) noted that farm practices if not understood can be misinterpreted and considered cruel and inhumane. One may conclude that even though 50% of the 2001 class had some form of agricultural experience, they still were uncertain about confinement housing, an agricultural issue that has received much attention in the media. The

2001 class agreed on both the pre and post-test that farmers are concerned about the humane treatment of animals; the 2003 class agreed on the pre-test, but disagreed with the statement on the post-test. This change in perceptions for the 2003 class may be partially due to their exposure to the many facets of livestock production during the VGSA that which increased their awareness of the topic. This conclusion concurs with Nordstrom et al (1999) whose research identified students' attitudes toward animal-derived products and services.

Recommendations

Based on the findings of this study, the VGSA was successful in expanding 2001 and 2003 participants' agricultural literacy. Thus, it is recommended that the VGSA be used as a model for other land-grant institutions. Currently, there are only three known Governor's schools across the nation: the VGSA, the Pennsylvania Governor's School for Agricultural Sciences (PGSAS), and the Georgia Governor's Honors Program in Agriscience and Biotechnology. These programs not only serve as agricultural literacy tools, but also provide opportunities for administrators and faculty to

recruit future scholars to agricultural colleges. Because of VGSA's success, the researchers suggest that additional funding be identified to support a larger number of participants. As a final note, a longitudinal study should be conducted to determine if in fact the VGSA did persuade student participants to enroll in a college level agriculture program and move into the ever expanding field of agriculture upon graduation.

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