An Ornamental Summer Program for High School Students: Issues and Perspectives[1]

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Abstract

Potential students who would otherwise be averse to majoring in agriculture, yet who embrace the opportunities available in horticulture industries, should be recruited to this agricultural field. However, they are unaware that ornamental horticulture and related areas, including turf and landscape design, are indeed, agriculture. It is important to provide learning opportunities to increase student's awareness of agriculture so they can make unbiased decisions and enter careers in the field. Therefore, residential ornamental summer internships were conducted in 2005-2007 for select Delmarva Peninsula high school students. Thirty-five high school students from 16 high schools on the Eastern Shore, the Western Shore, and neighboring states participated in the two-week program, where they learned about landscape design, propagation, turf, floral design, horticulture therapy, tissue culture, water quality, geospatial information systems, and horticulture careers. All students reported that they gained new knowledge and interest in the above areas, and demonstrated the gain in knowledge on tests they completed. They agreed that the program increased their desire for a career in ornamental horticulture. Fifty-six percent indicated that they will consider a career in agriculture or ornamental horticulture. Students agreed that they learned much from the program, including new skills, techniques, and ideas.

Introduction

According to ongoing reports, American youth lack agricultural knowledge and literacy while at the same time they have several misconceptions about agriculture (Fields et al., 2003; Myers et al., 2004; Overbay and Broyles, 2008). Influenced by factors such as negative perceptions, the pervasive biases of some sectors of society, career opportunities, and influential individuals, many of these students, particularly minorities, equate agriculture and horticulture with negative images of post slavery share cropping (Bradley et. al, 2000, Fields et. al., 2003, Myers, 2004, Pieter et al., 2004). According to Gilmore's (2006) citing of the study of J. A. Gonzales, 2006, 41% of high school students have a misconception or image issue with agricultural sciences, 33% lack knowledge of employment opportunities, and 22% are unaware of fields of study within Food Agriculture Natural Resources and Related Sciences. Among students the overwhelming perception is that agriculture is farming, which is viewed as boring, stressful, and hard physical labor with low pay (Holzj-Clause and Jost, 1995; Talbert et al., 1999; Overbay and Broyles, 2008). Consequently, some youth avoid studying agriculture or related disciplines when they select their college major and miss the opportunity to have a career in this field. For example, Bradley et al., (2000) reported no minority enrollment in their study of selected horticulture departments and that most of the enrolled students made the decision to major in horticulture while in high school or by the sophomore year in college. Furthermore, the report of Jones and Larke (2003) noted that many students of color did not decide to enroll in an agriculture related class or pursue an agriculture-related career until college, further evidence of the need for more agricultural awareness for K-12 youth.

Youth's aversion to agriculture and horticulture pose a challenge for the workforce since this limits the number of agriculture- prepared graduates to meet workforce needs. Indeed, the 2009 report of the Association of Public and Land Grant Universities (APLU) noted a widening gap between the number of agricultural job vacancies and the number of graduates needed to fill them. In concurrence that the lack of agriculture literacy and agricultural interest among youth must be addressed, some proponents in higher education have now issued the call to support more integration or augmentation of K-12 curriculum through different types of agricultural programs (APLU, 2009).

While there are ways such as vocational agriculture programs like 4-H and FFA, by which the agriculture curricula of K-12 students have been supplemented during the school year, other modes such as short summer programs have also caused gains in agriculture knowledge for students and increased interest in agriculture as evidenced by the work of Cotton et al., 2009, Galbraith et al., 2003, and Russell, 1993. Furthermore, researchers who studied student enrollment suggested that mentoring, teaching, and enhanced interactions with leaders in the career field could have a major impact on these students at the college level (Jones and Larke, 2003).

Experiential activities can be effective in stu-

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dents' learning, by enabling them to understand and make connections with the different disciplines. Since high school students fail to see the inherent multidisciplinary nature of agriculture as not only production and marketing, but also as the science of the disciplines, we believe that the use of learning techniques, such as field trips and hands-on laboratories, will enable them to better understand ornamental horticulture and related disciplines. Herein, ornamental horticulture is defined as the production, marketing, and scientific nature of plant and plant products for aesthetics, and recreational value. Moreover, the value of hands-on experience in supporting the experiential learning of students has been well established (Knobloch's 2003, Powell et al., 2009; Retallick and Steiner, 2009). Ornamental horticulture, along with floriculture, comprises the United States Green Industry, one of the fastest growing sectors in crop- related agriculture. This industry has an average annual growth rate of 9% (Johnson and Johnson, 1993) and represents nearly 10% of all crop agriculture. For greenhouse and nursery crops, the total wholesale receipts continue to rise and were $15.7 billion in 2004 (McCarron, 2005). A similar trend is evident on Maryland's Eastern Shore, home to the University of Maryland Eastern Shore (UMES), where this internship was conducted. Therefore the objective of this program was to provide experiential opportunities for high school students to learn about selected areas of ornamental horticulture and to determine the effects on their agricultural literacy and interest.

Methods

Program Participants and Activities

Through the team efforts of a program facilitator, faculty, and agriculture ambassadors, a two-week ornamental horticulture summer program for high school students was conducted during the summers of 2005, 2006, and 2007. Financial support was provided by a USDA teaching capacity grant. These funds supported room and board, and a $400.00 stipend for each high school intern; salaries for program coordinator, and college students who worked as dorm assistants; and other related program costs. Students were recruited from 16 high schools on the Delmarva Peninsula and neighboring states. In the 2006 group, with the exception of eight, who were also participating in an Upward Bound day program on the campus, all students lived on campus. During the spring of each of the camp years, the implementation committee developed letters, application forms, and flyers and sent them out to several high schools. The selection criteria were an essay explaining why the student was interested in the internship and what he or she would like to gain from it, two letters of recommendation from a faculty member or administrator at their school, a resume, an official transcript, and a list of their interests/hobbies. Based on the program selection criteria, a total of 35 students (Table 1) were selected and participated in the program during this period. The breakout of participants by year was 8, 18, and 9 for years 2005, 2006, and 2007, respectively. Over the two-week period, students were engaged in various activities to enlighten them about ornamental horticulture while experiencing campus life. These activities included field trips to a nursery, golf course, botanical garden; talks with/by professionals; exploration of job opportunities; discussions of careers in agriculture, horticulture, and ornamental horticulture; and hands-on laboratory activities in landscape design, plant propagation, turf, floral design, horticulture therapy, tissue culture, water quality, and geographic information systems. Based on the nature of the topic areas and the available times for some of the activities, the length and frequency of the sessions and overall student exposure to the hands-on laboratory activities for each area averaged six hours, with landscape design exposure the longest, at 13 hours. The exposure to field trips was 15 hours for each internship session and included nurseries, a flower shop, Longwood Botanical Gardens, the National Arboretum, a golf course, and a greenhouse. Most of the academic sessions were taught by UMES faculty. A commercial horticulturalist, floral designer, golf course manager, and nursery manager also taught some sessions.

Table 1. High school Student Demographics in the Ornamental Summer Internship Combined over 2005, 2006, and 2007 (n=35)

Characteristic	Frequency/Value
Gender	
Male	10 (29%)
Female	25 (71%)
Race	
African American	21 (60%)
Caucasian	12 (34)
Asian	1 (3%)
Hispanic	1 (3%)
Classification	
Freshman	8 (23%)
Sophomore	12 (34%)
Junior	11 (31.5%)
Senior	4 (11.5%)
Average GPA	3.3

Student's Agricultural Literacy and Interest

Agricultural literacy was determined using two components: the student's actual knowledge and the student's perception of their gain in knowledge and interest in the topic areas. Each student's knowledge of the topic areas was assessed. For the 2005 and 2006

sessions, students completed short descriptions of each of the eight hands-on topic areas covered in the program. In the 2007 session, they completed a pre- and post-test of some of the hands-on subjects covered in the program and answered three open-ended questions to demonstrate their understanding of agriculture and related horticulture disciplinary areas. The pre-test was administered at the beginning of the first session of the program; the post-test was completed during the last class session of the program. The pre- and post-tests for the hands-on topics were graded as correct or incorrect. The pre- and post-test given to assess the student's thoughts of the disciplinary areas included three tasks: to describe what came to mind when they heard the term "agriculture," to describe what came to mind when they heard the term "horticulture," and to describe what came to mind when they heard the term "ornamental horticulture." These responses were categorized into two groups: those pertaining to the production of a commodity and those pertaining to the science, production, and marketing of a commodity.

Each student's perceptions were determined for each year of the program. They completed surveys on their perceived knowledge and interest about the topics covered, satisfaction with the program, suggestions for the program, and their inclinations for a career in agriculture or ornamental horticulture. Their knowledge and interest about the topics covered were assessed using a Likert scale of 1-5, where 1 = none, 2 = little, 3 = some, 4 = much, and 5 = excessive. Overall information on the program was also determined using the Likert scale of 1-5, where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. This study was deemed exempt by the University of Maryland Eastern Shore Institutional Review Board.

Data Analysis

Data were analyzed using SPSS Statistics 17.0.

Results and Discussions

Program Participants and Activities

The demographics of the high school participants included mostly females (71%) due to the limited number of male applicants (Table 1). A similar trend for a lower percentage of male participants was also reported for the summer high school program of Overbay and Broyles (2008). Our students were primarily African American (60%) and Caucasian (34%) as well as sophomores, juniors, freshman, and seniors, who had an overall GPA of 3.3. The high percentage of African Americans students attracted to this summer program is in sharp contrast to the much smaller percent enrolled nationally in agricultural degree programs, which have predominantly Caucasians. We believe this is influenced by our university's historic mission and ability to attract African American students, to its programs, which have 75% black enrollment. Each year the residential students were exposed to campus life as they experienced the ornamental program activities, which were done Monday-Friday of each week. Using laboratory exercises, field trips, presentations by guest experts, and their own presentations on their experiences at the culmination of each internship, students gained knowledge of ornamental horticulture, horticulture, agriculture, and the following eight related topics: landscape design, propagation, turf, floral design, horticulture therapy, tissue culture, water quality, and geographic information systems.

Table 2. Percent of Students Knowledgeable about Selected Topics Before and After Ornamental Program

Topic	2005 Post-test	2006 Post-test	2007 Pre-test	2007 Post- Test
Landscape Design	100	100	88.9	88.9
Plant Propagation	100	100	33.3	100
Turf	100	100	66.7	77.8
Floral design	100	100	77.8	100
Hort Therapy	100	100	[z]ND	ND
Tissue Culture	100	100	22.2	77.8
Water Quality	88	100	11.1	77.8
GIS	100	ND	ND	ND

[z] Not determined

Student's Agricultural Literacy and Interest

For the 2005 and 2006 sessions, 100% of the students demonstrated literacy in the eight hands-on topics through their accurate completion of the short descriptions of two things they learned from each of the areas covered in the program (Table 2). In 2007, the pre- and posttest on these topics also showed a trend for students' increased knowledge of most of these topics after their participation in the program (Table 2). On the contrary, the limited sample of 2007 students generally did not change their immediate perceptions of the three disciplinary areas of ornamental horticulture, horticulture, and agriculture. From the time they took the pretest to the time they took the posttest, the dominant perception centered on production (data not shown). They did not include science as a part of their first thoughts on these three

Table 3. Student Perception of their Knowledge Before and After Ornamental Program for 2005-2007

Topic	Before		After		*P*- values
	Mean	SE	Mean	SE	0.00*
Landscape Design	[z] 2.03	0.18	3.73	0.19	0.00*
Plant Propagation	2.15	0.21	3.50	0.18	0.00*
Turf	1.62	0.16	3.62	0.21	0.00*
Floral design	2.76	0.25	3.70	0,22	0.01*
Hort Therapy	1.59	0.17	3.24	0.19	0.00*
Tissue Culture	1.77	0.24	3.12	0.27	0.00*
Water Quality	2.10	0.22	3.35	0.19	0.00*
GIS	1.25	0.16	2.63	0.33	0.00*
Ornamental horticulture career	[y]ND	ND	3.1	0.20	
Horticulture career	ND	ND	2.8	0.23	

[z] Scale of 1=none,2=little,3=some,4=much and 5=excessive
* $p<0.05$
[y]Not determined

Table 4. Student Perception of their Interest before and after Ornamental Program for 2005-2007

Topic	Before		After		*p*- values
	Mean	SE	Mean	SE	
Landscape Design	[z] 2.53	0.24	3.50	0.22	0.00*
Plant Propagation	2.62	0.23	2.91	0.23	0.37
Turf	1.88	0.21	2.94	0.23	0.00*
Floral design	3.21	0.27	3.47	0.24	0.48
Hort Therapy	2.18	0.24	3.18	0.24	0.00*
Tissue Culture	1.82	0.31	2.82	0.35	0.04*
Water Quality	2.26	0.24	2.71	0.24	0.20
GIS	1.75	0.41	2.38	0.46	0.33
Ornamental horticulture career	[y]ND	ND	3.24	0.24	
Horticulture career	ND	ND	3.33	0.26	

[z] Scale of 1=none,2=little,3=some,4=much and 5=excessive
* $p<0.05$
[y]Not determined

Table 5. Students' Combined 2005-2007 Response to Career Questions

Questions	Yes (%)	No (%)
Will you use the skills and knowledge obtained from this program in the future?	97	3
Will you consider majoring in Agriculture when you attend college?	56	41
Will you consider a career in Ornamental Horticulture?	56	41

areas. This finding is similar to that of Overbay and Broyles (2008), who noted that many students in their summer program still defined agriculture as farming after they had completed a summer experience in agriculture. Our results indicate that high school students may need to be exposed to longer periods of education on these topics in order to readily connect their thoughts with the science of these career areas.

Students' perceptions of their knowledge showed a trend, in that they believed they had gained knowledge from the hands-on topic areas over the course of the internship (Table 3). They felt that they had little to no knowledge of the hands-on topics before the internship and increased to having some knowledge after completing the program. Their perceptions of this knowledge gain tended to agree with their actual assessments based on the open-ended questions on the eight topics at the end of the 2005 and 2006 sessions and from the pre- and posttest questions for 2007 (Table 2). Similar to their perception of gain in knowledge, students indicated on the surveys that they had gained an interest in the topic areas (Table 4). In general, their interest level rose from little to some. With respect to their perceptions on ornamental horticulture and horticulture careers, they indicated that they had some knowledge of and interest in the careers at the end of the program. Follow-up questions for the combined three years revealed that most (97%) thought they will use the skills and knowledge from the pro-

gram, and 56% would consider majoring in agriculture or ornamental horticulture (Table 5).

Based on a list of 16 statements related to the program, students agreed overall that the program was positive and that they learned much (Table 6). Learning new skills and exposure to new concepts and ideas were among the highest rated areas, rating 4.6 out of 5. While they found the program activities (4.4) and field trips (4.3) helpful in understanding the topics, they were neutral (3.1) in their response on whether the internship experience was challenging. Because the internship experience included the academic activities as well as other aspects of campus life, we believe this may have negatively impacted this factor based on their comments, such as dislike for walking too much on campus and dissatisfaction with the variety of campus foods.

When asked whether the internship length, length of each class session, or the number of field trips were insufficient, sufficient, or excessive, at least 80% felt that two weeks was adequate for the length of internship and five was adequate for the number of field trips. However, 26% felt that the length of each individual class session was excessive, an observation noted in the feedback pertaining to what they disliked.

Students have offered a variety of comments and suggestions about the program over the last three years. Some of the common ones are as follows. In response to what they liked most about the program, they noted learning new things, the lab projects, and field trips, with Longwood Gardens a favorite trip site. One student commented, "I got to learn new things that never really crossed my mind." Their dislikes were walking too much on campus, a lack of variety in campus foods, and long class periods. When asked what topics they would have liked to learn more about, surprisingly, they noted all the topics covered in the internship. Yet, they complained that the duration of the class periods were too long. This suggests that shortening each class session and increasing the frequency of each class may be more effective for learning in future activities. Although students were accepted to this program because of their stated interests in ornamental horticulture, it is interesting that one of their additional comments suggested broadening the learning experience by including more areas of horticulture or agriculture.

Overall, students learned about new areas in ornamental horticulture during the two-week internship period and highlighted the field trips and lab projects as their favorites. Most thought that the length of the internship was adequate, and some preferred shorter individual class sessions. This will be one item for consideration for future K-12 student activities.

Graduates from the three years of summer programs, provided a low response rate (20%) to a follow up survey mailed to them in summer 2007, following the end of the last program. All respondents were enrolled in a college program with 8.6% studying agriculture and the others studying engineering, business, pre-nursing or criminal justice. They stated that they would recommend or had recommended the program to other students because of the experience and knowledge they had gained. It was our

Table 6. Student's Overall Rating of the Program Activities (2005-2007)

Student perception	2005 [z]Mean	2005 SD	2006 Mean	2006 SD	2007 Mean	2007 SD
My overall experience was positive	4.75	0.46	4.18	0.73	4.33	0.50
My internship experience was challenging	3.38	0.51	3.11	0.99	2.89	1.36
I learnt new skills and techniques	5.00	0.00	4.35	0.61	4.56	0.53
I was exposed to new ideas and concepts	5.00	0.00	4.41	0.51	4.44	0.73
The labs and studios were conducive to my learning	4.25	0.71	4.18	0.64	4.44	0.73
The instructors were knowledgeable	4.88	0.35	3.83	1.07	4.56	0.53
The instructors presented their information clearly	4.00	0.53	4.18	0.64	4.33	0.87
The education materials helped me learn	4.63	0.74	4.35	0.70	4.44	0.53
I felt comfortable around the instructors	4.75	0.46	4.18	0.95	4.67	0.71
I felt at ease participating in discussions	4.63	0.52	3.82	1.07	4.56	0.73
The projects were interesting	4.38	0.52	3.88	0.78	4.11	0.78
The projects helped me understand the topics	4.38	0.52	4.35	0.49	4.44	0.73
The field trips helped me understand the topics	4.63	0.52	4.06	0.83	4.44	0.53
I learnt much from the program	4.88	0.99	4.35	0.61	4.33	0.71
This experience increased my desire for a career in ornamental horticulture	3.88	0.71	3.41	1.06	3.44	1.13
I will recommend this program to other students	4.75	0.77	3.94	0.75	4.44	0.73
n	8		18		9	

Rating scale where 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

observation that this program had become popular, not only because of our advertising, but also due to the interns' dissemination of information to other students in their schools. We continued to receive inquiries about the next year's programs after the last internship. Regrettably, the grant funds had been exhausted as the grant expired; and we did not have resources to continue the program.

Summary

The findings from these three summer internships show that high school students learned new information and developed new ideas and skills in ornamental horticulture. This finding was in agreement with their belief that they had increased their knowledge and interest in this area. While the total number of students impacted by this program over the three years was low (35), the trend in their increased knowledge indicates that short term summer programs can have a positive effect on increasing student literacy in ornamental horticulture and related sciences. Although students perceived that they had some knowledge of ornamental horticulture and horticulture after completing the internship, they may need to be exposed to additional agricultural learning opportunities as many still fail to first connect the science with agriculture, horticulture, and ornamental horticulture when they think about these career fields.

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