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Stepping from service-learning to SERVICE-LEARNING pedagogy

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Abstract

Service-learning can mean different things and look quite different in varying statistics curricula that may include undergraduates, graduates, majors and non-majors across a wide array of higher institutions. The terms community engagement, volunteerism, community-based projects and service-learning are tossed around on various institutions' websites. The purpose of this article is two-fold. First is to provide an historical review of the evolution of service-learning activities to try to unify and define the terminology as one might use this pedagogy for statistics instruction. Second is to present some examples of how a first and second course in business statistics can step up from service-learning and move up the continuum towards reaping the reciprocal benefits of SERVICE-LEARNING (SL). In this article, service learning (note the omission of a hyphen) is a valued classroom service activity that separates the activity from the learning goals of the class, while service-learning (note the presence of a hyphen) is a teaching methodology in which the service and learning goals are carefully given equal weight in the development of the project so that classroom goals and service outcomes enhance each other providing a reciprocal experience for all participants (Sigmon 1994). When this careful design is a "method of teaching through which students apply newly acquired academic skills and knowledge to address real-life needs in their own communities" (ASLER 1994), SL unifies what students are currently learning in the classroom with the service they are simultaneously providing in the community. Careful design opens the door to provide opportunities of SL in an introductory, non-majors statistics class.

1. Introduction: History and Terminology

In 1985, the Campus Compact (http://www.compact.org/about/history-mission-vision/) was formed by a coalition of more than 1,100 college and university presidents dedicated to campus-

based civic engagement. The Campus Compact "promotes public and community service that develops students' citizenship skills, helps campuses forge effective community partnerships, and provides resources and training for faculty seeking to integrate civic and community-based learning into the curriculum". Campus Compact was created to help colleges and universities create such support structures.

As the idea of campus-based civic engagement became more intimately involved with learning objectives in the classroom, Sigmon (1994) proposed a typology designed to illustrate how one can fully integrate the concepts of service and learning within the boundaries of a classroom syllabus. He illustrates four levels of service-learning pedagogy. Any service project or activity which is implemented that completely separates the activity from learning goals, or without thought of specific classroom learning goals is *service learning*. Any activity that is designed around the primary focus of the service outcomes while the learning goals are secondary is termed as *SERVICE-learning*. On the other hand, if the learning goals of a course become the primary driver for a particular service project without meaningful consideration of service goals, the project, while helpful does not further the outcomes of the service organization. Sigmon classified this as *service-LEARNING*. When the service and learning goals are carefully given equal weight in the development of the project such that classroom goals and service outcomes enhance each other providing a reciprocal experience for all participants, then we have achieved *SERVICE-LEARNING* (SL). Sigmon's (1994) classifications are presented in Table 1 below. This really suggests a continuum of categories clarified further by Furco (2003). A reproduction of Furco's graphic is provided later in Figure 1.

Table 1. *Sigmon (1994) proposed typology*: differentiating the levels of service learning pedagogy

SL step continuum	**Primary and secondary beneficiaries**
service learning	service and learning goals completely separate
service-LEARNING	learning goals are primary; service outcomes are secondary
SERVICE-learning	service outcomes are primary; learning goals are secondary
SERVICE-LEARNING	service and learning goals of equal weight, reciprocity

Since Sigmon's typology was introduced, two other key resources published by the Campus Compact have been helpful in defining experiential learning models as service-learning (Heffernan 2001) and to further illustrate how some traditional experiential learning may slide along the continuum above (Furco 2003).

Heffernan (2001) offered course construction guidance for six models of service-learning founded on four basic principles. The six models include terminology such as 'capstone courses', 'internships', 'community-based action research', 'discipline-based', 'problem-based' or 'pure' service-learning. Heffernan emphasizes that to be service-learning these classroom experiences must follow four basic principles:

1. ***Engagement***: Does the service component meet a public good?
2. ***Reflection***: Is there a mechanism that encourages students to link their service experience to course content and to reflect on why the service is important?
3. ***Reciprocity***: Is reciprocity evident that every individual functions as both teacher and learner?
4. ***Public dissemination***: Is the service work made public?

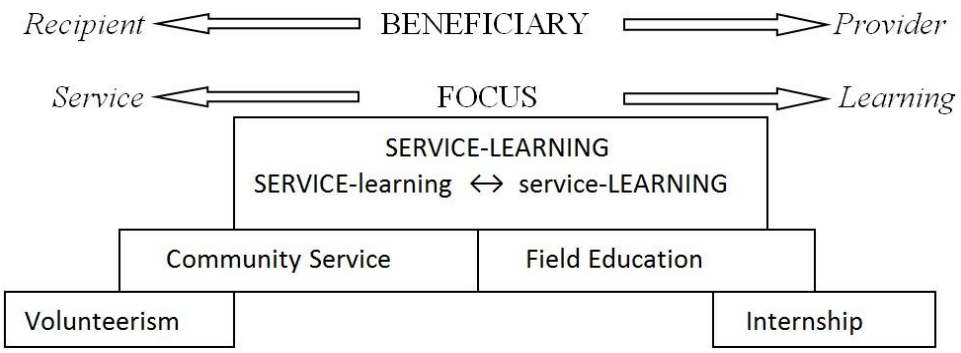
Note that Heffernan places a hyphen between the words service and learning. While this may seem a subtle addition or even a misuse of proper punctuation, adding the hyphen indicates a service-learning pedagogy in its truest form (Eyler and Giles 1999), SERVICE-LEARNING. Hydorn (2007) summarizes the six models and offers examples supporting that statistics service-learning courses can meet these principles.

Furco (2003) suggests we consider two questions when designing a service-learning course to help us determine which way we may slide on the continuum. These are, "who is the beneficiary" and "what is the focus"? In doing so, one can more readily see whether the activity is shifting toward a more focused service outcome with community benefactor or toward more focused learning outcomes with the student as benefactor. If the focus and beneficiary are equally balanced, we have achieved service-learning or SERVICE-LEARNING (SL). While each of the experiences below could thoughtfully shift toward a more balanced approach, Figure 1 represents an illustration of how these experiential learning opportunities have traditionally been implemented through activities such as volunteerism, community service, internships and field education.

- ***Volunteerism*** is engagement of student activities where the primary emphasis is on the service provided and the primary intended beneficiary is the community recipient. In many cases, acts of volunteerism on college campuses are motivated by extra-curricular student involvement and not attached to an academic course or learning goals and, therefore, not service-learning.
- ***Community service*** is the engagement of students in activities whereby the primary focus is on the service being provided with a secondary thought toward personal development and perhaps diversity awareness. While the student may receive some benefit of learning how the service may make a difference in someone's life, the service is not directly associated to academic learning goals. This differs from volunteerism in that the program involves more structure and student commitment. Students may engage in activities that involve a cause that meets a community's needs such as recycling or environmental improvement. The service provided primarily meets a need of the community by cleaning up green space, however, it may also provide the opportunity to learn about the cause and the community needs.
- ***Internships*** engage students in service activities primarily for the purpose of providing students with hands-on experience that enhances their learning or understanding of issues related to their discipline of study. While this activity provides professional knowledge service to an organization, the main objective is to give the student real-world experience to apply learning goals previously learned in a classroom setting.
- ***Field Education*** provides students with co-curricular service opportunities that are related, but not fully integrated with their classroom instruction. A Google search of this term provides hits that are largely in the fields of social work, divinity and education whereby the pedagogy provides an opportunity for the student to work side by side with a professional in their field to gain experience and knowledge about how their discipline functions in the real world. Students perform the service as part of their program of study to enhance student learning while also emphasizing the service provided.

Figure 1 represents the shifts away from a completely balanced design depending on the primary emphasis placed on the beneficiary and focus.

Figure 1: Distinctions Among Service Programs (Taken from Furco 2003)]



1.1 Getting Started

By 2005, our institution began to take steps toward providing a required service-learning opportunity for all of our students. I attended workshops and seminars to see how I could implement this pedagogy in my business statistics classes. I started with two small projects in my Business Statistics II courses. Through five years of implementation, assessment and redesign, I developed a two-semester project that demonstrated reciprocity as defined by Heffernan (2001) in which introductory, non-statistics major students functioned as both teacher and learner. While I received full support from our office of service-learning throughout the developmental five years that my projects were sound service-learning activities under Heffernan's 'discipline-based' model, I felt that my pedagogy was not quite balanced. In my pursuit of understanding, I found Furco's (2003) illustration above and reasoned I was sliding more heavily toward one side or the other of the balance. Initially, I served as a 'middle-manager consultant-type'. I met with the community partner, did most of the experimental design and pulled it all together in a final report after the end of the semester. The students collected the data, summarized the results and performed inferential statistics by completing various assignments throughout the semester. They were in fact applying newly acquired academic skills (ASLER 1994) and a non-profit organization received valuable information. I guarded my learning objectives and made sure that the service supported their learning. In order to meet the reflective component, I included a short reflection assignment to be turned in with the final written project. There were no oral presentations because three sections of a required business statistics class would mean taking three class meetings away from teaching new material. The service and learning were separated by me playing the 'middle-management' role. The classroom activities focused more on the learner and there was minimal reflection required.

Those original attempts worked amazingly well but took a lot of effort on my part. However, with the experience of how to organize a service-learning project behind me, each new project brought about adjustments to the delivery of the pedagogy, and better assignments to free up time for oral presentations and to move the students into a position to balance the focus on the

community partner. My most recent project brought my pedagogy soundly to the middle of the continuum. The hyphen was in place and I felt like shouting SERVICE-LEARNING!

1.2 Service-learning meets the GAISE criteria

Fundamental to most majors' curricula is at least one pre-requisite statistics course. Implementing a community service project that requires students go through the steps of a statistical analysis that benefits a local non-profit organization allows the student to actually practice what they are concurrently learning in the classroom and provides a reciprocal relationship between the classroom and the community partner. This type of instruction naturally supports the GAISE guidelines (GAISE College Report 2010).

Service-learning pedagogy structures class activities around the service so the students are learning the statistical concepts while simultaneously performing the data collection, description, analyses and concluding summary reports for the project. Classroom concepts come alive in a real context while providing a meaningful service to agencies that possess little expertise in statistical analyses nor have the staff to conduct such services. Reflection exercises that are structured around asking students to review the benefits of the service in helping them to learn the steps of a statistical analysis, as well as to consider how their statistical expertise is meaningful to the organization, may provide a deeper understanding of the learning as well as personal growth (Phelps and Dostilio 2008). Including periodic interaction between the community partner with ongoing progress and results from the students, administrators of the organization learn valuable practical statistical skills. The students become teachers. Best practices as suggested by the GAISE guidelines are fully supported. The data is real, technology is essential, active learning and statistical literacy are promoted through interaction with the community partner, data collection and project reporting and integrated assessment is achieved through the reflection exercises, quizzes and lab instruction.

Service-learning in the social sciences has been growing since the early days of the Campus Compact. Examples cited in the statistics education literature began to develop with the statistics reform movement and discussions leading to the GAISE guidelines. Frequently cited statistical education papers describing service-learning experiences often are applied in consulting-type classes (Jersky 2002) or involve more advanced students in the natural sciences (Anderson and Sungur 1999). Other cited studies focus on anecdotal student self-evaluations without a detailed description of the level of the course. These studies offer supporting evidence that service projects affect social cognitive development (Sperling, Wang, Kelly, and Hritsuk 2003) and improve students' attitudes toward a course (Evangelopoulos, Sidorva, and Riolli 2003) and Gordon 2004). Thorne and Root (2001) provide supporting evidence of ways community-based projects help students learn statistics in an applied class.

2. Implementing SL in an Introductory, Non-majors class

Applying SL in a truly introductory, non-major statistics class is less frequent than in upper level statistics courses and incorporating critical reflective thinking has not been widely reported in the statistics education literature. The second task of this article is to provide some guidance of how

SL can be implemented in an introductory, single semester, non-majors statistics class or a second semester business statistics class. The following will demonstrate steps taken by a business statistics professor over the last 5 years to fully incorporate the three key concepts of SL identified and supported by our institution that are academic instruction, meaningful service and critical reflection to enhance student learning and social responsibility and to ensure that the pedagogy is based soundly on reciprocity. Students gain experience from data collection, to data summarization, to statistical analyses and to presenting an oral and written report. Community partners not only learn some basic statistical techniques of their own, but gain valuable assessment information from which to reflect and change their own programming and policies.

2.1 Business Statistics Course descriptions

All business students at our institution are required to take two semesters of business statistics. The objectives of the first semester include numerical and graphical descriptive statistics for single variables and the relationship between two variables, basic probability rules, the normal probability distribution, sampling distributions for a mean and a proportion, confidence intervals for estimating a mean and estimating a proportion and hypothesis testing for a single mean or a single proportion. Business Statistics II takes the students through the two sample t-test, paired t-test, two proportions Z-test, Chi-square tests of independence, simple and multiple linear regression and one-way and two-way analysis of variance. Textbooks used over the years have included: Moore, McCabe, Duckworth and Sclove, *The Practice of Business Statistics, 1st ed.;* Anderson, Sweeney and Williams, *Modern Business Statistics, 3rd ed*. and more recently Sharpe, DeVeaux and Velleman, *Business Statistics*. All students in Business Statistics II are required to complete a final research project. They may choose to participate in the service project or to perform their own analysis and they may choose to work in groups of up to 3 or by themselves. Typically about half of the students choose the service project. This results in about 50 students over three sections that elect to participate in the SL project. Students are informed on the first day about the final project requirement and the choices they will have to make. Parallel assignments are created throughout the semester to keep the independent projects moving along with the requirements of the SL projects. This will be further developed below.

Finding a community partner to work with is a difficult initial step in implementing SL. I am fortunate that our institution fully supports an Office of Service Learning whose purpose is to address the needs of faculty members, community partners and students involved in community-based learning. The project overview described below begins with meeting the community partner prior to the beginning of classes. Section 2.2 gives a rough outline of how a typical semester may flow with supporting documents available in the appendix. Section 2.3 briefly describes a few one-semester Business Statistics II projects. Section 2.4 expands the pedagogy to a two-semester project and includes a more detailed timeline complementing the general outline given in section 2.2.

2.2 General project overview

Prior to the start of each semester in which a SL project is proposed, the instructor should arrange a few meetings with the community partner. Based on these discussions, the instructor provides a proposal that outlines what is expected of the community partner, the instructor and

the students throughout the semester (see Appendix A). This helps to clarify the project and gives the instructor an outline from which to develop the course syllabus and assignments. The project and community partner are introduced to the students at the beginning of the semester. In many of my partnerships, this requires that students obtain HIPAA (Health Insurance Portability and Accountability Act) certification because many of my projects have dealt with reviewing personal client information. This is accomplished by having the students take a short on-line certification course in which they learn about the laws which protect an individual's rights about their personal information and procedures taken to ensure privacy. I tell them that they can put this on their student resume and I have yet to receive any complaints.

Within the first few weeks of class, students can begin to participate in designing the data collection process framed around discussions in class about surveys and sampling and types of data which are often initial topics of a first course in statistics. Students will now begin to schedule a few hours to go to the community site to collect the data. For many of my projects this has meant sifting through boxes of paper that most non-profit organizations collect in copious amounts but have little time or expertise to analyze. In one case, it meant contacting agencies and arranging times to interview management and homeless clients. In another, we set up an on-line survey. Once the data are entered and cleaned, students can begin the analyses. With careful planning and a commitment to 'stay the course,' one can have the data ready for analysis by the tenth week of class.

The level of analysis can be dictated by the requirements of the course objectives. In many cases, the non-profit organizations are exceedingly happy with simple descriptive statistics and basic relationships between two variables; however, the requirements of most introductory classes will include some hypothesis testing and perhaps regression analysis. Herein lies an unanticipated reciprocal benefit. The instructor can build in types of analyses that are required in the course syllabus and the community partner receives additional information about potential significant relationships that they may not have originally considered given a lack of expertise in statistical analyses. Having the students give oral presentations to the community partners, gives them the experience to interpret the analyses in a way that is understandable to a general audience. This skill will be necessary later in life with co-workers of varying academic backgrounds. The most important learning goal of my two-semester business statistics course is that the students become 'consumers' of statistics. Many of these students will not be doing hypothesis testing in their employment after graduation but will need to be conversant about proper statistical procedures and what the results mean in the contexts of their employment.

2.3 One-semester Business Statistics II examples

My original foray into the implementation of SL began with a second semester business statistics course. I thought that I would have to wait until students had some statistics instruction before I could ask them to apply statistics in the community. In my first few years of applying SL in this class, the survey instruments were designed between the community partner and me, the instructor. I introduced the project and gave a little background about the non-profit organization. The data collection methodology was laid out before the students with some limited discussion about who was being studied, what variables were being collected and why the project was being done. Coordination efforts were focused on scheduling students to do the

data collection and getting the data into a usable form for analysis. The students provided limited reflection at the end of the semester and there were no oral presentations. Following their written reports, I prepared a summary report for the organization taken from the various student projects. Although there was reciprocity, I felt that the service activity was separated from the learning activities. The data collection and summary skills used in the project were learning goals from the previous semester in the Business Statistics I class. While repetition is certainly a good teaching tool, students were not performing the service concurrent with the classroom instruction. Students were, however, developing statistical model applications concurrent with Business Statistics II learning objectives and providing data analyses service to the non-profit organization. This looked more like service-LEARNING in which I was sliding more toward the learning side to preserve academic content.

The following describes two early attempts of service-learning in a second business statistics class. As I became more experienced with the pedagogy, I began to add reflection exercises, include the students more in the planning and experimental design and make time for oral presentations with the community partners invited. The additional reflection exercises were designed to have students think more deeply about the service and civic responsibility. The oral presentations provided enhanced reciprocity as the students became the teachers and the community partners became the students.

2.3.1 An Advocacy Agency for Health Insurance Access (Spring 2006):

The primary focus of this study was for the students to investigate poverty and insurance trends of clients receiving aid in the form of free prescription drugs due to inadequate income and insurance coverage. The administrators of this agency felt that over recent years their clients appeared to be poorer on a National poverty scale with less government aid to assist in providing prescription drugs. Students spent two weeks on the premises reviewing more than 250 client folders. Students collected information on date of service, family size, income status and whether the client had Medicare, Medicaid or private insurance coverage. Small groups worked together to summarize significant changes in poverty and insurance coverage over the years from the late 1990's through 2005.

2.3.2 An Inner-city Faith-based homeless shelter for men and women (Spring 2007):

Small groups were assigned three hour time-slots over a two-week period to review client files. They gathered information on length of stay, recidivism, age, education, race, mental health/addiction status, veteran status, gender, in which of the three shelter programs offered was the client enrolled and whether the client successfully completed the program. Students brought the information back to the class and built a database of responses. From this, the students worked in small groups to perform statistical analyses. Statistical analyses were geared toward comparing the three programs (two types of male homeless programs and one for homeless mothers) for completion and length of stay. Students attempted to describe influences of the various variables on proportions of clients who completed the program and how long they stayed in the program.

2.4. SERVICE-LEARNING: A two-semester Business Statistics Example

I was introduced to an organization in the summer of 2010 that provided independent living skills to teens in the county foster care system. The organization offers a non-residential program that provides community-based education to those up to 21 years of age and a supervised residential living program to teens between 16 and 18 years of age. The residential program provides services to teen boys, teen girls and teen moms. The organization was looking for ways to begin outcomes assessment for the purposes of program improvement, grant writing and general community awareness. The summer timing allowed me the opportunity to take a chance on involving the Business Statistics I students as I generally teach the first business statistics course in the fall and the second course in the spring. This potential project was introduced early enough for students to get properly acquainted with the organization and to prepare a proposal that clearly outlined the community partners' responsibilities, my responsibilities and the students' responsibilities. Having the project proposal agreement improved the management and flow of the project and the timeliness of assignments. Starting in the first semester of business statistics allowed for more time to interact with the community partner and get the students involved with the design of the data collection process. The students were actively learning about sampling data, types of data that needed to be collected to address specific questions and problems that naturally occur in the collection of real data concurrent with the topics being introduced in the classroom. The data they personally collected was used to illustrate graphical and numerical summary descriptive statistics for categorical and numerical variables, and to investigate potential relationships between variables. While we were not ready to perform two-sample t-tests or analysis of variance, we could address questions about success or failure for males and females, how long teens remain in the programs and how other types of demographic variables might influence outcomes of longevity or success.

The first semester was more about data collection, data description, and confidence interval construction for single mean or single proportion inferences. All students were required to participate in the first semester and volunteers were solicited to present our results the last day of class. I had three classes presenting different program analyses to the organization. Each class had about 30 minutes to discuss future questions that could be further investigated in the second business statistics class. Through these conversations the students and the executive directors of the non-profit organization were beginning to see the importance of more sophisticated statistical modeling that we could do in a second course in statistics.

The first semester provided mostly descriptive statistics and basic two variable relationships between 48 variables among nearly 200 teens enrolled over a five-year period for the residential program of at-risk teens. From the oral presentations at the end of the first semester, the students engaged in conversation with the program administrators to develop a similar assessment for their community-based education (non-residential) program as well as to develop a more statistically sophisticated analysis modeling significant influences to predict program successes. In the second semester, students were given the option of choosing to continue with the SL project or to propose an independent project of their own interests. Students electing to continue the SL project repeated the data collection process on clients enrolled in the non-residential program. Different student groups were assigned to different assessment questions that required a variety of statistical analyses that are learning goals for Business Statistics II. These included

two-sample t-tests, analysis of variance, simple and multiple linear regression and chi-square tests of independence.

The second semester is really just a reproduction of the first semester in which the primary learning goals of the project are shifted toward those objectives in a second semester of statistical analysis procedures. The final reflection assignment was given to all students at the end of the second semester so that I could compare students' responses between those that elected to do the service project and those that elected to do their own project. It is my desire that all students perceive that the final project assignment is useful for learning *academic content* and *student development*. While *social responsibility* is not a primary objective when assigning a traditional final statistics project, some students do select topics that may provide a social context.

3. A Two-semester timeline:

Summer 2010

- The instructor meets with the Community partner several times.
- The instructor provides a project proposal with a tentative timeline (see Appendix A for an example).

Homework (HW) assignments are usually embedded within the bi-weekly lab assignments. Refer to Appendix B for examples of guided reflection questions.

Fall 2010 – Business Statistics I, all students participate

- The community partner meets with the class to provide an orientation to the organization and to describe the project.
- All Students are required to complete the on-line HIPAA certification. (HW)
- The Students assist in the development of the survey/data collection instrument. (HW with a short reflection assignment)
- The students schedule a 2-3 hour block of time to go to the organization to collect data. Generally, I work out a two-week schedule with the organization when they can have small groups of students come and review the files. (HW with a short reflection assignment)
- The students that were unable to go to the organization spend a week on data entry and cleanup. (Same HW with a short reflection assignment as in the previous bullet)
- The student groups are assigned different variables to summarize, graphically display and perform statistical inferences in the form of a single population confidence interval estimate or hypothesis test. This will be the final project assignment.
- The final written project is due the last week of class. The students could submit a final guided reflection assignment if this were a one-semester project (see Appendix C).

Spring 2011 – Business Statistics II, students choose to participate

- We begin the semester with a brief overview of the first semester project and discuss what we need to do for this semester's project continuation. The students will decide whether they want to continue with the SL project or do their own project.

    - Those choosing to do the SL will present a draft proposal of what variables and study questions they wish to investigate. If there are any new students, they will need to complete the on-line HIPAA certification.
    - Those choosing to do their own project will present a draft proposal of what hypothesis they wish to investigate and what variables are needed.
- The students submit a proposal for collecting their data
    - Those choosing to do the SL will assist in the development of a new survey/data collection instrument. (HW with a short reflection assignment)
    - Those choosing to do their own project will submit a proposal for collecting data. (HW that does not include a reflection but this is more difficult for those designing their own studies and therefore usually requires a couple of re-writes before I accept their proposal)
- The students schedule a 2-3 hour block of time to go to the organization to collect data for the community-based (non-residential) program while the non-SL students are supposed to be getting their own data.
- The data is collected and put in an Excel spreadsheet ready to be analyzed.
- The student groups are assigned different program questions and variables to analyze as their final project.
- All student groups are scheduled to present their projects orally. All students participating in the SL will present on the same day to allow for the community partners to attend. Written reports are due on the last day of class. All students will complete the final guided reflection assignment (see Appendix C).

4. Reciprocal Benefits

The Advocacy Agency for Health Insurance Access example illustrated reciprocity while generally keeping the learning goals separate from the service provided. Although the students interacted with the agency during the data collection phase, there was little interaction between students and community partner before or after collecting the data. I provided the orientation, there were no oral presentations and I summarized the students' projects in a summary report given to the agency. In the beginning, I felt time was a big obstacle. I was also new to the idea of reflection. The final reflection assignment (Appendix C) was created during the semester and was the only reflection assignment for the whole semester.

The following year with some experience and timing behind me, I could begin to focus more on reflection as the "mechanism that encourages students to link their service experience to course content and to reflect on why the service is important" (Heffernan 2001). I added a few brief reflection assignments following the orientation to the community partner and the discussions on data collection. While I felt it was important to increase the interaction with the community partner and the students, I still found it challenging to free up enough time to allow for oral reports. Given my class sizes, it meant removing a week and a half of what I thought was 'quality' course instruction time. I continued to function as the consultant-middle person between the students and the community partner when approached by the inner-city faith-based homeless shelter for men and women. Three service-learning projects came from this relationship. The first year the second semester business statistics students performed several analyses that compared the homeless mother's program to the two male programs. Analysis of

variance, two-sample t-tests and multiple linear regressions modeled success in completing the programs.

This is where the increased interaction between students and community partner added value toward reciprocity as "evidence that every individual functions as both teacher and learner" (Heffernan, 2001). The community partner took our results, made changes to their programs and asked my students to come back and look at measuring the changes. I added the project proposal that detailed each participant's responsibilities and gave more structure to the implementation of the project. I finally came around to the value of the oral presentations and made time for each group to present, inviting the community partner to the presentations. This experience also set the stage to convince me that this pedagogy can be successful with first semester, introductory students.

Values added to improve reciprocity and balance between the recipients and the focus are:

1. The pre-semester project proposal improved organization and increased communication between the classroom and the community partner.
2. The added embedded short reflection assignments encouraged the students to link their service experience to the course content and to reflect on why the service is important.
3. Oral presentations with the community partner provided the opportunity for the students to become the teachers and the community partners to become the learners.

The benefits of the two-semester project far exceeded my expectations. In the first semester, all students in three sections of business statistics (n=94) were required to participate. No student openly complained or opposed taking the online HIPAA training and getting certified. The data collected provided examples and opportunities for homework assignments and in-class quizzes (see Appendix D and Appendix E), as well as the final project at the end of the semester. The end of the semester meeting with the community partner provided the opportunity for students to engage in a mock consulting meeting with real clients.

In the second semester, students were given the choice to continue working with the community partner (n=34) to collect additional data and engage in further analyses to try to answer some of the research questions that came from the discussions at the close of the first semester. Students not choosing the service project (n=46) were required to propose a project of their own choosing. Parallel assignments (see Appendix B) were given to both groups throughout the semester. All students presented their results orally in the last week of classes and all students turned in the final reflection assignment. The students were informed that the reflection papers would not be graded but that they would lose five points on the final project grade if they did not turn in the reflection assignment.

From the Community Partner:

Following the oral presentations, the executive director commented to school administrators that "…based on the results presented by the students, our organization has made changes in how they operate and how they compile and store their records."

From the students:
Students' responses were positive toward both the traditional and the service-learning projects in their reflection papers. Here is what a few students who participated in the SL project said:

- "There is nothing better than helping out a non-profit. There comes a point when you have to take the training wheels off and just let the students be free."
- "My time in that class and especially on the project feels like a complete success and one day I hope to be as helpful to an organization our class was." (sic)
- "Helped me to retain, encourages good communication skills and teamwork."
- "…made it possible for me to contribute in a service that actually helped someone."
- "I am most happy that I chose this topic."

5. Discussion

The purpose of this paper was to help define the various experiential learning pedagogies traditionally associated with community engagement, service and service-learning and further define how a service-learning project can move along the continuum as defined by Sigmon (1994) and Furco (2003). The examples given in this paper illustrate how SERVICE-LEARNING (SL) can be implemented in a first and second non-majors statistics course with students who may have little or no previous statistics education. While the pedagogy may take additional preparation time, the benefits faculty gain include: improved organization of class activities through matching the syllabus to the project proposal, increased interaction and rapport with students through the data collection process, and an overall good feeling from seeing students successfully produce a project the helps your local community while providing a real-life opportunity that fully supports the GAISE guidelines.

So much work leading to the GAISE guidelines focused on the one-semester, introductory statistics class yet there is little evidence that service-learning in statistics education has been practiced with this group of learners. If statistics educators have only a one-semester option to teach statistics to non-majors, then we should want the best opportunity to help them be consumers of good statistical practices as citizens. I find that a well-balanced SL pedagogy provides that opportunity. Furthermore the process of continually tweaking the SL pedagogy has made me a better educator. The extra-time required to move this pedagogy along the continuum has helped me to be a more organized instructor, has forced me to reflect and re-assess what is really important to the non-major and has led me to consider assignments that really matter while giving students a practical real-life experience. I may add that I continue to follow and observe the on-going reciprocal benefits provided to these organizations by providing general pro-bono support as needed. Additionally, I have used this opportunity to create a work study job for a select qualified upper-classman to serve as an undergraduate research assistant. This student, while gaining leadership and professional skills, assists in taking some of the additional preparation time away from the instructor.

Although, this article presents a successful two-semester model, a one-semester model can be extracted from the timeline, whether the course is a first semester statistics class or a second semester statistics class. If the reader has never used this pedagogy in class, I encourage them to start out small as in the first two examples. Even though these examples were from a second

semester, non-majors class, a large part of the project was collecting data and descriptive statistics which are typical first semester learning goals. To those who may not have the support of an Office of Service Learning, the first two examples are similar to a consulting project except that we are managing a large number of students to collect the data and perform the analyses. One can add to the course design as one gets more comfortable with the service-learning pedagogy and the organizational skills that go along with this type of instruction.

Appendix A
Project Proposal Agreement Fall semester 2010

A service learning opportunity between Business Statistics students at _____ University and _____

Student Responsibilities:

Students enrolled in Business Statistics I class, BA281, in the Fall of 2010 will work with administrators at _____to determine important information that would be helpful in characterizing _____'s clients for the purpose of identifying successes and areas for program changes. This will require that students

- receive HIPAA training and certification
- consult with administration on what information they want to ascertain
- develop a *data information sheet*
- review client files and extract selected information for the data information sheet
- provide data entry and data summary :
  - ✓ data summarized in graphs: pie charts, bar charts and histograms and boxplots where appropriate
  - ✓ Descriptive statistics such as means, sd's, medians and proportions where appropriate
  - ✓ Confidence Interval estimates
  - ✓ Interpretations and applications

Students will prepare a 20 minute presentation of the project, data summary and conclusions to be presented to _____ on the last day of scheduled classes.

Community Partner Responsibilities:

Administrators from _____will agree to meet with the three BA 281 classes

1. During the second week of the semester to provide a 15 minute overview of
   - ✓ the services that _____ provides
   - ✓ the type of information they would like to collect and
   - ✓ how they will assist in the collection of data.
2. They will agree to be available for assistance, questions and clarifications throughout the 15-week semester.
3. _____ representatives will be present on the last day of scheduled classes to view the presentation at which time a project report will be given to representatives of _____.

Prospective TENTATIVE time scale:

Tuesday August 31: _____ will come on Tuesday August 31, 2010 to give a brief presentation to all three classes. We will allow for some questions and brainstorming for developing the data information sheet.

August 31 through September 14: Students will use notes from the brainstorming to develop the data information sheet. A near final draft will be submitted on Tuesday September 14 for _____ to make final changes.

September 21: We will propose to have the data information sheet ready for final changes and approval.
September 21-October 21: Students will be scheduled block times to go to the Service Learning office and review files, using the data information sheet to get pertinent information from client files and record it on the data information sheet.
October 21-November 5: Students will enter the data into Excel and begin the data summary and final report.
November 18: Students will have a final report and PowerPoint turned in. The instructor will make final comments and suggestions over Thanksgiving Break. Students will make final corrections.
December 4: The final project presentation will be presented in class.

Appendix B

Brief Outline of Lab assignment topics with SL assignments embedded

Both Business Statistics I and Business Statistics II have bi-weekly lab assignments in which students tackle larger datasets and address a general business question.

Lab I: Summarizing and describing categorical variables, Due Sept. 14

Service-learning Homework Assignment I: Getting your HIPAA training certification

This is a mandatory assignment. Five points will be deducted from the mandatory lab 5/6 assignment at the end of the semester. Furthermore, you will not be able to help in collecting the data necessary to complete the projects proposed for _____ which will result in further point deductions.

Lab II: Summarizing and describing numerical variables, Due Sept. 28

Service-learning Homework Assignment II: Service-learning orientation

After listening to the community partner's orientation in class and reviewing the community partner's website, submit a list of ten variables you might find in the client's file which will help us to describe characteristics of the clients and look for relationships. Submit a short paragraph that includes how this information may help the organization.

Lab III: Describing relationships

Service-learning Homework Assignment III: Data collection and Reflection

Schedule a 2-3 hour block of time to collect data:

Please pick a time from the following options to go to the Office of Service Learning to review files and record data:

September 27 **2:00-4:30**	**September 28** **11:00-1:30** **3:00-5:00**	**September 29** **10-12:30** **1:00-2:00**	**September 30** **3:00-5:00**	**October 1** **10-12:30** **2:00-4:30**
October 4 **10-12:30** **2:00-4:30**	**October 5** **11:00-1:30** **3:00-5:00**	**October 6** **10-12:30** **1:00-2:00**	**October 7** **3:00-5:00**	**October 8** **10-12:30** **2:00-4:30**

SL Reflection Assignment: ON A SEPARATE SHEET OF PAPER TURNED IN

After you have participated in the data gathering process please write a short paragraph reflecting on how you expected the data collection to go contrasting with what really occurred; and write another short paragraph describing something you learned about Ward Home.

Appendix C
Final Project Reflection

Throughout the two semesters of business statistics, it is my ultimate goal to prepare you to be able to design a data collection study formulated around a specific question or hypothesis. The final project is therefore designed to mimic a more real-life experience and meet the following learning objectives.

- **Learn how to develop a research design for testing the difference between two or more population means or proportions (or testing the relationship between two variables such as a simple linear regression would be necessary) and apply the appropriate statistical model(s) for testing a desired hypothesis.**
  In order to accomplish this, students will exhibit the ability to:
  - design a simple method of data collection and be able to discuss sampling bias
  - structure and synthesize the information collected by using appropriate summary graphs and statistics
  - apply analytical procedures for the purpose of drawing useful conclusions,
    - tests of hypotheses
    - confidence interval estimation
  - draw conclusions about the sampled population
  - and develop proposed solutions, if necessary

On a separate piece of paper, please answer the following questions and staple it to the multiple choice questions on the back of this page. THERE ARE NO RIGHT ANSWERS, just a 5 point reduction in your project grade for failing to submit a response individually. <u>This is not a group effort.</u>

1. Reflection on the *academic content* of the final project assignment:
Please write a short paragraph on how doing this final project helped you to:
   1) design an experiment following a question of interest
   2) understand difficulties in collecting data as free from bias as possible
   3) prepare the data for statistical summarization (using statistical software)
   4) perform a statistical analysis including data summarization, hypothesis testing, confidence interval estimation and drawing conclusions.

Please comment on problems you did or did not expect and how you dealt with them.

2. Reflection on the *(social) benefits* to a population on doing this project:
Please write a short statement about who might benefit from this information and why this is important. For those who volunteered with the service-learning project, please consider why your statistical 'expertise' was valuable or not valuable for the organization we helped.

3. Reflection on *student development*. Please comment on how completing the objectives in this final project may have furthered student development as you approach upper level classes and ultimately a professional life.

Appendix D
Lab Assignment Example

Separate the Clients into whether their ***LastPlace*** was a shelter facility or not.

Part I – Hypothesis testing
Perform three tests of hypotheses:

1. Determine if there is a significant difference in the mean Length of Stay, LOS (days) between those clients who came from a shelter or not.
2. Determine if there is a significant difference in the mean age between those clients who came from a shelter or not.
3. Determine if there is a significant difference in the mean AdmitAssessmentScore between those clients who came from a shelter or not.

Currently, while I may have some thoughts about it, I really have no reason to believe the shelter group should stay longer or shorter, be older or younger OR score higher or lower on the Admit Assessment Score, so I would suggest that we perform a two-sided test for all three questions.

Part II – Confidence Interval constructions
A. IF any of the tests above indicate a significant mean difference, construct a confidence interval estimate to estimate the mean difference between the two groups and interpret this estimate.
B. If any of the tests above DO NOT indicate a significant difference between the two groups, then combine all clients together in a single population and construct a confidence interval estimate for that variable and interpret this estimate.

Instructions:
For each test, be sure to include:
1. Either a side-by-side boxplot or histograms for each group. Please be sure to include a comment that either confirms that the variables follow an approximate normal distribution or that the sample sizes are large enough.
2. Copy and paste all important outputs that are necessary for you to perform the tests of hypotheses and confidence intervals BUT do not give me extraneous information that is NOT useful to the analyses.
3. IMPORTANT: Provide a final **concluding paragraph** which SUMMARIZES what you learned about these three variables and clients who come from shelters or not.

Appendix E
Example Quiz Questions

Single population Hypothesis Testing using the service-learning data

1. The following frequency distribution summarizes the distribution of client ages accepted into the residential independent living program.

a. Do the data support that more than ¾ of students accepted in to Ward Home are 16 and 17 years old? Please show all your work including the null and alternative hypotheses, test statistic and proper use of the Z or t tables. Please state your conclusion in terms of the data and the question being asked. Use a significance level of 0.05.

Age	Total	Percent
15	2	0.01227
16	61	0.374233
17	84	0.515337
18	15	0.092025
19	1	0.006135
Grand Total	163	1

b. Verify that the conditions of sample size holds for using the normal distribution to make your inference.

2. One might assume that clients who leave the program with a negative outcome might have a shorter mean length of stay.

One Variable Summary	**LOS (Days) Negative outcome**
Mean	192.03
Std. Dev.	147.91
Median	150.00
Minimum	7.00
Maximum	729.00
Count	80
1st Quartile	77.00
3rd Quartile	270.00

a. If we can use the overall mean LOS of 215 days as indicative of an accepted LOS average, do the data extracted from only those that ran away or were given a 30-day notice suggest that the mean length of stay is shorter than 215 days? Please show all your work including the null and alternative hypotheses, test statistic and proper use of the Z or t tables. Please state your conclusion in terms of the data and the question being asked. Use a significance level of 0.05.

b. Clearly the distribution of length of stay is skewed.

1) What information from the descriptive statistics above indicates that the distribution is not bell-shaped?
2) Is the distribution skewed right or skewed left?
3) Given the distribution is skewed, what condition allows you to use Normal sampling theory to make an inference about the mean length of stay for these clients?

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