

## Measured Community Engagement Outcomes Increases in a Business Statistics Class

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### Abstract:

Paired pre/post responses for six scaled community-engaged (CE) outcomes (engaged learning EL, critical thinking CT, local and national engagement LCE and NCE, civic engagement CE and social responsibility SR) were compared between students enrolled/not enrolled in a service-learning (SL) class campus-wide. Generally those enrolled in SL campus-wide showed significant scaled increases for CT, LCE and NCE, and marginally significant increases for EL. Comparisons were also noted between business statistics SL and business statistics non-SL classes. While the general student population did not show significant increases in CE and SR, those in the business statistics SL resulted in marginally significant ( $p = 0.08$ ) mean gains when compared to those business statistics students enrolled in the non-SL classes. These results were not achieved at the expense of student learning as no significant differences were noted in any mean assessments comprised in calculating the course grade.

**Keywords:** Community Engaged projects, Community Engagement outcomes, Student learning

### 1. Introduction

The 1990's produced rich pedagogy recommendations both in the world of introductory statistics courses through the discussions that eventually led to the GAISE recommendations and parallel work to advance community engagement and civic learning on college campuses. The intersection of these seemingly diverse academic disciplines showcases the educational reform promoted by Angelo and Cross (1993) in which they stressed the importance of student engagement suggesting that students learn more when they take an active role in their learning. Newmann (1992) tied experiential learning with community engagement by coining the phrase "psychological investment" suggesting that learning occurs by combining traits of purpose and caring with authentic work that give the student a sense of ownership and a connection to the 'real world'. The heart of the GAISE recommendations was to provide students with real world data and give meaning to a discipline that was plagued by theory and deemed by students (ironically) as a subject they 'would never use'.

As community engagement and service-learning began to take root on college campuses, our private catholic university founded on the principles of Spiritan beliefs located in the heart of a major city concerned with urban redevelopment provides a unique opportunity to have students invest in surrounding communities. Embedding classroom learning goals with projects designed to advance community initiatives is clearly a win-win opportunity offering students real world applications. Providing statistical support for a local non-profit allows the student to perform a statistical analysis from the beginning stages of experimental design and data collection (often messy) through analysis and summary and conclusion reporting. The advantages of contemporary technology and software frees us of the classical burdens of calculations, gives us time to focus on real-life applications and allows us to exercise the GAISE recommendations.

Service-learning (SL) pedagogy was introduced on our campus beginning in 2006 and later became a university requirement. This was a monumental task and by 2012 administrators were interested in measuring its potential effects. As one who fully embraced the SL pedagogy in my business statistics courses, I offered to assist in creating the assessment survey and volunteered one of my classes to help with the statistical support and analyses.

The present study serves to measure the outcomes demonstrated by students who completed a SL class in the spring 2013 semester. Of general interest, outcomes related to social responsibility, engaged learning, and community involvement are of primary interest. The information gained through this study was to be used to document the success of the SL program and to make visible any areas for improvement. Specifically for this paper, outcomes from those providing the statistical support will be compared to outcomes from business statistics students enrolled in classes offered by the same instructor who were not involved in the service project. Additionally, this paper will highlight differences observed between those enrolled in a University Core Service-Learning (UCSL) designated business statistics class and those UCSL designated academic areas not devoted to teaching statistics.

## 2. Methods

The Bringing Theory to Practice Project (BTtoP) encourages colleges and universities to reassert their core purposes as educational institutions, not only to advance learning and discovery, but to advance the potential and well-being of each individual student, and to advance education as a public good that sustains a civic society. The Project supports campus-based initiatives that demonstrate how uses of engaged forms of learning that actively involve students both within and beyond the classroom directly contribute to their cognitive, emotional, and civic development, [http://www.aacu.org/bringing\\_theory/index.cfm](http://www.aacu.org/bringing_theory/index.cfm).

Using scales from the *Bringing Theory to Practice Toolkit Assessment Survey*, a pre/post on-line survey was designed to quantitatively assess student gains in social responsibility, engaged learning and community involvement as well as critical thinking across the entirety of a service-learning program at an urban, research intensive university. The goals of the assessment were shaped by the institution's core learning goals for students. Pre/post gains were compared to a sample not enrolled in a SL class as well as adjusted for several demographic variables which included: gender, year in school, age and previous SL classes completed.

The pre-and post-surveys were developed with the assistance of Ashley Finley, PhD, National Evaluator for the American Association of Colleges and Universities. The survey included scales from the Bringing Theory to Practice Project, Eyler & Giles (1999) *Where's the Learning in Service-Learning*, and the Wabash National Study. In total, the survey contained 50 questions;

- 18 questions measuring preference for critical thinking. (as measured by Need for Cognition scale)
- 7 questions measuring engaged learning. (as measured by engaged learning items)
- 5 questions measuring engagement with local issues. (as measured by Bringing Theory to Practice scales)
- 5 questions measuring engagement with national issues. (as measured by Bringing Theory to Practice scales)
- 10 questions measuring civic engagement. (as measured by Montclair State University scale)
- 10 questions measuring social responsibility. (as measured by Eyler & Giles, 1999)
- 5 additional demographic questions; id, gender, year in school, birth year, and major.

The pre-and post-surveys were open to all students enrolled in all UCSL designated classes in the spring 2013 semester with the exception of the University's Liberal Arts Learning Communities. Learning Community students were omitted from the assessment because the learning community design may influence a greater degree of involvement in service-learning. Students enrolled in a sample of four non-SL courses were also given the opportunity to take both the pre-and post-surveys. Students in these four classes were selected to serve as a pseudo-random control group. These classes were selected because they were the same academic courses as a SL course taught by the same instructor. For example, two of the four courses were business statistics taught by the same instructor as the business statistics SL course. Students

were invited to voluntarily participate in both the pre- and post-surveys through a series of email messages, in-class announcements, and Blackboard postings. Blackboard is a course manager system used by faculty at this University.

Paired t-tests were used to measure mean gains from pre-test to post-test for each of the six scaled outcomes measured; critical thinking, engaged learning, engagement with local issues, engagement with national issues, civic engagement and social responsibility for all students enrolled in the UCSL designated courses and for those students enrolled in the sample of four non-SL classes. Independent t-tests were used to compare mean increases in each of the six scaled outcomes between the UCSL group and the non-SL group of students.

### 3. Results

#### ***3.1 Paired t-test analyses comparing pre/post mean gains***

Overall, there was a 26% response rate for students enrolled in the SL classes who completed both the pre- and post-assessments ( $n = 236$  out of 903). The 236 paired responses resulted from 374 students who completed the pre-test and 273 who completed the post-test. For the students enrolled in the one UCSL business statistics class and the two non-SL business statistics classes, the response rates were considerably higher; 24 out of 34 (71%) responded to both pre- and post-surveys for the SL group and 47 out of 69 (68%) in the non-SL group responded to both.

For those students enrolled in the business statistics classes, no significant mean gains were observed for either the SL or the non-SL groups for the scaled outcomes of engaged learning (EL), civic engagement (CE) and social responsibility (SR). Significant mean gains were observed for both the SL and the non-SL groups for the scaled outcomes of critical thinking (CT) ( $p = 0.04$  and  $p = 0.03$  respectively).

For those students enrolled in the business statistics classes, no significant mean gains were observed for non-SL group for the scaled outcomes of local (LCE) and national community engagement (NCE). Significant gains ( $p = 0.048$ ) in NCE were observed in the SL group, while marginally significant gains ( $p = 0.081$ ) were observed for the LCE scaled outcome.

#### ***3.2 Independent t-test analyses comparing mean gains between the SL group and the non-SL group***

Although neither the SL nor the non-SL statistics group showed significant increases in mean gains for SR, the SL group's post responses showed a mean increase while the non-SL group showed a mean decrease. Given these results, the differences of the independent groups' mean changes between the SL group and the non-SL group resulted in a marginally significant SR improvement ( $p = 0.08$ ) in the SL group. The only other t-test showing any potential mean differences occurred when comparing the mean gain differences in NCE. Similarly, those in the SL statistics group showed a marginally significant ( $p = 0.06$ ) higher gain in NCE when compared to the non-SL statistics group.

#### ***3.3 Comparing Results between SL Statistics Students and SL students campus-wide***

Generally, across campus (including the business statistics), we experienced similar trends in the SL students. The p-values were smaller attributable to the larger sample size of the total number of students enrolled in UCSL designated classes,  $n = 236$ . As a group, students who completed a SL class in spring 2013 demonstrated:

- A highly significant increase in preference for critical thinking,  $p < 0.0001$ .
- A marginally significant increase in engaged learning,  $p = 0.07$ , with males experiencing a significant increase,  $p = 0.04$ .
- A highly significant increase in local community involvement,  $p < 0.0001$ .

- A highly significant increase in national community involvement,  $p=0.0006$ .
- No significant change with regard to civic engagement or social responsibility.

No significant differences were observed in any of the scaled outcomes between the business statistics students enrolled in the UCSL designated class ( $n = 26$ ) and those students enrolled in all other UCSL designated classes that were not business statistics ( $n = 266$ ).

### **3.4 Comparing course assessments between SL statistics students and non-SL statistics students**

Two-sample t-tests were used to determine significant mean differences in student learning based on course grades, project grades and final exam grades. No significant differences were observed in mean course assessments (course grade, final exam grades nor project grades) between the SL and non-SL business statistics students. These results might suggest that the SL pedagogy was not effective in increasing student learning; however that was not the original motivating hypothesis in this study. It is encouraging, however, to note that using this pedagogy is not harmful in obtaining class learning goals. The benefits of using real data and seeing a practical application of the techniques taught in an introductory business statistics class is indeed a positive motivator. Additionally, past studies have shown that while there may be no differences in student grades during the course of instruction, results of a statistics retention exam given at least two semesters later do show that long term retention of basic statistical concepts is higher in students that participated in SL projects (Phelps 2008, 2012).

## **4. Discussion**

Pedagogies involving community engaged learning and service-learning in statistics classes have been documented and are clearly aligned with the GAISE recommendations. One might argue that well executed student projects will also achieve the goals of the GAISE guidelines but students may lose the social relevance that they have helped others or miss the importance of data in the outside world (Thorne and Root, 2001 and Jerskey 2002). Anderson and Sungur (1999) suggest that when the data come from a local source, student interest and ownership of the project is strong and may be more meaningful. Others offer supporting evidence that service projects affect social cognitive development (Sperling et al, 2003) and improve students' attitudes toward a course (Evangelopolis et al, 2003 and Gordon, 2004). These studies, while concerned that their students are learning key statistical objectives, were focused on observing additional social benefits potentially gained from the experience of a community engagement or SL project.

The results from this study add value in the practice of using community engaged activities to teach statistics by measuring potential gains in scaled community engagement outcomes widely endorsed by the Association of American Colleges and Universities and the Bringing Theory to Practice initiative's core purpose of "developing sustainable campus cultures to support the advancement of higher learning and discovery, the well-being of the whole student, and higher education's mission as a public good to deepen and sustain the civic society." Business statistics students participating in a SL project demonstrated increased gains similar to those observed by all SL students campus-wide. Furthermore, those enrolled in the SL section may show increased gains in social responsibility and national community engagement.

## **5. Appendix**

### **5.1 Instruments**

The pre- and post-surveys consisted of six scales that have been used as part of the Bringing Theory to Practice Assessment Toolkit, a project of the Association of American Colleges and Universities:

- Need for Cognition - a proxy measurement for critical thinking

- Source: Wabash National Study 2006-2008, <http://www.liberalarts.wabash.edu/study-instruments/#ncs>
- Engaged Learning
  - Source, 2012 Bringing Theory to Practice Assessment Toolkit
- Engagement with Local Community
  - Bringing Theory to Practice NSEE Consortium Questions and Montclair State University, developed by the Bringing Theory to Practice team
- Engagement with National Community
  - Bringing Theory to Practice NSEE Consortium Questions and Montclair State University, developed by the Bringing Theory to Practice team
- Civic Engagement
  - Source: Montclair State University, developed by the Bringing Theory to Practice team
- Social Responsibility
  - Source: Eyler, J., & Giles, D. (1999). Where's the learning in service-learning?. San Francisco: Jossey-Bass

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