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# Community Service-Learning in Statistics: Course Design and Assessment

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## Abstract

Service-learning projects are a useful method for students to learn both the practice and value of statistical methods. Effective service learning, however, depends on several factors and can be implemented according to a variety of models. In this article, different models for incorporating service-learning in statistics courses are presented along with example statistics courses. Principles for good service-learning practice will also be presented as a means for assessing the quality of a service-learning course component.

## 1. Introduction

I first started using service-learning projects in my introductory statistics classes in the fall of 1998, and I have continued with at least one project each semester until 2002 when I became the chair of my department. Planning for and managing these kinds of projects takes a substantial amount of time, which as department chair I have much less of, so I began to look for other ways to be involved with service-learning besides class projects. Through a faculty seminar, I had the opportunity to learn more about different models for incorporating and assessing service-learning. Together with five other faculty members, I reviewed and discussed service-learning videos, workbooks and other service-learning resources (e.g., [Heffernan 2001](#), [Howard 2001](#), [Miller 1996](#)).

Service-learning is more than simply combining community service with academic learning. Successful service-learning depends on a variety of factors, which have been

discussed by several authors (Eyler and Giles 1999, Heffernan 2001, Howard 2001). Among these factors are:

- Relevant community service.
- Improved understanding and appreciation of course content through critical reflection.
- Civic responsibility.
- Reciprocity where the student and the community both benefit from the service experience.

Each of these goals can be met with properly orchestrated service-learning projects within introductory to advanced statistics courses, as described in articles by Hydorn 1999, Anderson and Sungur 1999 and Root and Thorne 2001. Civic responsibility, in particular, is not generally connected with statistics education, but it can grow out of students' increased awareness of the purpose and function of community service agencies brought about by the students' participation in a service-learning project. Many other possibilities exist besides service-learning projects, however, for instructors to incorporate service-learning into their courses.

## **2. Models for Course Design**

Prior to the faculty seminar on service-learning I had only thought about service-learning in the form of projects in my introductory course. However, course projects are an example of just one way to implement service-learning. In the Campus Compact publication, "Fundamentals of Service-Learning Course Construction," Heffernan 2001 outlines six service-learning models. These models are described below with example courses, some of which are actual courses and others that could be implemented by statistics faculty. Heffernan provides examples of all six models across all disciplines along with example syllabi and service-learning assignments. She also discusses specific challenges inherent in each model.

### **2.1 "Pure" Service Learning**

Many schools have service- or experiential-based learning programs which offer students educational experiences focused on service. These courses can be found in many disciplines and are primarily focused on public service and community-related issues.

Examples:

- Miller 1996 describes a service-learning course offered by the Experience Based Education Department at Sinclair Community College for which students distributed radon screening tests to area residents after preparing and disseminating materials explaining radon and its hazards. The students collected the test kits which were then sent to a local lab for analysis. The students later analyzed and plotted the results and provided summaries to the area residents.

- A Public Service Practicum, such as the one at Providence College (Heffernan 2001), could prepare students, who plan to become directors of a community-based service organizations, to complete the statistics involved in applying for and reporting to grant agencies. Such a practicum could be called something like “The Statistics of Agency Funding, Development and Assessment.”

## 2.2 Discipline-Based Service-Learning

These courses include a specific link between disciplinary course content and community experience. They differ from “pure” service-learning courses by their emphasis on non-service course content.

Examples:

- Several of the discipline-based service-learning courses described by Heffernan involve tutoring. One example is a Composition course at Millikin University where students provide tutoring to a local GED prep class. Similarly, students in an introductory statistics course could tutor elementary and middle school students on basic descriptive statistics and graphs.
- Other discipline-based courses described by Heffernan include a student-teaching internship, such as the Medieval History course at Sacred Heart College. For this course, students present medieval history units to middle school students and also help design and implement class projects. In a similar vein, students in introductory or higher-level statistics courses could complete student-teaching projects on probability and statistics topics for middle school students, such as producing and interpreting graphs and developing and using simple probability models. These students could also help middle school students with designing and conducting simple surveys and simulations.

## 2.3 Problem-Based Service-Learning

In this type of course students relate to the community as a “consultant” working for a “client.” Students gain knowledge and experience through course content that will allow them to help a community agency to answer questions or solve a problem. Courses with community-based service-learning projects are good examples of problem-based service-learning. Additional examples can be found in Anderson and Sungur 1999 and Root and Thorne 2001.

Examples:

- Duke 1999 describes several projects done in conjunction with the United Way. For one project students prepared a booklet for the United Way that used statistical data and graphs to introduce each agency that received United Way funding. For another project, students helped six United Way agencies to prepare for presentations on fund allocations.
- Some general categories of service-learning projects are provided in Hydorn 2005. These include client summaries, program evaluations, and community surveys, all conducted for an introductory course. Each of these types of projects

- is designed to address different agency needs, from promoting a better understanding of their role in the community and who they serve to assessing the impact of their programs within the community.
- A “Statistics Service Learning” course could be created, similar to the Science Service Learning course at the University of Washington (Miller 1996) as an elective counterpart to an introductory or higher-level statistics course. For the course at the University of Washington, students attend class one hour each week and perform two hours of service. Every other week students meet with a service site coordinator for planning and reflection.

## 2.4 Capstone Courses

These are courses that are designed for majors, and are typically offered to students in their final year. They differ from problem-based service-learning courses in that their goal is to cover new material or to generate a broader understanding of the discipline for students.

Examples:

- A Mathematical Consulting course at the University of Redlands offers students the opportunity to work as part of a team on interdisciplinary projects. Most of the projects for this course are statistical in nature and many are conducted for community agencies, such as an analysis of bird count data supplied by the local Audubon Society (Hydorn et al 2005).
- Long term statistical projects can be handled by teams of students participating in a course similar to the Engineering Projects in Community Service (EPICS) program at Purdue University (Coyle et al 1997). Students enroll in the course for several semesters and participate in some or all of the phases of a particular project: finding a community partner, assembling a team, writing a project proposal, designing and developing the project, and completing the project.

## 2.5 Service Internships

Service internships are like traditional internships with the inclusion of an on-going reflection component. Unlike traditional internships, service internships involve a greater emphasis on reciprocity. Several of the examples described by Heffernan are offered as a disciplinary practicum.

Example:

- An internship for a student majoring in statistics could be offered by a community-service organization in need of designing and implementing a needs-assessment or other study. An example conducted at the University of Mary Washington had psychology students design and conduct a study to determine which method of advertising was most successful for attracting new volunteers for the local Big Brothers/Big Sisters organization.

## 2.6 Undergraduate Community-Based Action Research

These courses are similar to an independent study option but involve learning research methodology and serving as an advocate to the community.

Examples:

- The multidisciplinary Lake Winnecook project at Unity College involves 17 service-learning courses (including Statistics II) and focuses on six goals, such as monitoring water quality of the lake and streams that feed the lake, establishing a protocol for coliform bacteria testing and conducting ongoing tests, and conducting a natural resource inventory of the lake (Heffernan 2001).
- A senior-year course for nursing students on leadership and research at Bethel College includes projects such as an immunization survey, health needs assessments, assessment of a smoke detector education program, and a survey on depression and medication use (Schaffer and Peterson 1998).

## 3. Assessment

Several authors have proposed a set of guidelines for assessing the quality of service-learning courses and programs. The following list is from Honnet and Poulsen 1989 and was used by Coyle et al 1997 to assess the engineering service-learning program at Purdue. Another set of principles is given in Howard 2001.

### Principles of Good Practice for Combining Service and Learning

1. Engages students in responsible and challenging actions for the common good.
2. Provides structured opportunities for students to reflect critically on their service experience.
3. Articulates clear service and learning goals for everyone involved.
4. Allows for those with needs to define those needs.
5. Clarifies the responsibilities of each person and organization involved.
6. Matches service providers and service needs through a process that recognizes changing circumstances.
7. Expects genuine, active and sustained organizational commitment.
8. Includes training, supervision, monitoring, support, recognition, and evaluation to meet service and learning goals.
9. Insures that the time commitment for service and learning is flexible, appropriate and in the best interests of all involved.
10. Is committed to program participation by and with the diverse populations.

The variety of courses and projects described in section 2 above provides ample evidence that the first and last principles can be met by statistics service-learning courses and that the community-service agencies have a large role in defining the projects to meet their needs. Reflection can take the form of regular journal assignments and/or group meetings to discuss progress on service projects. Reports on an agency's function within the community as well as the results of any data analyses or other studies are also a part

of the reflection process and help students to connect course content with community needs. Carefully constructed course syllabi and agreements with community-service agencies can help to ensure that the service and learning goals and responsibilities of all those involved are well expressed. (See Heffernan’s book for details on constructing a service-learning syllabus.) Students should be assigned to projects based on interest and prior experiences, and training can take place in class discussions and through project guidelines. A project time line can be designated as part of the course syllabus to ensure that both students and agency representatives are aware of when the project will be completed.

As part of the service-learning course design process, Howard 2001 provides several matrices that could also be used as a rubric to assess the quality of the service-learning experience provided to students. The example matrix shown below is designed to help faculty assess the purposeful civic learning component of a service-learning course. By following the workbook, faculty are encouraged to consider which aspects of civic learning they want their course to meet and then to develop strategies for meeting those aspects through classroom activities and student assignments. This matrix, along with several others from the workbook, could be used by faculty after teaching their service-learning course for the first time to assess the quality of the service-learning component of the course.

Goal Categories for Purposeful Civic Learning	Specific Objectives	Classroom Strategies	Student Assignments	Assessment Learning
Academic Learning				
Democratic Citizenship Learning				
Diversity Learning				
Political Learning				
Leadership Learning				
Inter- and Intra- Personal Learning				
Social Responsibility Learning				

#### 4. Discussion

A great deal of overlap exists among the six models described above and the examples presented are only the beginning of the service-learning possibilities for statistics faculty to explore. I would like to add co-curricular service learning activities as an additional model for service learning. Although some service-learning experts contend that “true” service-learning takes place only at the intersection of (1) relevant service to the community, (2) enhanced academic learning, and (3) purposeful civic learning (e.g, Howard 2001), it is unrealistic to assume that all learning stops at the end of a course. Through participating in a statistical consulting group, for example, under the direction of

a statistics faculty member to complete data and other analyses for community-service agencies, students' knowledge of and experience with statistical methods will be further enhanced. In addition, their co-curricular work can provide valuable experience to supplement their resume or graduate school application.

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