The Role of Agriculture in Reaching Gifted and Talented Students

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Abstract

The agricultural industry has become more sophisticated and, consequently, has a great need for talented employees. Attracting gifted and talented young people to the industry may be a solution to its current needs. A school such as the Virginia Governor's School for Agriculture can help attract such a talent base to the agricultural industry. The results include a definite trend toward more urban students participating since its inception in 2001. The majority of the students are white and female. The vast majority are currently enrolled in a post-secondary institution or plan to attend one. It was concluded that the Governor's School exposed gifted and talented students to the diversity of agriculture and increased their agricultural literacy. The Virginia Governor's School for Agriculture, and programs like it, can help interest and prepare gifted and talented students for the agricultural industry.

Introduction

Agriculture in recent decades has become technologically advanced and increasingly complex. As a result, production requires ever fewer people. For several decades, the industry has needed a steady supply of well-trained and highly educated professionals to insure future success (Betts and Newcomb, 1986). Many careers in agriculture today demand skills in science and math (Shelley-Tolbert et al., 2000), offer high salaries, and appear in profitable sectors of the agricultural industry, such as food processing and agricultural finance (National Research Council, 1988). The changes in the employment structure of the agricultural industry necessitate employees with an increased level of education in math, science, and technology (Shelley-Tolbert et al., 2000). Among the students with the potential to meet the demands of the agricultural job market are those who have been identified as gifted and talented.

The agricultural industry now faces the challenge of recruiting gifted and talented students to pursue study and careers in agriculture. As the National Research Council's (1988) benchmark report on agricultural education in the late 1980s concluded, American students and the general public did not have an understanding of the scope of agriculture, the career possibilities in the industry, or the sophisticated level of science required by the industry. In the early 1980s, as many as 13% of the jobs in the food and fiber industry were either filled by under-qualified individuals or not filled at all (Mallory and Sommer, 1986). Two decades later, that trend has continued. Employment opportunities in the agricultural and natural resources sector are expected to remain strong over the next five years. Researchers predict that approximately 52,000 jobs will be available annually in agriculture between the years 2005 and 2010, with only 49,300 qualified college graduates available for these jobs (Goecker et al., 2005).

One way to encourage gifted and talented students, especially non-traditional students, to enter the field of agriculture is to design programs specifically for them.

One example is a summer enrichment program. In several states, including Virginia, Pennsylvania, and Tennessee, agricultural enrichment programs have been developed for gifted and talented students. Pennsylvania established the first Governor's School program in 1986 at Penn State University. The Pennsylvania Governor's School for Agricultural Sciences (PGSAS) illustrated the success of specifically targeting gifted and talented students (Houser and Baker, 1991). The Virginia program, called the Virginia Governor's School for Agriculture (VGSA), was conceived to enhance the agricultural literacy of gifted and talented students from Virginia (Duncan and Broyles, 2004) and admitted its first pupils in the summer of 2001. The Virginia Department of Education defines gifted and talented as those students who require special educational programs because of their demonstrated outstanding abilities and potential (Virginia Department of Education, 2005).

The Virginia Tech campus has hosted the school since its inception, and the school has since grown from 52 students in the first class to 92 in 2004. Organizations such as the Virginia Farm Bureau and the Virginia Agribusiness Council recognized an agricultural Governor's School as a tool to develop gifted and talented students' knowledge of the food and fiber system, recruit students to study agricultural sciences in higher education, and motivate

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them to pursue careers in the industry (Virginia Farm Bureau, 2000). Through the efforts of industry groups, the Virginia General Assembly adopted legislation creating funding for the VGSA in 2000.

The Department of Agricultural and Extension Education (AEE) in the College of Agriculture and Life Sciences (CALS) at Virginia Tech is the administrative body for the VGSA. Faculty and staff of the Department of Agricultural and Extension Education develop the curriculum and activities for the four-week school, which begins the first Sunday of July. AEE faculty and staff collaborate on the curriculum with faculty from CALS, the College of Natural Resources, the College of Liberal Arts and Human Sciences, and the Virginia-Maryland College of Veterinary Medicine. Instructors for the VGSA are members of the faculty of participating colleges and secondary agricultural instructors throughout the state.

The Mission of the VGSA:

To provide hands-on, cutting-edge, scientific and academic instruction to future leaders and scientists in developing their understanding of the scope, opportunities, and challenges, through academic and scientific rigor of the broad fields of agriculture, human health, natural resources, and veterinary medicine. (VGSA, 2004, p. 3).

The school has the following goals:

• To provide educational programs designed to increase student knowledge of the infrastructure, scope, and implications of Virginia's largest industry, agriculture;

• To acquaint rising juniors and seniors with the professional and scientific education and career opportunities available to them in the agricultural, human health, natural resources, and veterinary medicine sectors;

• To provide structured educational programs in agriculture, natural resource management, veterinary medicine, environmental systems, and life sciences that will challenge these gifted and talented youth to study and research the scientific nature of agriculture and natural resources management as it relates to and affects environmental sustainability;

• To promote an atmosphere of inquiry and dialogue, with an appreciation for multicultural diversity; and

• To increase understanding of the complexities involved in providing safe, economical, and aesthetically pleasing food, fiber, and shelter (VGSA, 2004).

Students apply for the Virginia Governor's School for Agriculture through their local school divisions. Private and home-schooled students are also eligible for the VGSA program (Duncan and Broyles, 2004). Each student at VGSA selects a major in agricultural economics, animal science, food science, natural resources, plant science, or veterinary medicine. All students take a core course in each of the six fields of study and one specialized course in his or her major. Students also take a communication and presentation course, which provides instruction in public speaking and professional presentation, and several elective courses in such fields as global positioning systems, food safety, genetics, biotechnology, and leadership (Duncan and Broyles, 2004). These courses combine several teaching formats, including lecture, discussion, and laboratory.

In addition to the classroom curriculum, students also participate in research projects. Each student is assigned to an Independent Group Project (IGP) with two or three other students according to his or her major. Developed under the supervision of university faculty, graduate students, and VGSA staff (VGSA, 2004), the projects address real problems and applications related to agriculture in the state of Virginia and provide students an opportunity to conduct real-world research. Projects from the 2004 school included Expanding an Agricultural Entrepreneurship Through Agri-marketing and Agri-tourism; Sex Determination in Chicken Tissue Samples using PCR; Investigation of Edible Protein Films in Peanuts to Prevent Oxidation; Remotely Sensing the Future of Forest Sustainability; and Turfgrass Strength for Use on Athletic Fields. Every group is required to produce a paper, professional poster, website, and brochure, which present the results of its research project. The groups also give a 10-15 minute oral presentation as part of the capstone symposium on the final Friday of the school. Since the VGSA's inception, several student project papers have been accepted for refereed publication.

With four VGSA sessions now completed, a longitudinal study could examine the impact of the VGSA on the program's alumni. Specific objectives were to determine:

1. Demographic and other characteristics of the Virginia Governor's School for Agriculture alumni;
2. The alumni perception of the influence of the Virginia Governor's School for Agriculture on participants' choice of institution for post-secondary education; and
3. The alumni perception of the influence the Virginia Governor's School for Agriculture has on participants' choice of major or field of study.

Materials and Methods

This study used a descriptive design. A mail survey was developed using procedures Dillman (2000) recommended. University faculty and both college and high school students helped develop the instrument, which consisted of items to gather demographics and characteristics of the VGSA alumni and Likert-type items to determine alumni perception of the VGSA's influence on choice of college and major. The Likert-type items were tested for reliability, and a Cronbach's alpha of .72 was determined.

The instrument was mailed to the VGSA alumni in early January 2005. Follow-up reminders were sent to students at intervals until data collection was complete.

The sample for this study was the entire population of VGSA alumni (N=316). Of the instruments that were mailed, 11 were returned as undeliverable by the postal service, resulting in an accessible population of 305. In all, 188 instruments (62% of accessible population) were completed. A follow-up phone survey was conducted with 10 randomly selected non-responders. The data from the 10 non-responders was combined with 20 late responders to determine non-response error, and no significant difference existed between the sample and the non-responder/late responder group.

Statistical analysis using SPSS 13.0 for Windows Student Version was conducted on the data. Means and standard deviations were used to measure the impact of the VGSA on students' choice of college and major. Means were compared with t tests and Analysis of Variance (ANOVA) across different demographic variables. VA priori alpha levels were set at 0.05 for all statistical analysis.

Results and Discussion

Demographic characteristics of the respondents are displayed in the Table 1. Females (63%) constituted a majority of those who responded. The students lived in a variety of community settings, with the highest group from urban areas of population greater than 20,000 (38%). Students were predominately white (83%).

Interestingly, FFA members made up a little more than one third (36%) of the sample. The number of FFA members has remained consistent from year to year; however, the proportion of FFA members has drastically decreased from the first to the fourth year of the school. Similarly, 4-H members made up a little more than one quarter (27%) of the sample, and, as with FFA, while the number of 4-H members has remained constant each year; the proportion has decreased since the inception of the program.

Table 1. Demographic Profile of VGSA Respondents

VGSA Class	2001		2002		2003		2004		Total	
Variable	***n***	**%[z]**	***n***	**%[z]**	***n***	**%[z]**	***n***	**%[z]**	***n***	**%[z]**
Gender										
Male	8	29	19	46	19	36	23	35	69	37
Female	20	71	22	54	34	64	43	65	119	63
Residence										
Farm	9	33	10	25	7	13	13	20	39	21
Small Town/Rural	7	26	11	28	9	17	3	5	30	16
Small Urban	7	26	8	19	12	23	18	27	45	24
Urban	4	15	11	28	25	47	32	48	72	39
FFA Membership										
Member	19	68	17	44	14	26	17	26	67	36
Non-Member	9	32	22	56	39	74	49	74	119	64
4-H Membership										
Member	11	39	14	36	12	23	13	20	50	27
Non-Member	17	61	25	66	40	77	53	80	135	73
Racial/Ethnicity										
White (Not Hispanic)	27	96	38	93	43	81	48	73	156	83
Black (Not Hispanic)	1	4	0	0	2	4	4	6	7	4
Asian (Not Hispanic)	0	0	3	7	8	15	11	17	22	12
Unknown/Unidentified	0	0	0	0	0	0	3	4	3	1

[z]Percentage of total for specified year.

One hundred seven (57%) of the respondents to the survey had completed high school. Of those students, three were not currently enrolled in a post-secondary institution. One was a partner in his father's dairy farm, and the other two planned to attend college in the future. Of the 104 students who were enrolled in a college or university, 45 were freshmen, 35 were sophomores, 23 were juniors, and one was a senior, and their mean college GPA was 3.28 on a 4.0 scale. Four of the students sought associate's degrees. Virginia Tech was the most popular institution among respondents, with 57 VGSA alumni enrolled. The University of Virginia was second, with 13.

All 82 current high school students who responded to the survey reported that they plan to attend a college or university upon graduation. Forty-one voiced an interest in attending Virginia Tech; for 29 students, Virginia Tech was

the only choice. Three students were planning to enroll at Harvard, and eight students were undecided.

All alumni were asked about the influence of the VGSA on their choice of post-secondary institution. This was a Likert-type question, with one being no influence and five being much influence. The mean score for the entire sample was 3.37, with a standard deviation of 1.45. Fifty-five students responded that the VGSA had much influence (five), while 33 responded that the VGSA had no influence (one).

Table 2 provides results by gender, FFA membership, and 4-H membership. The mean for females was slightly higher than for males. An independent samples t test was performed on the two means, and no statistically significant differences were found. The mean for FFA members was higher than that of non-members. Another independent samples t-test was performed on those two means and showed that the means were not statistically different. The mean for 4-H members was higher than non-members, but an independent samples t-test indicated that there was no statistically significant difference between the two means.

Table 2. The Influence of the VGSA on Post-Secondary Choice by Gender, FFA Membership, and 4-H Membership

	Male Students (n=69)		Female Students (n=119)		
	M	*SD*	*M*	*SD*	*t*
Post-secondary choice	3.34	1.44	3.39	1.44	0.22[a]
	FFA Member (n=67)		Non-FFA Member (n=119)		
	M	*SD*	*M*	*SD*	*t*
Post–Secondary Choice	3.56	1.45	3.27	1.44	1.32[b]
	4-H Member (n=50)		Non-4-H Member (n=135)		
	M	*SD*	*M*	*SD*	*t*
Post–Secondary Choice	3.48	1.39	3.33	1.48	0.63[c]

Note. Scale of 1=No Influence, 5=Much Influence
[a] df=185, p≤0.83
[b] df=183, p≤0.19
[c] df=182, p≤0.53

Table 3. The Influence of the VGSA on Post-Secondary Choice by Residential Background and Race/Ethnicity

	Farm (n=39)		Small Town (n=30)		Small Urban (n=45)		Urban (n=72)		
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*
Post-Secondary Choice	3.29	1.56	3.77	1.22	3.42	1.37	3.24	1.52	1.08[a]
	White (n=156)		Black (n=7)		Asian (n=22)		Unknown (n=3)		
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*
Post-Secondary Choice	3.42	1.45	3.86	1.46	2.95	1.46	2.33	0.58	0.88[b]

Note. Scale of 1=No Influence, 5=Much Influence.
[a] F=1.08, df= 3, 181, p<.05
[b] F=0.88, df= 4, 182, p<.05

Statistical analysis for residential background and race/ethnicity is found in Table 3. To factor in residential background, students from small towns (population less than 5,000) had the highest mean, but an ANOVA test revealed that the perception of VGSA influence on post-secondary choice was not statistically different when comparing the size of home community. Similarly, while Black students had the highest mean, means of the different racial/ethnicity groups were compared by an ANOVA analysis and no statistical difference was found.

From the findings, the VGSA on average does not have an overwhelming influence on its alumni's choice of post-secondary institution. However, Virginia Tech had by far the most alumni enrolled and was the dominant choice of alumni who had not completed high school. Four weeks may be a short period of time to convince students to attend a particular institution, especially given the notions that students bring with them from their homes, communities, and schools, but the VGSA provides potential students with exposure to Virginia Tech that they would not otherwise receive. Research from the Pennsylvania program produced similar results. Hoover and Houser (1991) showed that after completing the PGSAS, a slightly higher percentage of students expressed interest in an agricultural career than had upon arrival at the school. Research from the late 1990s indicated that by providing students with access to agricultural education opportunities, the PGSAS led to higher enrollments in colleges of agriculture (Nordstrom et al., 1999).

Alumni were also asked what influence the VGSA had on their choice of college major or field of study. This, too, was a Likert-type question, with one being no influence and five being much influence. The mean score for the entire sample was 2.95, with a standard deviation of 1.46. Thirty-six students responded that the VGSA had much influence (five), while 46 responded that the VGSA had no influence (one). Forty-eight VGSA alumni chose an agricultural major at a post-secondary institution, with Animal Science netting the highest enrollment (n=14). Thirty-two alumni, who were still in high school, responded that they planned to enroll in an agricultural major. Animal Science was also the most popular agricultural major among high school students (n=8).

Table 4. The Influence of the VGSA on College Major or Field of Study by Gender, FFA Membership, and 4-H Membership

	Male Students (n=69)		Female Students (n=119)		
	M	*SD*	*M*	*SD*	*t*
College Major Choice	2.72	1.45	3.08	1.45	1.65[a]
	FFA Member (n=67)		Non-FFA Member (n=119)		
	M	*SD*	*M*	*SD*	*t*
College Major Choice	3.14	1.60	2.85	1.36	1.29[b]
	4-H Member (n=50)		Non-4-H Member (n=135)		
	M	*SD*	*M*	*SD*	*t*
College Major Choice	3.18	1.49	2.85	1.43	1.37[c]

Note. Scale of 1=No Influence, 5=Much Influence
[a] *df*=185, p≤0.10
[b] *df*=183, p≤0.20
[c] *df*=182, p≤0.17

Table 5. The Influence of the VGSA on College Major of Field of Study by Residential Background and Race/Ethnicity

	Farm (n=39)		Small Town (n=30)		Small Urban (n=45)		Urban (n=72)		
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*
Post-Secondary Choice	3.13	1.60	3.37	1.30	2.71	1.46	2.85	1.43	1.55[a]
	White (n=156)		Black (n=7)		Asian (n=22)		Unknown (n=3)		
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*
Post-Secondary Choice	3.02	1.49	3.14	1.46	2.59	1.26	1.67	0.58	1.11[b]

Note. Scale of 1=No Influence, 5=Much Influence.
[a] F=1.55, *df*= 3, 181, p<.05
[b] F=0.88, *df*= 4, 182, p<.05

Results of the influence of the VGSA on college major or field of study by gender, FFA membership, and 4-H membership is found in Table 4. The mean for female students was higher than that for males, but an independent samples t-test showed no statistical difference between the two means. Independent samples t-tests also demonstrated that while members of the FFA had a higher mean than non-FFA members, the mean influence of the VGSA on major or field of study for FFA members was not statistically different from that for non-FFA members, and that while the mean for 4-H members was higher than non-4-H members, the mean influence of the VGSA on major or field of study for 4-H members was not statistically different from that for non-4-H members.

Table 5 displays results of the influence of the VGSA on college major or field of study by residential background and race/ethnicity. Alumni from rural areas or small towns with populations less than 5,000 had the highest mean. An ANOVA analysis showed that there was no statistical difference between the means for residential background. An ANOVA analysis of racial/ethnicity groups revealed that although Blacks had the highest mean, there was no statistical difference between the means when comparing race/ethnicity.

As with choice of college, the VGSA on average did not provide an overwhelming influence on student choice of college major or field of study. Alumni reported a very diverse selection of college majors, and almost one quarter of the respondents reported that the VGSA had no influence on their choice of major or field of study. However, the VGSA did strongly influence a number of alumni (35). As with college choice, the VGSA exposes students to the many fields of study in agriculture, which they might never have learned about without the program. Virginia Tech and the College of Agriculture and Life Sciences benefit from the exposure provided by the VGSA. Other institutions that provide agricultural

disciplines could also benefit from this exposure, as not all VGSA alumni attend Virginia Tech.

Summary

The Virginia Governor's School for Agriculture (VGSA) is an enrichment program developed to expose gifted and talented students to the diversity of the agricultural industry. Industry groups such as the Virginia Farm Bureau and Virginia Agribusiness council supported this summer residential program to increase the agricultural literacy of Virginia's best and brightest. The VGSA and similar programs in other states, including Pennsylvania and Tennessee, fulfill the recommendations of the National Research Council published in its 1988 benchmark report, Understanding Agriculture: New Directions for Education.

As a result of this study, the College of Agriculture and Life Sciences at Virginia Tech should continue to use the VGSA as a recruitment tool. The VGSA provides students with exposure to Virginia Tech and the College that they would not receive had they not participated in the program. Along the same lines, departments representing agricultural majors in the College of Agriculture and Life Sciences should also use the VGSA as a recruitment tool, as the VGSA provides exposure to the different majors and their faculty members.

Similar research should be conducted on similar programs in order to determine the influence of the experience on choice of college and major. These results should be compared with the Virginia school.

Further research should be conducted to provide a more in-depth study of how and why VGSA students select a college and major. Pre- and post-VGSA surveys should be conducted to determine the true nature of the influence of the VGSA on choice of college and major.

The VGSA has been successful, and the Virginia Department of Education should continue it. Other state departments of education and institutions of higher education with fields of study in agriculture should consider implementing programs similar to those in Virginia, Pennsylvania, and Tennessee.

Research has forecast a shortage of qualified candidates for highly skilled positions in the agricultural industry (Goecker et al., 2005). Gifted and talented students can meet agriculture's scientific, mathematical, and technological demands, and programs like the VGSA, through unique experiences and curricula, expose those students to the industry.

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