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Service Learning in Biology I and II: Effects on College Student Engagement and Accomplishment

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Service Learning in Biology I and II

Effects on College Student Engagement and Accomplishment

Service Learning (SL)

"Service-learning is a teaching and learning strategy that integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities¹."

Question

Does service learning (SL) improve student engagement and accomplishment in the Biology I and II course sequence for Biology Majors?

Introduction

Currently at least 30% of approximately 6.7 million college students surveyed nationwide report having completed some form of service learning (SL) throughout their college curriculum². In fact, many institutions of higher education have entire departments dedicated to the maintenance and tracking of SL opportunities and community partners. Being involved in SL programs, particularly in one's major field of study, has been shown to improve the overall college experience for students leading to greater engagement and overall retention and satisfaction^{3,4}. College students benefit by becoming more actively engaged in their own learning process and directly experiencing the relevance of their own education, possibly even investigating future career paths or interests^{5,6}. The community partners benefit by gaining an excited and motivated workforce of volunteers, as well as long term relationships with universities⁷. All aspects of society stand to benefit by these SL educational opportunities. This is especially true for SL projects linked to K-12 science education, where the demand for "concept-based science outreach at the elementary school level" has never been greater.⁸

Approach/Assessment

In the courses, Biology I and II (BIOL 1500 and 1510) students created curricular units (based on Biology I or II course topics) and presented science demonstrations to elementary school students and their families at a *Science Alive!* community night event at Welleby Elementary School in Broward County, FL.

- SL Project was 5% of overall course grade; could be completed as a group/individual project
- Pre and Post-survey on student attitudes toward science education and the SL process
- Curricular unit developed for elementary students to learn science; presented in class to peers and assessed (by peers and professor)
- Reflection Essay
- Mandatory (Biology I) and optional (Biology II) participation in a *Science Alive!* event

Student Reflections

- "Throughout this experience I learned more about myself; I learned that I can be part of a leader within a group. I even got a compliment that I was a good speaker."
- "The *Science Alive!* project wasn't only pleasant to prepare during class and experimenting at home, but it was also rewarding to know that the children at Welleby Elementary School enjoyed and learned from our efforts."
- "It was a great learning experience and I feel honored that I was able to give back to the community and receive a grade for it. This event was a great addition to our biology course and teaches the elementary kids as well as the Nova students."
- "The littlest experiment can bring so much joy to these children. With this experience, I have been able to teach and show my own children what I was taught."
- "The enthusiasm and happiness in the children's eyes when they got a turn to do the science demo almost brought me to tears... One of the children came up to me and asked me to explain more details... He then told me... , "You are just so smart!", with the cutest crunched up face I have ever seen. This experience gives you an unforgettable feeling of satisfaction and happiness that you can get addicted to."
- "I think our school should have more events like this cause it is not only a great activity and environment for Nova students to exchange knowledge, but also creates a good image of Nova University in the parent's mind."

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Survey Results

Table 1: Pre and post survey results regarding outcomes of the SL experience in Biology I and II. (1=Strongly Agree; 5=Strongly Disagree)

Questions	Bio I Pre Avg (SD) n=21	Bio I Post Avg (SD) n=17	Bio II Pre Avg (SD) n=26	Bio II Post Avg (SD) n=29
1. Community service should not be required for a particular grade.	2.9 (1.8)	3.1 (2.1)	2.9 (4.2)	3.6 (2.9)
2. Preparing a science demo helps (helped) me understand concepts in my biology course better.	2.3 (3.6)	2.4 (1.9)	2.3 (2.9)	1.7 (6.8)
3. It is pointless to go and teach young children because they are not appreciative or interested.	4.9 (8.3)	4.8 (7.1)	4.6 (7.9)	4.9 (11.4)
4. The only way for a child to learn difficult topics pertaining to science is through tests and assessments. Hands-on learning experiences are not effective teaching tools.	4.5 (6.6)	4.1 (4.3)	4.8 (10.0)	4.6 (9.2)
5. Children love science and enjoy learning as much as they possibly can.	2.6 (3.2)	2.1 (3.5)	2.8 (4.1)	2.1 (4.9)
6. When asked "what do you want to be when you grow up?" most of the students respond "a scientist!"	4.0 (3.6)	3.6 (1.6)	4.0 (4.1)	3.6 (3.8)
7. Science is not fun, regardless of how it is presented.	4.4 (5.6)	4.9 (5.7)	4.7 (8.4)	4.7 (8.8)
8. Young kids are difficult to control regardless of how many times you ask them to behave; they probably will not listen to you because you are not a teacher or any sort of disciplinarian.	3.3 (4.1)	3.8 (2.3)	4.1 (4.5)	4.2 (6.5)
9. Parents will be more interested in the experiments than the children.	3.3 (3.8)	3.7 (2.9)	3.9 (5.1)	3.9 (6.9)
10. I am anticipating a fun night of science activities at the <i>Science Alive!</i> event. I am excited to see how the children react to my presentation.	2.1 (4.2)	2.2 (2.4)	1.9 (4.7)	2.4 (4.5)
11. A project like this one should be a group project for BIOL 1111 students.	3.0 (4.5)	2.8 (1.7)	2.5 (3.1)	2.0 (5.3)
12. BIOL 1111 students should have the option to either work independently or in a group, as they choose.	2.4 (5.0)	1.7 (4.0)	1.8 (5.9)	1.2 (10.8)
13. Preparing a science demo will make/has made me more excited to study biology.	2.9 (1.8)	3.1 (2.1)	2.9 (4.2)	1.8 (5.6)
14. This project will help/did help me improve my grade in BIOL 1111 this semester.	2.3 (3.6)	2.4 (1.9)	2.3 (2.9)	1.4 (9.7)

Table 2: *NSU Volunteer Participant Survey* given at the end of the *Science Alive!* night on 3/28/12 at Welleby Elementary School, Sunrise, FL in Broward County.

Questions	Strongly Agree (1)	Agree (2)	Neutral (3)	Disagree (4)	Strongly Disagree (5)	Total	Average	SD
1. I enjoyed this experience for community service.	61	6	1	0	0	68	1.1	26.6
2. I enjoyed working with my team members.	59	9	1	0	1	70	1.2	25.4
3. I made new contacts with classmates and/or upperclassmen that may be useful to me throughout my education.	49	9	4	0	4	66	1.5	20.2
4. I plan to put my participation in this event on my resume.	50	6	9	2	1	68	1.5	20.6
5. I believe these experiments were a great way to present simple science demonstrations using basic household items.	52	14	2	1	0	69	1.3	22.1
6. I plan to return again next year if I am in the area and available.	61	2	2	0	1	66	1.2	26.7
7. I can imagine myself doing these experiments again at another school or with a family member.	61	9	0	0	0	70	1.1	26.6
"Great experience!"								
"Great time, I would love to volunteer again!"								
"Always a pleasure!"								
"Excellent!"								
"Some of the groups were very large and overwhelming, 30+ students at once"								
"Some of the groups were too big"								
"More supplies were needed for the penny pipetting experiment"								
"You are the best Dr. Schmitt!"								
"Need more food coloring colors"								
"I love Science Alive!"								
"Science is awesome!"								
"Yay for science!"								
"I loved it, I will be back next year!"								
"We should have the teachers help us calm the students down, that would help the process go smoother."								
"Thank you for allowing me to participate, it was a splendid evening. I would love to do this at the high school level with alternate experiments more suitable for the higher school levels!"								
"I enjoyed the experience, it is something I would love to participate in again and I look forward to do these experiments at home with my little sister!"								
"Good time ☺"								
"I had so much fun! Possibly even more fun than the kids, I am glad they all enjoyed the demonstrations!"								
"Thanks for having us Welleby Elementary!"								

SL in Action

A Biology I student (L. Odom) demonstrates her SL project "Blobs in a Bottle" to classmates in March 2012 (Fig. 1). This activity became part of the *Science Alive!* Community Night at Welleby Elementary School on 3/20/13 (Fig. 2). NSU students teach elementary school students about enzymatic reactions (Fig. 3). The 2013 *Science Alive!* Community Event Team, March 2013 (Fig. 4).



Overall Trends

SL ideas on which college students agree (average <2.5)

- Preparing science demonstrations helps me understand my biology course better.
- I am anticipating a fun night of science activities and I am excited to see how the children react to my presentation.
- This SL project helps me improve my course grade.

SL ideas on which college students disagree (average >2.5)

- It is pointless to teach young children because they are not interested.
- The only way for children to learn difficult concepts pertaining to science is through tests; hands-on learning is not effective.
- Most children say they would like to be scientists when they grow up.
- Science is not fun.

Largest areas of change (Pre→Post Surveys)

More agreement

- Children love science and enjoy learning.
- Most children say they would like to be scientists when they grow up.
- Preparing a science demonstration has made me more excited to study biology
- This SL project helps me improve my course grade.

More disagreement

- Science is not fun.
- Young children are difficult to control and probably won't listen to me since I am not a "teacher".
- Parents will be more interested in the experiments than the children.

Conclusions

Students on all levels had an exciting, interactive, and genuinely fun time exploring science through this course-linked SL program. College students gained an added sense of mastery over course content, while strengthening the community and fulfilling a need. Public speaking ability in college students was greatly enhanced as was their confidence levels as presenters. College students served as scientist-role models for the elementary school students, and directed groups of kids through activities of science exploration and discovery. Additionally, members of the University community were brought together (faculty, graduate students, undergraduate students, and alumni and friends) while sharing the excitement of doing science. It was readily apparent that everyone involved grew in some way during the SL process. *Science Alive!* family nights at Welleby Elementary School have grown in attendance and scope each year, attracting the attention of parents, as well as upper level school administration.

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