Digital Media and Environmentalism: Using Statistics to Conserve Plastic Bags

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Abstract

To challenge and supplant undergraduates' preconceived notions of statistics, a service learning project was implemented to apply students' knowledge of statistics to a current environmental issue. Throughout the semester, digital media were used to post students' personal reflections on a weblog and film a service learning documentary. Toward the end of the semester, students hosted a festival to raise public awareness on the consumption of plastic bags. Project outcomes indicated wide participation among students, volunteers, and community residents. Lessons learned and recommendations for integrating environmentalism into a statistics course are discussed.

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Digital Media and Environmentalism: Using Statistics to Conserve Plastic Bags

As part of the psychology curriculum, students are required to learn statistics. Teaching undergraduate statistics, however, entails unique challenges (Conners, McCown, & Roskos-Ewoldsen, 1999) because students consider statistics less relevant and less interesting in understanding psychology (Bartsch, 2006). Many students also experience increased math anxiety and decreased self-confidence in mastering course objectives (Baloglu & Zelhart, 2003; Ma, 1999). Furthermore, students are less likely to transfer their knowledge of statistics to real-world issues when such learning is presented in a decontextualized setting (e.g., Bransford & Stein, 1993). Consequently, these negative beliefs and attitudes may result in poorer retention and comprehension of statistics.

In recent years, Americans have expressed greater concern for protecting the environment (Leiserowitz, 2007; Yale Environment Study, 2007). To bolster claims regarding several environmental issues, experts use statistics to educate the public on global warming (Kerr, 2001; Oppenheimer & Boyle, 1990), habitat loss (Ehrlich & Wilson, 1991), and deforestation (Oppenheimer & Boyle, 1990). Experts also use statistics to estimate the consumption of natural resources (e.g., oil) and overreliance on non-biodegradable products (e.g., plastics) (Nickerson, 2003).

Yet, despite efforts to inform the public of these environmental issues, people may have difficulty interpreting abstract statistical information (Gigerenzer, Hertwig, van den Broek, Fasolo, & Katsikopoulos, 2005). To illustrate, the Environmental Protection Agency (2005) estimates that the U.S. alone consumes 380 billion plastic bags annually. Although the numerical value is impressive, it is difficult to comprehend the magnitude of this statistic. Moreover, there is no personal connection to 380 billion plastic bags and no value associated with a single plastic

bag. Consequently, consumers are unlikely to change their behavior while the number of bags continues to accrue. Is there a way to relate this statistic to our personal actions that inspire sustainable practices?

To forge a connection between psychology and environmentalism (e.g., Koger & Scott, 2007), students enrolled in a statistics course were provided a rich, contextual basis for understanding statistics and raising public awareness on the consumption of plastic bags. To implement these goals, a service learning project was designed to apply students' statistical knowledge to this issue. In addition, students were exposed to a variety of digital media (e.g., class weblog, website, and documentary) that fostered an interactive learning environment. Thus, students learned about an environmental issue to deepen their understanding of statistics and increase their civic participation in the community.

Overview of Service learning Components

In general, service learning builds a connection between the academic curriculum and a community need by engaging students in experiential learning and reflection through service (Jacoby & Associates, 1996). Service learning programs enhance academic performance by instilling multiple perspectives on a given issue that support moral and civic responsibility (Colby, Ehrlich, Beaumont, & Stephens, 2003). Service learning also improves students' writing skills, critical-thinking skills, commitment to community engagement, and leadership ability (Astin, Sax, Ikeda, & Yee, 2000). Hence, this project applied the ideals of service learning to undergraduate statistics and environmentalism.

Throughout the semester, students read primary sources (e.g., *BioCycle*) that used statistics to measure waste reduction. In addition, students read *Garbage Land: On the Secret Trail of Trash*, which described a person's two-year journey investigating the hidden intricacies

of the public waste stream (Royte, 2006). This supplemental text served as a foundation to broaden students' general knowledge about garbage-related issues and waste's impact on the environment. To integrate these readings with course objectives, students wrote weekly reaction papers, which they accessed via the project website (www.iusb.edu/~cpbags). Hence, these at-home activities enabled students to assimilate supplemental readings with in-class examples and demonstrations.

For active learning outside the classroom, students completed six hours of service at Riverbend Community Math Center, a local non-profit organization dedicated to teaching children mathematics. Several students also participated with another non-profit organization, Marshall-Starke Development Center, to teach mildly-disabled clients how to make crafts (i.e., coasters) from reused plastic bags.

For active learning inside the classroom, a "mini pile-up" demonstration was conducted and filmed as part of the documentary. The purpose of this activity was to pilot a festival activity (discussed below) and revise a class survey for data-collection purposes. Students recorded the number of plastic bags brought to class and brainstormed ideas on how to conduct this activity at the festival.

Students also helped organize BagFest, a public event designed to raise awareness of the economic and environmental issues flowing from the use of plastic bags. Several festival activities, including games, live music, and media presentations were conducted by local businesses, non-profit organizations, and musicians. Experts from across the country participated in a panel discussion: Jeff Ashby, Co-owner of Rocky Mountain Recycling, discussed the economic issues regarding the recycling of plastic bags; Steve Antonetti, District Manager of Wal-Mart, addressed Wal-Mart's efforts to recycle plastic bags; Allison Kozdron, Customer

Relations Manager of reusablebags.com, discussed the importance of reusing plastic and cloth bags; and Calvin Manns, Supervisor of South Bend Waste Paper, discussed current recycling efforts in the South Bend community. Elizabeth Royte was the featured speaker at BagFest.

Fourth through twelfth graders were also invited to join Bag Force, a student-lead task force promoting authentic civic action on the conservation of plastic bags. Bag Force members asked questions about the plastic-bag issue to the panelists and worked together to develop a community action plan, which was published in the *South Bend Tribune*. In addition, local residents were invited to bring their plastic bags to BagFest. These plastic-bag donations were gathered to create an enormous pile of plastic bags so that festival attendants may gain an understanding of the amount of plastic bags sent to landfills when they are not recycled. Students displayed a running tally of the number of bag donations to associate the bag pile with the numerical figure. Finally, 100 volunteers completed the class survey. Thus, festival attendants gained first-hand experience of how their plastic-bag donations reflected this issue, and students gained first-hand experience on survey construction and data collection.

Use of Digital Media for Personal Reflections

For personal reflection, students recorded and posted their thoughts via a documentary and class weblog. (The documentary is now available for public dissemination. Please contact the author to request more information on how to obtain the documentary for educational purposes.) Throughout the semester, this service learning documentary was filmed to record students' observations, interviews, and reactions as the project was in development. The class blog (www.conserveplasticbags.blogspot.com) functioned as an online forum to discuss reading-discussion questions and personal reflections about the service learning project. Because posting comments on a blog is a form of public expression, students participated in frequent intellectual conversations with their peers, professor, and bloggers worldwide. This online format differs

from traditional methods of writing reflections because postings were highly visible, and anyone could respond by posting a comment to a student's reflection. Moreover, student reflections are typically unidirectional in the sense that only a few people (i.e., professor) read student papers. By blogging about their personal experiences regarding this project, students were able to engage in an online dialogue with their peers and share their experiences more readily. In addition, blogging was conducted at everyone's convenience throughout the semester, which did not complicate the faculty member's workload. On the contrary, blogging was generally regarded as an enjoyable activity by both students and faculty (see Table 1). Consequently, blogging about this issue served to improve students' writing skills, develop a public voice, and take action in addressing a community issue. Thus, in combination with the service learning documentary, the blog provided students a dynamic platform to reflect, consider multiple perspectives, and participate in reasoned discourse with others.

Project Outcomes and Assessment

Given the wide range of activities throughout the semester, several approaches using subjective reports and objective measurements were implemented to assess the impact this service learning project had on the students, faculty, and community residents.

Students completed an anonymous questionnaire at the end of the semester to gauge their attitudes and evaluations about the service learning course. As shown in Table 1, students were generally positive in their assessment. Most students believed they had made a positive difference in the community, and many students felt they had a personal responsibility in helping the community. Several students indicated that this course helped to enhance their leadership skills, and they were in a position to communicate these ideas outside of the classroom. Although many students indicated that environmentalism is not a prerequisite for learning statistics, they

were now able to articulate a deeper understanding of the course material and relate it to current environmental issues.

Students (N = 18) posted a total of 192 blog entries throughout the semester (M = 7.89, SD = 3.16); one outlier was removed because she posted over 50 blog entries. An online tracking system (www.google.com/analytics) was used to record the total number of site visits (N = 2, 060) from January 2007 to May 2007. Worldwide, bloggers from 408 cities in 48 countries visited the class blog. On average, bloggers viewed 1.94 pages per visit and spent 2:33 minutes on the blog. To date, the class blog has received over 12,000 site visits and serves as an online repository for students' personal reflections.

Reading the student reflections provided an opportunity to obtain qualitative information about student learning and enhancement. For the most part, students posted their reactions from the discussion questions and from their personal experiences regarding various service activities (e.g., Riverbend Community Math Center, BagFest). In addition, some students discussed how the course material affected their shopping habits. As shown in Table 2, students were able to make several connections from the course to their everyday experiences.

Students completed an average of 7.5 hours of service in the community. As part of community outreach, students taught children several mathematical activities and participated in a community science festival. Based on reading students' personal reflections, many students expressed greater confidence in their mathematical ability. As one student mentioned in her reflection on teaching children statistics, "I enjoyed it but it was challenging because some of the math concepts I haven't used for years. But it did help refresh my memory. Helping people like that also helps build [my] confidence."

Approximately 500 students, faculty, and community members attended the event and donated 72,571 plastic bags for recycling (see Figure 1). Media personnel from local television stations and newspaper organizations interviewed students, organizers, and festival attendants at BagFest in order to disseminate the festival activities to a wider audience.

Based on this service learning experience, 26% of students applied their knowledge of environmental issues to other class projects and extra-curricular activities. Two students gave a speech on pro-environmental actions in their speech class; one student joined the campus' recycling committee and wrote several articles about sustainability for the campus newspaper. Another student obtained an internship to continue her involvement with Riverbend Math Community Center. And one student became vice-president of an environmental student club. Although a causal relation cannot be inferred, these students indicated how this course empowered them to pursue these activities on their own volition.

Lessons Learned and Recommendations

To be sure, this project was not without its limitations. From a student perspective, the number of service hours was too strenuous for this predominantly non-traditional college population. Hence, service hours were reduced by two hours, thus requiring students to complete six hours of community visits. And though students enjoyed working with community partners, only one mathematical activity was exclusively focused on teaching children statistics. In the future, it may be fruitful to incorporate more statistical activities as part of this service learning experience.

From a professor's standpoint, a considerable amount of time and effort was spent on coordinating activities and groups with educators, local businesses, and non-profit organizations. In addition to ongoing effects to organize the festival activities, the faculty member had to stay

ahead with the supplemental readings and upload discussion questions for students on a timely basis. The faculty member also made great effort to incorporate the chapter readings to serve as in-class examples throughout the semester. To reduce the workload, it may be helpful to collaborate with a colleague. It is also prudent to work with administrators to organize and publicize the event. This project was largely successful because key staff members and community partners played an active role throughout all phases of this project. In short, this project would not have been successful without this collaboration.

Conclusion

This service learning project offered students an interactive approach in learning how psychologists use statistics to objectively measure and understand human behavior. Most important, students worked together to apply their statistical knowledge to a community action. By weaving digital media and environmentalism into this undergraduate statistics course, students were provided a holistic framework to enrich their moral, civic, and intellectual development.

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Table 1. Means and standard deviations of scores from student questionnaire.

Item	M	SD
Course material in everyday life	3.55	0.83
Better understanding of material	2.85	1.18
More responsibility for learning	3.35	1.31
Aware of other disciplines	4.05	1.19
Benefit to community	4.25	0.72
Aware of community needs	3.75	1.16
Personal responsibility to community	4.50	0.69
Personal strengths and weaknesses	3.55	1.00
Clarify career goals	3.15	1.18
Good working relationship with site supervisor	3.70	0.92
Working with different people	3.60	1.10
Aware of personal biases and prejudices	3.05	1.15
Enhance leadership skills	3.70	1.08
Able to communicate ideas in real world	3.85	1.14
Make a difference	4.50	0.61
Enjoyed writing blog postings	3.65	1.35
Enjoyed reading blog	3.90	1.07
Have deeper understanding of course material	3.60	1.23
Have deeper understanding of the bag issue	3.85	1.27

Note. Responses made on a 1 (strongly disagree) to 6 (strongly agree) scale. N = 20.

Table 2. Sample excerpts from online student reflections.

Student 1	"One of Royte's lines in our recent reading that struck me was: "It isn't worth it, they said, to get worked up over paper versus plastic at the grocery store." After this statement I responded pretty defensively, because I thought, wait we just had a whole BagFest over plastic bags and now they, the UCS, say it is not worth it to think about these "unimportant decisions." It raised a lot of questions for me, as far as the value, impact, and role of our BagFest. At this point I began to smile, I thought of the 25+ people that I spoke to while counting their bags. I thought of our impact, or footprint, that we made that day. I thought of all the things we learned and had fun with in class. And I think one of the best things was the relationships I built throughout this whole project. It was not about collecting 72,571 bags (that was awesome, though), but it was about the statement, the opportunity, the awareness, and the knowledge that came from BagFest. Without BagFest in our community, who would have thought that in one day we could collect what Wal-Mart gathers in a month? If BagFest never would have happened, who would have believed that there is an importance in what we do as a community with plastic bags? Sure we all might only have 50 bags, but put them together and look at what our community has created. We recycled those bags that would normally either be thrown away or stuffed away. The community I think gained a lot of knowledge from this opportunity. It was not about collecting the bags, but rather taking the time to expand our knowledge of resources that are just waiting for the community. It was amazing and encouraging to see so many young children involved in this event. Also it was surprising how many people from all around the community cared. Overall, I saw this event as bringing awareness to the community of the difference we can make when we all pull together, and what an impact that makes! I grew a lot through this experience. I found myself leading, teaching, and talking with people I never thought I would have an opportunity to. The relationships I built with my classmates were encouraging, motivating, and unique, because we were all going through an experience together. I do not think I have ever been involved in any other school activity that I felt so proud of and so self-rewarded by. So, is it worth it to get worked up over paper or plastic (or cloth)? I would say most definitely!"

Student 2	“I am very happy that professor Verges included in this class *Garbage Land*. It definitely made the class even more interesting. Personally, I learned a lot. I changed the way I was recycling and even the way I was buying! To change a way of thinking about something is something that a very few classes can achieve. I want to thank professor Verges for everything she taught us. She can be sure that we all learned a lot from her and changed a lot of bad habits that we had.”
Student 3	“When we were given this assignment for the first time, I felt sick in my stomach. The idea of writing my views did not sit very well in my mind. This was horrifying for me to share what I was thinking about and give my personal opinions was not my ideal way of studying Statistics. To me numbers, large formulas, and extra computation that no any other class wanted to do them was going to be dumped on us. That was the ideal way of studying Stat. The blog slowly became more fun and informative and surprising enough to me, it became one of the things I would look forward to look and write something in it. There were a lot of good ideas that were shared in the blog that before this assignment, I would not find it possible that the blog could provide. There is something empowering about sharing my own ideas that I have just discovered in this class. By no means do I mean that I had the best views, however, I mean that it is a good feeling to share thoughts and ideas. I GENERALLY ENJOYED THIS BLOG !!!! THANKS AND GOD BLESS.”
Student 4	“So we have been talking about garbage for months now, and in particular the demon plastic bags. I have been spouting off statistics to people from Garbage Land and from our blog. "Do you know that we use 380 billion plastic bags a year?" I would blurt out. "Do you know that 95% of magazines are printed on completely virgin paper?" Suffice to say, I have been talking, but until recently I was all talk no action. Tonight, I joined the reusable bag crowd. I had my tote bags tucked into my regular bag when I went grocery shopping tonight, and I whipped them out at the checkout. I had saved my produce bags from the last time I had gone shopping, and reused them for my onion, bananas, and grapes. I figure reusing my plastic produce bags is better than nothing. I don't know why it took me so long, but it is oddly satisfying not just to talk the talk, but to walk the walk.”

Figure 1. Image of plastic-bag pile at BagFest.