Short-Term Service-Learning in an Introductory Mathematics Course

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This study examines the effect of a small-scale service-learning experience on college undergraduates. The example in this paper illustrates how short-term service-learning can be implemented in an introductory-level non-major mathematics course for students who may have little or no previous mathematics education.

Introduction

Service-learning (SL) or community engagement can be defined as an activity performed by students in order to provide a service to the community, while enhancing their own learning in the context of a specific course. Sigmon (1994) describes SL as when service and learning goals are given equal weight in such a way that the classroom goals and service outcomes are balanced and complementary for all participants. Students who participate in SL projects provide services to the community based on what they are currently learning in the classroom.

SL can adopt a different meaning and appearance in varying mathematics courses that are undertaken by majors or non-majors across an array of higher education institutes. Root, Thorme, and Gray (2005) argue that SL experiences in mathematics motivate students to take more mathematics courses, since they understand the purpose of learning the material. Students are usually excited by what statisticians are able to do and impressed by the subject's wide applicability.

Research on SL (e.g., Kuh, 2008; Borwnell & Swaner, 2010) suggest that participants may experience character-related changes, such as a sense of social responsibility, meaningfulness in college life, expectations of a future commitment to community service, and an awareness of social problems. While there are numerous studies reporting the positive effect of community engagement on students, some institutions may find the energy, cost, and resources of large-scale SL experiences to be prohibitive. Furthermore, SL experiences in non-major, introductory-level mathematics classes are less frequent and not widely reported in the literature.

In this article, we explore a short-term SL experience and its positive impact on students and the community. One of the main reasons for doing short-term SL projects is to undertake a specific project for a community partner with limited resources. This type of SL model is called project-based SL (Bradford 2005; Hydorn 2007). Many organizations have special projects that they lack the capacity to undertake. However, students with a specific skill set may be able to fill these capacity gaps.

Project

The introductory mathematics course at Miami regionals is designed as a service course for a variety of academic majors as a way to fulfill a quantitative general education requirement. The majority of students in this course lack motivation and are academically underprepared to take college-level mathematics or mathematics courses. The main course objective was to increase students' awareness of data in everyday life, allowing them to develop a sufficient understanding of mathematics in order to deal with the information that they are inundated with on a daily basis, think critically about it, and make good decisions based on this information. Our SL project aimed to analyze survey data conducted by a local charity organization. The community agency uses many different surveys to understand the community's needs and attitudes, which help them to allocate their recourses more effectively.

All of the students were required to meet together and discuss strategies as a group. The author worked as a mentor to each group. The students participating in the SL experience had to follow three main steps:

1. *Record survey data:* In this project, there were five different types of surveys (approximately 500 of each type), with each survey containing five to ten questions. The first task for the students was to record the survey responses in a statistically meaningful way. The main challenge was how to record incorrectly filled surveys that contained less or more information than required. The process of entering data into a statistics application was instructive for students. Although they had no difficulty completing a textbook exercise for categorizing variables, the same problem was challenging when they needed to digitize the questionnaire responses or data collected from an organization's application form.

2. *Analyze the data*: Students analyzed the survey data using the Excel. They used the databases to generate bar graphs and pie charts, and presented other information in tables or charts. In this second phase, students used the findings from their chosen surveys to answer their own questions regarding the characteristics of the local community. Revisiting lessons that had once appeared trivial in an academic setting were now seen in a richer context, thus giving new depth to these lessons and rendering them a much more enduring learning experience.

3. *Interpret and present the final results:* With the author's guidance, the students decided the appropriate graphs to illustrate the information for a report. They presented a draft to the author and after making revisions, they submitted the final report to the community agency. This process gave students the opportunity to examine all of the accumulated data and identify any interesting aspects or connections. For some students, the process of sorting through the data to identify the most interesting aspects was quite time-consuming and resulted in numerous graphs.

Analysis

The author taught two introductory mathematics courses in the same semester. One group of students was assigned an SL project (26 students), while the other was considered as a control group (23 students) by undertaking a regular project from the textbook. When the post-survey measures were examined for all SL and control students, SL participants were shown to be better in terms of community awareness and real-world applications. The survey results are summarized as three main objectives in

Table 1.

Measure	SL group	Control group
Criterion	Mean (SD)	Mean (SD)
Organizing and representing data	3.49(0.77)	3.37 (0.69)
Help upper level classes	3.34 (0.96)	2.41(0.25)
Help in professional life	3.51 (1.21)	2.20 (1.49)
Math is important in everyday life	3.42 (0.73)	3.02(0.75)
Mathematics is not dull & boring	2.13(1.04)	2.14(0.68)

Serving the community	3.90 (0.12)	-
Positive experience	3.94(0.17)	-

Table 1. Responses were rated on a 4-point scale: 1=Strongly Disagree, 2=Disagree, 3=Agree, and 4=Strongly Agree

Almost all of the students agreed that the SL experience had positive impact on them that enabled them to learn how mathematics is related to real life. The community partner was very impressed by the project outcomes, indicating that the students were very responsible and provided a real service. The community organization also agreed to be involved in future projects.

Discussion

Even though the project only took 3 weeks, it clearly has the potential to motivate students and improve their learning skills. The students perceived experience as more enjoyable and relevant to the real world, as it supported student empowerment while assisting a local agency in need of statistical expertise. The required length of an SL experience to bring about changes in the students is still an open question. However, this project indicates that even minimal experience can have a measurable impact on students.

Since SL is a new concept for most students, the author spent a considerable amount of time describing it and explaining its benefits. In my experience, most of the work occurs outside of the class. However, it is important to keep in constant contact with the students and help them to organize their approach. The community partners do not necessarily have the analytical background to define a project that is possible for introductory mathematics students to undertake in the limited timeframe. Therefore, the author carefully discussed the project's goals, policies, deadlines, and expectations prior to its initiation.

Students learn best from examples and projects that are interesting and relevant to them. Community data projects are consistent with these ideas, as they tend to have some interesting academic, social, or scientific basis. With creativity and planning, educators can use short-term SL projects to make mathematics a more interesting and exciting course for their students. Even over a short duration, SL can make positive impact on students.

References

Bradford, M. (2005). Motivating students through project based service-learning. *T.H.E. Journal*, **32**(6), 29-30.

Brownell, J. E., & Swaner, L. E. (2010). *Five high-impact practices: Research on learning outcomes, completion and quality*. Washington, D.C.: Association of American Colleges and Universities.

Hydorn, L. D. (2007). Community Service-Learning in Statistics: Course Design and Assessment. *Journal of Statistical Education,* **15(2).**

Kuh, G.D. (2008). *High-impact educational practices: What they are, who has access to them, and why they matter*. Washington, D.C.: Association of American Colleges and Universities.

Root, R. Thorme, T. Gray, C. (2005). Making Meaning, Applying Statistics, *MAA Notes*, **66**, 89-100.

Sigmon, Robert L. (1994). *Serving to Learn, Learning to Serve Linking Service with Learning.* Council for Independent Colleges Report.