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Teaching Methods

The Benefits of Integrating Service Teaching and Learning Techniques into an Undergraduate Horticulture Curriculum

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ADDITIONAL INDEX WORDS. social impact, landscape design, community relationships, town and gown

SUMMARY. Service learning is a technique in which instructors integrate community service into their semester curriculum to enhance the learning experience. Service-learning teaching strategies naturally fit into horticulture and landscape design curricula, since hands-on laboratories are often incorporated into lesson plans. The purpose of this study was to integrate service-learning techniques into a university-level horticulture course and measure the impact of the course on students' perceptions of community involvement, perceptions of social impact, and perception of how well the students felt they learned the course material. Students in an undergraduate landscape design class were taught the process of landscape design using service-learning activities within the city and campus communities. Projects included developing designs for campus gardens, the city post office, neighborhood parks, the campus childcare center, city road median areas and the city women's shelter, and other projects. A survey tool was developed from other existing surveys to measure how students felt about service learning as a means to learn skills in class and to measure their perceptions of community involvement and social impact. Currently enrolled students were surveyed and alumni from five classes taught in a similar manner in previous years were surveyed. Results from the study showed major differences in that students felt more positive about community involvement after the course compared with before the course. Students rated their feelings of social impact and learning course material above the neutral levels in both categories. No differences were found in gender and grade point average (GPA) comparisons in any of the categories, with the exception of the social impact statements with males and students with higher GPAs rating their feelings more positively within that category. Additionally, differences were found in comparisons of alumni vs. current students, with alumni feeling more positive about how well they learned course material compared to current students.

Mahatma Gandhi said, "the best way to find yourself is to lose yourself in the service of others" (Jorda and Catala,

2009). He illustrated what many instructors are pursuing when they incorporate service learning into their course curriculum. The definition of service learning involves the incorporation of community service into a course as a requirement for credit or graduation (Dictionary.com, 2010). Students participate in "real life" and often hands-on activities in a course to meet

the objectives of a course while also working within the community. Service learning can be incorporated into curricula at all grade levels including elementary school, high school, and college courses (Billig, 2009; Jetson and Jeremiah, 2009). Proponents of service learning cite that the practical application of material by the students improves academic achievement while also improving civic attitudes and social values (Eyler and Giles, 1999; Vogelgesang, 2009). Additionally, supporters of the service-learning pedagogy believe that it improves "town and gown" relationships while linking academic ideas with practical applications (Sandy and Holland, 2006). Other studies have found that service learning can influence career choices, with students opting more for service-related careers if they have participated in service-learning activities (Astin et al., 2000).

The biggest obstacle to expanding the incorporation of service learning into courses is reluctance by faculty (Furco, 2007; Gray et al., 1999). Opponents of the service-learning methodology suggest drawbacks to incorporation of activities including constraints due to the time commitment for students and instructors, students not achieving the original objectives of the course, and the projects becoming a distraction to the original objectives of the course. Opponents also state that service learning promotes technical rather than theoretical learning (Astin et al., 2000). There has also been resistance in incorporating service learning into specific academic courses because some feel that service should be completed by students as part of an organizational commitment or on students' own time (Astin et al., 1999). While generic service activities are known to have positive impacts when completed for service for organizations, course-based service activities have unique benefits (Rhoads, 1997; Sax et al., 1996), especially when the service experiences are directly connected to the academic material (Astin et al., 2000). These benefits include students learning more within courses through the service involvement and that students feel that their service activities make a positive difference (Astin et al., 2000).

For students learning horticultural concepts, hands-on learning is often not only suggested but also

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necessary (Dillon et al., 2006; Waliczek and Zajicek, 1999). Therefore, horticulture curricula merge well with service learning and can often be beneficial for both the students involved in the activities and the overall community. The purpose of this study was to integrate service-learning techniques into a university-level horticulture course and measure the impact of the course on students' perceptions of community involvement, perceptions of social impact, and how well students felt they learned the course material.

Materials and methods

INSTRUMENTATION. Instruments that have been previously used and shown to be reliable and valid were used as models for the survey of this study (Barner, 2000; Markus et al., 1993). Since the instrument used questions/statements from multiple existing instruments, the survey was reviewed by a panel of horticulture and agriculture instructors to ensure that it was a valid instrument. The reliability of the overall instrument used for this study was determined using the Cronbach's alpha reliability test and was found to be 0.89 for this study, indicating a suitable reliability (Gall et al., 2006). Reliability is the extent to which the same test scores would be obtained if the test was administered again (Gall et al., 2006), and it ranges from -1.0 to +1.0. The closer the reliability score is to 1.0, the less error variance is present within the test, and the more likely the differences observed during measurement by the test are those that are due to respondents' answers (Gall et al., 2006).

PERCEPTIONS OF COMMUNITY INVOLVEMENT QUESTIONNAIRE. Perceptions of community involvement were measured using a retrospective reflective surveying technique. This section of the instrument consisted of 21 statements (Barner, 2000) that the respondents read and rated on a five-point Likert-type scale (Likert, 1967). Respondents rated how they perceived they felt about each statement before they participated in service-learning activities in the class and how they felt after participating in the class. Responses ranged from 1 = totally disagree to 5 = totally agree and from 1 = extremely unimportant to 5 = extremely important. Example statements included the following: "adults should give some time for the good

of their community or country" and "providing community service to people in need helps individuals avoid stereotyping groups of people." The maximum score possible on this section of the instrument was 105 and the minimum score possible was 21. A neutral score was 63.

PERCEPTIONS OF SOCIAL IMPACT STATEMENTS. Respondents were asked to rate nine statements (Markus et al., 1993) relating to the variable of "social impact" on a Likert-type scale (Likert, 1967). Responses ranged from 1 = totally disagree to 5 = totally

agree and from 1 = extremely unimportant to 5 = extremely important. Example statements included the following: "having an impact on the world is within the reach of most individuals" and "I feel that I can make a difference in the world." The maximum score possible on this section of the instrument was 45 and the minimum score possible was 9. A neutral score was 27.

STATEMENTS RELATED TO LEARNING COURSE MATERIAL. The last set of 10 statements measured students' perceptions of how well they felt they

Table 1. Demographic information for current students and alumni in the study of the benefits of integrating service teaching and learning techniques into an undergraduate horticulture curriculum.

	Frequency			
	Current student		Alumni	
	no.	%	no.	%
Gender				
Male	12	60.0	10	55.6
Female	8	40.0	8	44.4
Ethnicity				
African American	1	5.0	0	0
Asian/Pacific Islander	0	0	0	0
Hispanic	0	0	0	0
Native American	0	0	0	0
Caucasian	18	90.0	15	88.2
Other	1	5.0	2	11.8
Age (yr)				
21-23	12	63.1	1	5.9
24-26	4	21.0	5	29.4
27-29	1	5.3	6	35.2
30-32	1	5.3	2	11.8
33-35	1	5.3	1	5.9
36-38	0	0	0	0
39-41	0	0	1	5.9
42-44	0	0	0	0
45-47	0	0	0	0
48-50	0	0	0	0
>50	0	0	1	5.9
Year in school				
Freshman	0	0	0	0
Sophomore	1	5.0	0	0
Junior	6	30.0	0	0
Senior	13	65.0	0	0
Graduate student	0	0	0	0
Alumnus	0	0	17	100
Major				
Agricultural business/horticulture	17	85.0	11	73.3
Other major	3	15.0	4	26.7
Grade point average				
4.0	1	10.0	0	0
3.0	6	30.0	5	33.3
2.0	11	55.0	6	40.0
1.0	2	5.0	4	26.7
<1.0	0	0	0	0

learned the course material (Markus et al., 1993). Responses ranged from 1 = totally disagree to 5 = totally agree and from 1 = extremely unimportant to 5 = extremely important. Examples of statements included the following: "I deepened my interest in the subject matter of this course" and "I learned a great deal from this course." On this set of statements, the maximum score possible for each student was 50 and the minimum score possible was 10. A neutral score was 30.

DEMOGRAPHIC INFORMATION QUESTIONS. Demographic information was also gathered through the survey, including questions on gender, age, ethnicity, year in school, GPA, and major of each of the respondents. Additionally, there was an open-ended response area included in the survey that allowed students and alumni to write any additional thoughts that they may have had concerning the course or the survey.

SAMPLE POPULATION. The sample was drawn from undergraduate students attending a southern university who had enrolled and completed the basic landscape design course offered each spring semester. Students who were enrolled in the course were surveyed at the end of the spring semester in each of the 2 years. The 2008 course had 14 students enrolled, whereas the 2009 class had 11 students enrolled.

Alumni who had completed the course between 2001 and 2007 were also sought with the aid of the alumni office on campus. The year 2001 was used as a cut-off year since that was the first year that the course was offered in a service-learning format. Because all years of students completing the course in this format were used, no control group of alumni was available to survey. Surveys were sent to 60 students, of which addresses could be obtained for the 72 students who had taken and completed the course. Students in current classes and alumni were offered a school horticulture program T-shirt as an incentive for participation to increase response rates. Alumni were mailed surveys at the end of the spring semester at about the same time as the currently enrolled students were being surveyed in class.

Respondents self-selected themselves for inclusion in the study. To keep responses anonymous, all respondents filled out a consent form,

which was separate from the rest of the survey instrument, and no names were recorded on the actual survey instrument. A pretest survey was not administered so that students would not experience a bias in perceptions by knowing the basis of the study.

BASIC LANDSCAPE DESIGN COURSE FORMAT. Students enrolled in the basic landscape design course participated in small- to large-scale hands-on community design projects for the city and campus community as they progressed through the course objectives

Table 2. Analysis of variance test comparing responses of male and female respondents on community involvement, social impact, and learning course content in the study of the benefits of integrating service teaching and learning techniques into an undergraduate horticulture curriculum.

Score	Group	Responses				
		(no.)	Mean	SD	df	P
Before community involvement statements ^z	Males	22	70.68	13.778	1	0.171
	Females	15	72.13			
After community involvement ^z	Males	22	78.14	11.235	1	0.269
	Females	15	79.60			
Social impact ^y	Males	22	31.59	7.645	1	0.023*
	Females	15	29.93			
Learning course content ^x	Males	22	39.59	8.169	1	0.420
	Females	15	40.00			

^zScale included 21 statements that were rated on a five-point Likert scale. Higher scores indicated more positive answers. The maximum score possible was 105, while the minimum score possible was 21. A neutral score was 63.

^yScale included 9 statements that were rated on a five-point Likert scale. Higher scores indicated more positive answers. The maximum score possible was 45, while the minimum score possible was 9. A neutral score was 27.

^xScale included 10 statements that were rated on a five-point Likert scale. Higher scores indicated more positive answers. The maximum score possible was 50, while the minimum score possible was 10. A neutral score was 30.

*Statistically significant at $P = 0.05$.

Table 3. Analysis of variance test comparing responses of students with different grade point averages on community involvement, social impact, and learning course content in the study of the benefits of integrating service teaching and learning techniques into an undergraduate horticulture curriculum.

Score	Group	Responses				
		(no.)	Mean	SD	P	
Before community involvement statements ^z	4.0	1	78.00	-	-	0.195
	3.0	11	74.64			
	2.0	17	66.82			
	1.0	6	79.67			
	<1.0	0	-			
After community involvement ^z	4.0	1	86.00	-	-	0.092
	3.0	11	83.09			
	2.0	17	73.24			
	1.0	6	83.83			
	<1.0	0	-			
Social impact ^y	4.0	1	32.00	-	-	0.049*
	3.0	11	34.55			
	2.0	17	28.94			
	1.0	6	23.17			
	<1.0	0	-			
Learning course content ^x	4.0	1	42.00	-	-	0.355
	3.0	11	42.00			
	2.0	17	38.00			
	1.0	6	36.00			
	<1.0	0	-			

^zScale included 21 statements that were rated on a five-point Likert scale. Higher scores indicated more positive answers. The maximum score possible was 105, while the minimum score possible was 21. A neutral score was 63.

^yScale included 9 statements that were rated on a five-point Likert scale. Higher scores indicated more positive answers. The maximum score possible was 45, while the minimum score possible was 9. A neutral score was 27.

^xScale included 10 statements that were rated on a five-point Likert scale. Higher scores indicated more positive answers. The maximum score possible was 50, while the minimum score possible was 10. A neutral score was 30.

*Statistically significant at $P = 0.05$.

and semester. Students completed all phases of the design process, including interviewing clients to determine needs, measuring sites, drawing sites to scale, presenting initial design ideas to the clients, designing overhead plans on paper, completing plant inventory keys, and finally, presenting the master plans to the clients. Service-learning projects were required to be completed by students and accounted for the majority of points earned for student grades. Assignments were completed in class, in laboratory, and as take-home assignments. Examples of recent projects completed by students included developing designs for the city post office, the parks department, the campus child development center, the new city women's shelter, a local church property, a historic park area, and various areas of campus.

SCORING AND DATA ANALYSIS. Survey responses were coded and entered into Excel™ (Microsoft, Redmond, WA). Negative statement responses were reverse coded so that responses of 1 scored 5 points and responses of 5 scored 1 point for each section of the instrument. Nonresponse to any question resulted in missing data for that question. Scores were summed for each section of the instrument. Data collected were analyzed using SPSS (release 17.0 for Windows; SPSS, Chicago, IL). Statistical procedures included frequencies, paired *t* tests, and multivariate analysis of variance tests to determine differences between scores, individual survey statement responses, and any demographic influences.

Results

In total, a 44.7% response rate was achieved, with 38 of 85 responses being obtained from both current students and alumni. Twenty surveys were returned from current undergraduates enrolled during 2008 and 2009, while 18 surveys were gathered from alumni from 2001 through 2007. Demographic breakdown was similar for current students and alumni (Table 1).

COMMUNITY INVOLVEMENT RETROSPECTIVE REFLECTIVE STATEMENT RESULTS. Paired *t* tests were used to compare students' retrospective reflective answers of how they felt before the class on each of the community involvement statements to how they felt at the end of the course as they were

responding. Results indicated differences in comparisons, with students rating their perceptions of community service more positively after the course ($P = 0.000$). The mean score for the "before" statements was 71.95 while the mean score for the "after" statements was 79.24. These differences indicated that students felt more positive about giving their time toward community service and that they had developed an understanding of the need for service toward community after participating in service-learning activities. This observation supports other research that found students were motivated to community engagement after participating in service activities (Astin et al., 2006).

SOCIAL IMPACT STATEMENT RESULTS. Social impact statements were rated on a five-point Likert-scale and measured level of agreement by the student. Descriptive statistics indicated that the mean scores of all students were slightly above the neutral score of 27 at 30.34 points (SD = 8.263). Students did not feel strongly that the service-learning course influenced their views toward social impact. This finding did not support other research that has found service-learning experiences can positively impact students in this area (Astin et al., 2000).

While the service-learning activities did relate well to "real-life" situations that the students would be experiencing in the field of landscape design, they did neither emphasize the

area of social impact nor emphasize the idea that students can "make a difference." The service-learning projects for the basic landscape design course included city and campus projects that allowed students to meet with city and campus administrators. Perhaps if some of the projects included interactions with less fortunate citizens of the community such as developing plans for Habitat for Humanity or for the elderly, students may have benefited more in the area of an understanding of social impact; or if students were able to install the plans and see the landscape design plans through to development and then observe the impact the plans have on users of the landscape, they may have possibly been impacted larger in this area.

COURSE MATERIAL RESULTS. Another section of the instrument measured how students felt about how well they learned the course material. These statements were rated on a five-point Likert scale and measured level of agreement by the student. Descriptive statistics revealed that the learning statement mean score was 39.50 (SD = 7.259) on a scale where the maximum score was 50 and the neutral score was 30. This value corresponded with an average score of 4 or "agree" on the Likert scale rating. Overall, students felt that service-learning projects helped them learn course concepts. This supported past research, which concluded that service learning

Table 4. Analysis of variance test comparing alumni responses to current student response scores on perceptions of how they felt about community involvement before and after participating in a service learning class experience, social impact, and learning course content in the study of the benefits of integrating service teaching and learning techniques into an undergraduate horticulture curriculum.

Score	Group	Responses			
		(no.)	Mean	SD	<i>P</i>
Before community involvement ^a	Current students	20	70.35	14.210	0.455
	Alumni	18	73.72	13.226	
After community involvement ^b	Current students	20	75.80	13.644	0.201
	Alumni	18	83.06	8.495	
Social impact ^c	Current students	20	28.70	6.233	0.060
	Alumni	18	32.17	9.925	
Learning course content ^d	Current students	20	37.00	7.189	0.023*
	Alumni	18	42.28	6.433	

^aScale included 21 statements that were rated on a five-point Likert scale. Higher scores indicated more positive answers. The maximum score possible was 105, while the minimum score possible was 21. A neutral score was 63.

^bScale included 9 statements that were rated on a five-point Likert scale. Higher scores indicated more positive answers. The maximum score possible was 45, while the minimum score possible was 9. A neutral score was 27.

^cScale included 10 statements that were rated on a five-point Likert scale. Higher scores indicated more positive answers. The maximum score possible was 50, while the minimum score possible was 30. A neutral score was 10.

*Statistically significant at $P = 0.05$.

Table 5. Analysis of variance results comparing alumni and current student responses to individual statements measuring perceptions of community involvement^z before and after participating in a service learning class experience, social impact^y, and learning course content^x in the study of the benefits of integrating service teaching and learning techniques into an undergraduate horticulture curriculum.

Statement	Category	Sample size (no.)	Mean score ^y	SD	df	F	P
Before community involvement statements^z							
Working toward equal opportunity for all U.S. citizens ^w	Current students	20	3.50	1.235	37	0.908	0.347
	Alumni	18	3.89	1.278			
Developing a meaningful philosophy of life ^w	Current students	20	3.85	1.040	37	1.941	0.172
	Alumni	18	4.28	0.826			
Becoming involved in a program to improve my community ^w	Current students	20	3.35	1.040	37	2.040	0.162
	Alumni	18	3.83	1.043			
Being very well off financially ^w	Current students	20	3.65	1.137	37	0.420	0.521
	Alumni	18	3.89	1.132			
Volunteering my time helping people in need ^w	Current students	20	3.30	1.174	37	1.798	0.188
	Alumni	18	3.78	1.003			
Giving 3% of my income to help those in need ^w	Current students	19	2.47	0.772	36	4.974	0.032*
	Alumni	18	3.17	1.098			
Finding a career that provides the opportunity to be helpful to others or useful to society ^w	Current students	20	3.65	1.137	37	0.439	0.512
	Alumni	18	3.89	1.079			
Adults should give some time for the good of their community or country ^v	Current students	20	3.90	1.071	37	0.074	0.787
	Alumni	18	4.00	1.188			
Having an impact on the world is within the reach of most individuals ^v	Current students	20	3.95	0.887	37	2.463	0.125
	Alumni	18	3.44	1.097			
Most misfortunes that occur to people are frequently the result of circumstances beyond their control ^v	Current students	20	2.90	0.718	37	0.366	0.549
	Alumni	18	2.72	1.074			
If I could change one thing about society, it would be to achieve greater social justice ^v	Current students	20	3.10	1.021	37	0.633	0.431
	Alumni	18	2.83	1.043			
I make quick judgments about homeless people ^v	Current students	20	2.75	1.070	37	0.049	0.826
	Alumni	18	2.83	1.249			
People, regardless of whether they have been successful or not, ought to help those in need ^v	Current students	20	3.45	1.099	36	1.945	0.172
	Alumni	17	3.94	1.029			
People ought to help those in need as a "payback" for their own opportunities, fortune, and successes ^v	Current students	20	2.85	1.226	37	0.792	0.379
	Alumni	18	3.22	1.353			
I feel that I can make a difference in the world ^v	Current students	20	3.60	1.095	37	0.140	0.711
	Alumni	18	3.72	0.895			
Providing community service to people in need helps individuals to be more patient with others ^v	Current students	20	3.45	1.050	37	0.238	0.629
	Alumni	18	3.61	0.979			
Providing community service to people in need helps individuals better understand social problems ^v	Current students	20	3.60	1.046	37	0.140	0.711
	Alumni	18	3.72	0.958			
Providing community service to people in need helps individuals better understand how social service agencies are organized ^v	Current students	20	3.25	0.851	37	0.235	0.631
	Alumni	18	3.39	0.916			
Providing community service to people in need helps individuals be less judgmental about other people ^v	Current students	20	3.30	1.031	37	0.005	0.944
	Alumni	18	3.28	0.895			
Providing community service to people in need helps individuals avoid stereotyping groups of people ^v	Current students	20	3.10	1.119	37	0.268	0.608
	Alumni	18	2.94	0.639			
Providing community service to people in need helps individuals feel that they can make a difference in other people's lives ^v	Current students	20	3.50	0.946	37	0.038	0.846
	Alumni	18	3.56	0.784			

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Table 5. (Continued) Analysis of variance results comparing alumni and current student responses to individual statements measuring perceptions of community involvement^z before and after participating in a service learning class experience, social impact^y, and learning course content^x in the study of the benefits of integrating service teaching and learning techniques into an undergraduate horticulture curriculum.

Statement	Category	Sample size (no.)	Mean score ^y	SD	df	F	P
After community involvement statements^{z,w}							
Working toward equal opportunity for all U.S. citizens ^w	Current students	20	3.75	1.118	37	1.338	0.255
	Alumni	18	4.17	1.098			
Developing a meaningful philosophy of life ^w	Current students	20	4.30	0.801	37	1.195	0.282
	Alumni	18	4.56	0.616			
Becoming involved in a program to improve my community ^w	Current students	20	4.25	0.910	37	2.019	0.164
	Alumni	18	4.61	0.608			
Being very well off financially ^w	Current students	20	3.75	1.118	37	0.276	0.602
	Alumni	18	3.94	1.162			
Volunteering my time helping people in need ^w	Current students	20	3.60	1.118	37	6.051	0.019*
	Alumni	18	4.39	0.698			
Giving 3% of my income to help those in need ^w	Current students	19	2.79	0.918	37	3.336	0.076
	Alumni	18	3.44	1.247			
Finding a career that provides the opportunity to be helpful to others or useful to society ^w	Current students	20	4.05	0.999	37	4.256	0.046*
	Alumni	18	4.61	0.608			
Adults should give some time for the good of their community or country ^x	Current students	20	4.72	0.461	37	4.622	0.038*
	Alumni	18	4.00	1.188			
Having an impact on the world is within the reach of most individuals ^x	Current students	20	4.30	0.801	37	0.267	0.608
	Alumni	18	4.17	0.786			
Most misfortunes that occur to people are frequently the result of circumstances beyond their control ^x	Current students	20	3.00	0.918	37	0.039	0.844
	Alumni	18	3.06	0.802			
If I could change one thing about society, it would be to achieve greater social justice ^x	Current students	20	3.40	1.142	37	0.847	0.363
	Alumni	18	3.06	1.162			
I make quick judgments about homeless people ^x	Current students	20	2.65	0.988	37	0.207	0.652
	Alumni	18	2.50	1.043			
People, regardless of whether they have been successful or not, ought to help those in need ^x	Current students	20	3.55	1.050	37	3.564	0.067
	Alumni	17	4.18	0.951			
People ought to help those in need as a "payback" for their own opportunities, fortune, and successes ^x	Current students	20	2.80	1.240	37	0.383	0.540
	Alumni	18	3.06	1.305			
I feel that I can make a difference in the world ^x	Current students	20	4.50	0.707	37	3.382	0.074
	Alumni	18	3.90	1.210			
Providing community service to people in need helps individuals to be more patient with others ^x	Current students	20	3.70	1.031	37	0.358	0.553
	Alumni	18	3.89	0.900			
Providing community service to people in need helps individuals better understand social problems ^x	Current students	20	4.00	1.214	37	1.849	0.182
	Alumni	18	4.44	0.705			
Providing community service to people in need helps individuals better understand how social service agencies are organized ^x	Current students	20	3.60	1.046	37	0.738	0.396
	Alumni	18	3.89	1.023			
Providing community service to people in need helps individuals be less judgmental about other people ^x	Current students	20	3.40	1.231	37	3.009	0.091
	Alumni	18	4.00	0.840			
Providing community service to people in need helps individuals avoid stereotyping groups of people ^x	Current students	20	3.30	1.031	37	1.698	0.201
	Alumni	18	3.72	0.958			

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Table 5. (Continued) Analysis of variance results comparing alumni and current student responses to individual statements measuring perceptions of community involvement^z before and after participating in a service learning class experience, social impact^y, and learning course content^x in the study of the benefits of integrating service teaching and learning techniques into an undergraduate horticulture curriculum.

Statement	Category	Sample size (no.)	Mean score ^y	SD	df	F	P
Providing community service to people in need helps individuals feel that they can make a difference in other people's lives ^v	Current students	20	3.70	0.979	37	6.113	0.018*
	Alumni	18	4.39	0.698			
Social impact statements^y							
Participation in this course has increased or strengthened your intention to serve others in need ^v	Current students	20	3.25	1.097	37	0.989	0.327
	Alumni	18	3.56	1.097			
Participation in this course has increased or strengthened your orientation toward others and away from yourself ^v	Current students	20	3.20	0.894	37	0.428	0.517
	Alumni	18	3.44	1.381			
Participation in this course has increased or strengthened your intention to work on behalf of social justice ^v	Current students	20	2.85	1.040	37	0.462	0.501
	Alumni	18	3.11	1.323			
Participation in this course has increased or strengthened your intention to give to charity to help those in need ^v	Current students	20	3.25	0.786	37	0.173	0.680
	Alumni	18	3.39	1.243			
Participation in this course has increased or strengthened your sense of purpose or direction in life ^v	Current students	20	3.60	0.995	37	0.001	0.978
	Alumni	18	3.61	1.461			
Participation in this course has increased or strengthened your belief that one can make a difference in the world ^v	Current students	20	3.65	1.182	37	0.001	0.971
	Alumni	18	3.67	1.609			
Participation in this course has increased or strengthened your tolerance and appreciation of others ^v	Current students	20	3.60	1.188	37	0.726	0.400
	Alumni	18	3.94	1.305			
Participation in this course has increased or strengthened your understanding the role of external forces as shapers of the individual ^v	Current students	20	3.40	1.231	37	0.276	0.603
	Alumni	18	3.61	1.243			
Participation in this course has increased or strengthened your belief that helping those in need is one's responsibility ^v	Current students	20	3.35	1.040	37	1.851	0.182
	Alumni	18	3.83	1.150			
Learning course content statements^x							
I learned to apply principles from this course to new situations ^v	Current students	20	3.60	0.995	37	4.984	0.032*
	Alumni	18	4.33	1.029			
I developed a set of overall values in this field ^v	Current students	20	3.70	0.865	37	2.493	0.123
	Alumni	18	4.22	1.166			
I developed a greater awareness of societal problems ^v	Current students	20	3.15	1.137	37	0.852	0.362
	Alumni	18	3.50	1.200			
I reconsidered many of my former attitudes ^v	Current students	20	2.85	1.309	37	2.360	0.133
	Alumni	18	3.50	1.295			
I developed a greater sense of personal responsibility ^v	Current students	20	3.30	1.174	37	1.089	0.304
	Alumni	18	3.72	1.320			
I deepened my interest in the subject matter of this course ^v	Current students	20	3.95	0.887	37	10.957	0.002*
	Alumni	18	4.72	0.461			
I learned a great deal from this course ^v	Current students	20	4.25	0.786	37	3.336	0.076
	Alumni	18	4.67	0.594			
I felt that my experiences gained through the service-learning projects in this class will be beneficial to me if/when I practice landscape design within the industry ^v	Current students	20	4.30	0.801	37	3.845	0.058
	Alumni	18	4.72	0.461			

(Continued on next page)

Table 5. (Continued) Analysis of variance results comparing alumni and current student responses to individual statements measuring perceptions of community involvement^a before and after participating in a service learning class experience, social impact^b, and learning course content^c in the study of the benefits of integrating service teaching and learning techniques into an undergraduate horticulture curriculum.

Statement	Category	Sample size (no.)	Mean score ^y	SD	df	F	P
I would recommend that all landscape design students complete service-learning projects ^v	Current students	20	4.05	0.945	37	5.198	0.029*
	Alumni	18	4.67	0.686			
I feel that I am performing up to my potential in this course ^v	Current students	20	3.85	1.089	37	1.255	0.270
	Alumni	18	4.22	0.943			

^aScale included 21 statements that were rated on a five-point Likert scale. Higher scores indicated more positive answers. The maximum score possible was 105, while the minimum score possible was 21. A neutral score was 63.

^bScale included 9 statements that were rated on a five-point Likert scale. Higher scores indicated more positive answers. The maximum score possible was 45, while the minimum score possible was 9. A neutral score was 27.

^cScale included 10 statements that were rated on a five-point Likert scale. Higher scores indicated more positive answers. The maximum score possible was 50, while the minimum score possible was 30. A neutral score was 10.

^vStatements were rated on five-point Likert scale by marking 1 for "extremely unimportant," 2 for "somewhat unimportant," 3 for "not applicable/unsure," 4 for "somewhat important," and 5 for "extremely important."

^wStatements were rated on five-point Likert scale by marking 1 for "totally disagree," 2 for "somewhat disagree," 3 for "no opinion/unsure," 4 for "somewhat agree," and 5 for "totally agree."

*Statistically significant at $P = 0.05$.

improves self-reported academic outcomes including improvements in collegiate GPA, writing skills, and critical thinking (Astin et al., 2000). Research has also found that service-learning experiences embedded into course content enhance cognitive skill development (Astin et al., 2000).

DEMOGRAPHIC COMPARISON RESULTS. Mean scores were analyzed based on the demographic information of gender and GPA because these two categories included enough responses to consider differences between groups. Ethnicity, year in school and age were limited in several responses and, therefore, no statistical analyses were conducted.

No differences were found in comparisons of male and female responses in any of the categories of community involvement for before or after statements or learning course material statements (Table 2). However, differences were found in comparisons of male and female student responses in the area of social impact, with males responding more positively to the statements in comparison with females (Table 2). This difference was surprising because past research has found that women were more likely than men to be drawn to service (Astin et al., 2000). However, service-learning activities seemed to benefit both males and females equally in the other categories of community involvement and in learning course material.

Demographic comparisons were also made between students with different GPAs. Grade point average was

measured on a 4.0 scale, with students choosing from multiple choice answers the GPA that most closely related to their own. Answers included <1.0, 1.0, 2.0, 3.0, and 4.0. No differences were found in comparisons of GPAs in any of the categories of community involvement for before or after statements or in learning course content statements (Table 3). Differences were found in comparisons of students with different GPAs in the area of social impact, with students with higher GPAs responding more positively to the statements in comparison with students with lower GPAs (Table 3). These findings did not support past research that has found a negative correlation with students' performance on the GRE® (Educational Testing Service, Princeton, NJ) that was thought to be primarily due to high-scoring students being less likely willing to volunteer or to take service-learning classes because of the potential distraction from academic achievement (Astin et al., 2000). In this current study, students with higher GPAs may feel more confident that they have an ability to impact their community because of their higher academic achievement. Overall, the service learning activities appeared to benefit most students in most categories, regardless of GPA.

Lastly, alumni responses were compared to the responses of current students to evaluate whether service-learning activities have a lasting effect and if alumni recognize the benefits more than current students. No differences were found in comparisons of student vs. alumni responses in the

before or after statements in the community involvement category or the social impact statements. However, differences were found in the comparison of alumni and current students' responses in how well students perceived they learned the course content (Table 4). Alumni rated statements more positively, with their mean scores averaging over five points greater than current students (Table 4).

When individual statement comparisons were made between current student responses and alumni responses, most differences were found in statements concerning perceptions of learning course content (Table 5), with 3 of 10 statements having major differences. Alumni tended to rate individual statements relating to the service experiences and learning more positively when compared to current students reinforcing the findings from the overall score comparisons between the two groups (Table 5).

Some of the responses from alumni on the open-ended response area helped illustrate differences in means, as well. Alumni provided comments such as, "Without this kind of experience in the field, it would be much harder for students pursuing this profession to learn what it takes to be successful in the real world"; "Students can only learn so much from a book!"; "I currently own a landscape design business. This design class was crucial in building my confidence and expanding my awareness. I am scheduled to start a Master Gardener class where I will be involved in many volunteer projects. I am also trying to

start a community garden in my area"; and "I guess I didn't think of it as community service, but it was wonderful hands-on experience."

Past research has found that students appear to perceive more benefits from service-learning experiences if they have the opportunity to reflect on the experiences with peers or with their professors (Astin et al., 2000). Because alumni have had more time to reflect and process the past course experience, they may have noted the benefits of those experiences more.

Findings from this study showed that engaging horticulture students in service learning improved their views toward community involvement and increased their understanding of course material, especially as alumni. Therefore, more opportunities for service learning should be incorporated into horticulture curricula. College is a time when students make decisions on whom they will become as they move into adulthood and service learning helps to show them how they can make a difference in society at large and in the workplace. Some university-level instructors feel that by the time students reach the university classroom, they can no longer be impacted in value-oriented areas. However, this study and past studies show that many students are influenced by service-learning experiences and that these activities have the potential to help students find their career purpose and their civic obligation and meaning in life, which is similar to what Mahatma Gandhi said. Service-learning activities teach them content and show them their potential to impact the community as they move into their careers.

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