

A Sampling of IT Service Learning Activities: Possible Impact on Students and Community Partners

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Abstract

Information technology (IT) has dramatically changed the workforce. Today, almost every aspect of business is impacted by technology. With this advancement also comes the complexity of IT experience to secure, train, and maintain the technology that runs every business. The result of more complex IT integration into business increases the qualification demands of IT employees. Today, many organizations are looking for IT personnel with a degree and IT experience. As a result, institutions and instructors are utilizing serving learning experience for students. This study describes three various types of service learning activities for IT students. Both qualitative and quantitative data were collected to better understand the value and impact of service learning activities for IT students and community partners. The results revealed positive impacts and value from service learning activities for students and community partners.

Keywords: service learning, experiential learning, IT workforce skills, IT curriculum

1. INTRODUCTION

As information technology (IT) continues to rapidly integrate into our daily lives and work, the need for IT professionals increases (Koulouri, Lauria, & Macredie, 2015; Shapiro, Rison, Phillips, & Herbert, 2006). Reisinger (2016) and the Association for Computing Machinery's CareerNews (2016) states "IT professionals are highly sought after in the health care sector." They also argue that soon there will be close to 2 million unfilled IT jobs in the United States (U.S) because of the limited supply of IT professionals who can ask the right questions and help support,

analyze, and examine the key information technology metrics and decomposition business. Hence, the current employer demands for IT professionals extends beyond a bachelor's degree. Today's employers require a degree and IT work experience (Moore, 2016).

In an effort to prepare IT students to meet the demands of the current workforce, instruction should extend beyond the walls of the classroom. (Beck, 2015; Levin-Goldberg, 2012). Recognizing that internships and Co-ops are not typically required in all undergraduate programs, many professors have turned to integrating service

learning activities into their classrooms. The goal of this study is to explain three good examples of service learning activities that occurred in an undergraduate IT/computing discipline. Additionally, this research will report the results from student data collected from a survey, formal letters, and informal student and community feedback. This work has practical implications for IT programs and faculty wishing to better prepare their students for the workforce via service learning activities. The service learning activities provided could be replicated at other institutions. The remainder of this paper is structured as follows: a brief review of IT service learning, Overview of three service learning activities, methodology, results, and conclusion.

2. BACKGROUND

2.1 Service Learning

For the purpose of this paper, service learning is defined as a pedagogy approach where students applied course knowledge to evaluate, examine, and solve real world IT problems for local small businesses. Service learning experiences are designed to benefit the student and the community (Harms, 2015).

Service learning is not a new concept for higher education. Quesenberry, Weinberg, and Heimann (2013) state that over the last decade, service-learning initiatives have gained attention within the undergraduate IT disciplines. Some of the reasons for this increase in service learning activities includes, but not limited to, employer needs for practical experience to address complex human, communication, teamwork, and ethical issues that arise within the technical workforce (Quesenberry et al., 2013; Guthrie and Navarrete, 2004; Olsen, 2008; Tan and Phillips, 2005; Werner and MacLean, 2006). They state the typical IT college classroom experience focuses on solving theory-based or fictitious technical problems rather than not real-word experiences.

Among the many universities integrating service learning activities in their computing courses, Carnegie Mellon University is at the forefront. It has been reported that they has developed close to 400 partnerships with non-profits for service learning projects with their students (Mertz and McElfresh, 2010; Bloomfield, Sherriff, & Williams, 2014).

While service learning is independent of academic discipline, studies have directly examined its impact on STEM fields. Dakeev et al. (2017) found a strong link between holding a service learning

workshop and expected outreach impact. Similarly, Bosman et al. (2017) studied interest development in pre-engineering students. Moreover, one criticism of service learning is that it detracts from delivering course content; however, Daniel et al. (2017) discovered that service learning enabled rich content experience with students frequently seeking additional information beyond the confines of the course.

Furthermore, it is important to note that a recent study by Petkova (2017) examined service learning in Information Systems courses since 2000. Her literature review revealed that there are a limited number of service learning activities recently documented within the IT/computing discipline.

2.2 Benefits of IT Service Learning

There are numerous benefits to incorporating service learning activities/experiences into IT courses. Some of the benefits include the following:

- Service learning activities/experiences can help students apply course content and prepare students for career success (Chaytor, 2003; Quesenberry et al., 2012; Olsen, 2008; Webster & Mirelli, 2007).
- Service learning activities/experiences help expose students to IT opportunities nearby or within the state (Olsen, 2008; Webster & Mirelli, 2007).
- Service learning activities provide community partners with free resources and knowledge from the students (Stone, MacKellar, Madigan & Pearce, 2012).
- Service learning activities/experiences provide students to see the value and greater good in the their work as well as face real-world challenges (Beck, 2015; Stone et al., 2012).
- Service learning activities/experiences may provide a platform for discussion during job interview (Beck, 2015).
- Service learning activities may increase student retention rates within the IT field of study (Egan and Johnson, 2010).

3. PROJECT GOALS

This research seeks to add to literature regarding the benefits of IT service learning. Specifically, three good examples of IT service learning projects, which occurred over the last 5 years, will be explained. Additionally, with the data collected from each service learning activity, the following research questions will be investigated.

IT Service Learning Activity1 (SEDA):

1. Will there be a significant difference before and after the service learning activities and students perceptions regarding Pennsylvania's career opportunities?

IT Service Learning Activity2 (DATA LAB):

2. Will students perceive service learning activities/experiences as valuable?
3. Will the service learning activities provide community partners with positive free resources and knowledge from the students?

IT Service Learning Activity3 (Academy):

4. Will the service learning activities be favorable for the community partners?

4. SERVICE LEARNING ACTIVITIES

4.1 IT Service Learning Activity1 (SEDA)

4.1.1 Participants

Students enrolled in Telecommunications course in the Information and Technology Management (ITM) major were chosen to participate in service learning project associated with the mini grant from Susquehanna Economic Development Association's Council of Governments. (SEDA-COG). The Telecommunications course was chosen because it is a core course in the ITM major and it contained the necessary content for the SEDACOG mini-grant.

Subjects were undergraduate business students enrolled in one of the Pennsylvania State System of Higher Education schools. It is important to note that PASSHE (2013) defines their enrolled students as Pennsylvania's future with 90% of them being state residents and 80% being likely to remain in Pennsylvania after graduation. Students came from the one section of a 300 level Telecommunications course. Students enrolled in the course were sophomores, juniors, and seniors. The overall sample size included 31

undergraduate business students taking Telecommunications.

4.1.2 Instructional Materials

As specified in the course syllabus, all students were required to have a copy of the textbook. The text book was used to teach content via readings, step by step instructions, visual aids, photographs and illustrations, vocabulary lists, and chapter summaries. The instructor supplemented book-based instructions with additional activities including, but not limited to, step-by-step handouts, student centered discussions, and interactive IT role playing, career awareness assignments using Bloomsburg University's career software called FOCUS. Student's also received various local IT job posting throughout the semester that directly related to the service learning activity and classroom.

4.1.3 Service Learning Activity

At the beginning of the course, students were briefed about the "hands-on" small business systems security assessment as the instructor address the syllabus. Next, students were placed into self-selected groups of four. These self-selected groups were then assigned a specific small businesses. Each small business that was assigned was located within 10 miles of Bloomsburg University of Pennsylvania, USA.

Students were required to meet with the assigned businesses ten times throughout the semester to assess their network security. Each time the students met with their assigned business they had a series of specific questions to ask the business, a set of specific pictures to take regarding the technology infrastructure, and a list of physical networking items to assess.

At the end of the semester, students presented their findings to the entire class as well as the small businesses. Select groups went on to present their findings at a regional computing conference.

4.1.4 Data Collection

Prior to meeting with the assigned small business, the students were required to complete a survey. The survey was used as a "pre self-evaluation" tool to solicit information reading their value, awareness of small businesses in Pennsylvania. The pre and post survey (Appendix A) was developed by Susquehanna Economic Development Association (SEDA) Council of Governments (COG) and the author. The survey content was validated using a modified Delphi approach with two professors. The pre and post-

survey was quantitative based consisting of eight demographic questions and ten content questions.

4.2 IT Service Learning Activities 2 (DATA Lab)

All DATA Lab service learning activities were a separate activities that were not integrated into classroom but, rather operated under the center under the supervision of one of the authors.

There were several DataLab service learning activities. Each activities is listed on the DataLab Website (<http://organizations.bloomu.edu/datalab/projects.html>). However, this paper highlights three of the larger service learning projects: DATA Lab-Mechnet, DATA Lab E-Commerce System, and DATA Lab Non-Profit Inventory Management System.

4.21 DATA Lab Mechnet

This project was funded by a community development grant to provide a service to the community while training students in a high demand area, computer programming. In this project, students met with the clients and worked through the full system design lifecycle. While they were ultimately supervised by a faculty member, one senior student was selected to receive a higher pay and act as a project manager.

4.22 DATA Lab E-Commerce System

Student worked, directed by faculty, on development of a full-scale ecommerce website to permit a local manufacturer enter a fuller ecommerce venture while still supporting its local operations. Students reviewed the current system, proposed alternatives, designed the new ecommerce site, migrated data, and notified customers. The new site actually created a brief up-tick in sales due to customers visiting the website.

4.23 DATA Lab Non-Profit Inventory Management System

A local non-profit who provides goods and services to community residents in need, such as distribute food or supplies, was in need of a solution to manage their inventory. Throughout the lifecycle, 4 students were involved in different aspects, supported by faculty. Configuration of a database server, a backup server installation, basic networking upgrades to support the system, was the first task. Next, to be flexible students designed a web-based inventory system. As the system usage grew over the first year, upgrades

were necessary. New students became involved in the upgrade. First, additional memory and database tuning was required. Second, an upgrade to permit barcoding into the application became necessary. Students configured wireless bar code scanners and, using old donated equipment, configured industrial label printers. The result was the ability of the non-profit to be able to barcode and track their inventory at a minimal expense.

4.231 Participants

Three students were selected to participate in the DATA Lab service learning activities over the summer, Spring and Fall semesters. The students were undergraduate business students enrolled in one of the Pennsylvania State System of Higher Education schools seniors enrolled in a computing discipline. Student were a senior, a junior, and a freshman.

Data Collection

At the end of the first year, the three students voluntarily (without supervisory requirements or any encouragement) wrote letters of appreciation and commendation to the Dean of the College and faculty member regarding their service learning experience. The qualitative data contained in these letters was used to help understand the student's perception of

4.3 IT Service Learning Activity3 (Academy)

4.31 Participants

Students enrolled in a Training and Development course in the Information and Technology Management (ITM) discipline from 2012 - 2016 were chosen to participate in service learning project associated with Pennsylvania State System of Higher Education (PASSHE) Academy.

The PASSHE Academy is free educational outreach program that "offers all types of workshops targeted at my personal and professional development opportunities in the form of face-to-face training sessions or webinars for any employee within the 14 PASSHE universities or the Office of the Chancellor. For additional details regarding the PASSHE Academy, please reference their website at <http://www.passhe.edu/inside/hr/academy/Page/s/home.aspx>.

4.32 Instructional Materials

As specified in the course syllabus, all students were required to have a copy of the textbook. The text book was used to teach content via readings, step by step instructions, visual aids, photographs and illustrations, vocabulary lists,

and chapter summaries. The instructor supplemented text-based instructions with additional activities to prepare students to conduct a training session for the PASSHE Academy.

4.33 Service Learning Activity

At the beginning of the course, as the instructor address the syllabus, students were briefed about the PASSHE Academy Training Session/Service Learning Activity. Students asked to self-selected their group. Groups were limited to 6 students. Each group was asked to select a topic upon which they were knowledgeable and comfortable with conducting a training session. Upon selecting the group and topic, students were asked to select a date for their PASSHE ACADEMY training session. All training sessions were held at the end of the semester during class time. PASSHE Academy training topics included, Advance Excel, Tips and Trick for Microsoft Office, Making your Documents and Website ADA compliant, Working with SPSS, Ghost a Drive, and Prezi 101. It is important to note that the topics and students changed every semester.

The student's PASSHE Academy training sessions were advertised as Instructor lead (face-to-face) on the PASSHE Academy website for employees to attend. Throughout the course, students learned various training strategies and methods along with conducted a needs analysis, and training manual to provide to attendees.

During each PASSHE Academy training session, the instructor was present to assist the students with any challenges that may have occurred.

At the completion of all the PASSHE Academy training sessions an informal reception was held for the students. At this reception, the university's Department of Human Resources presented the students with certificates of appreciation for their service. Pictures were taken and posted to the university's website, newsletter or college's television display.

4.34 Data Collection

Data was collected in terms of the number of employees attending the PASSHE Academy sessions, the qualitative kind remarks provided from Bloomsburg University's Department of Human Resources, and the number of students showing up for the informal reception.

5. METHODOLOGY

Three IT service learning activities/experience are explained above. Within of these

activities/experiences, data was collected. Thus, a mix methods approach of using both quantitative and qualitative data was used. The quantitative data was analyzed via SPSS. Specifically, descriptive statistics and a paired t-test were used. The qualitative data was analyzed and reported in narrative form.

6. RESULTS

This study found that all service learning activities were positive for both the students and the community partners. Specific research questions were also answered.

6.1 IT Service Learning Activity1 (SEDA)

To answer research question 1, a paired t-test was conducted on the pre and post survey data collected. The Delphi Approach with four IT faculty members with service learning experience was used to determine the validity of the survey questions. Results, revealed a significant difference ($p=.046$) in students perceptions regarding Pennsylvania's career opportunities before ($m=5.00$) and after ($M=1.39$) the service learning activity.

6.2 IT Service Learning Activities 2 (DATA Lab)

To answer research question 2, qualitative data was collected from the condemnation letters. Since these were condemnation letters, the validity was not tested. However, students wrote the letters without any faculty intervention. Within the letters, students wrote about their perceived value of their service learning experience. Figures 1, 2, and 3 provide excerpts from each students letter.

On top of the immeasurable experience, knowledge, and confidence I've gained working with Data Lab, it has also been extremely fulfilling to perform the work that we do. Projects such as Agape and Watershed Hydrowatch were initiated with the hopes that they can have a positive effect on our area and its inhabitants. Nothing feels quite like knowing that your work can touch people and seeing and hearing about the many ways it has. Helping an incredible organization that does so much for its community such as Agape has been an incredible honor. Knowing that the company makes great use of the repaired servers, inventory system, and website we built for them has been unlike any other feeling of fulfillment.

Figure 1: DATA Lab Student 1's Perception of Service Learning Experience

Realizing the impact that DATA Lab has had on me, I hope that it continues to live on and help o students. This organization has the power to not only advance student education and job placem but to bring great recognition to the University. I plan to stay engaged with DATA Lab and be available to students as a resource when needed. I am certain that current and future DATA Lab members will feel the same. Thank you for all you have done and for your continuous support.

Figure 2: DATALab Student 2’s Perception of Service Learning Experience

I have learned a vast amount of knowledge in a short amount of time through the Datalab and the NutCon prototype project. My knowledge in web application development and web design has been greatly expanded, and I trust that it will continue to be so. Working with the Datalab has encouraged personal study and research into web development and provides me a place to apply my new knowledge. These projects have already shown me early on a great amount about how development happens in the real world and I feel much more confident about and prepared for my future because of them. The Datalab has also taught me a great deal about teamwork and I have gained valuable experience as part of a development team. I look forward to being able to continue this application of my knowledge from the classroom to real-life projects during my time at Bloomsburg University.

Figure 3: DATALab Student 3’s Perception of Service Learning Experience

Based upon the above qualitative data, the authors conclude that students perceive their service learning activity/experience as helpful for applying course content and prepare for career success.

To answer research question 3, qualitative data was also received from the community partners involved in this service learning activity. All community partners were grateful for the support they received from the students. This opportunity matched students with clients who could not afford expensive technical support thereby benefitting both parties. There was not any negative comment made by wither community partner.

Based upon the above qualitative data, the authors conclude that the service learning activities provided community partners with positive and free resource and knowledge from the students.

6.3 IT service Learning Activity3 (Academy)

To answer research questions 4, quantitative data was collected on the number of attendees for each Academy training sessions. Each semester, every session consisted of at least one attendee (Min=1) and a maximum of 8 attendees for the students to train per session. Table 1 provides

the descriptive statistics regarding the number of attendees per semester.

Based upon table 1, the authors conclude that IT service learning activities proved to be favorable for the community partner as the number of attendees consistently increased each semester. Furthermore, each year the university’s human resource department praised the students for their service and provided the students with a certificate of appreciation for their service.

Table 1: Academy Training Session Information

Semester	Training Sessions offered	Maximum & Minimum #. of attendees per training session	Total No. of attendees
Spring2016	7	Min=1, Max=8	23
Fall 2015	6	Min=1, Max=6	31
Spring 2015	6	Min=2, Max=7	33
Fall2014	8	Min=1, Max=6	32
Spring 2014	5	Min=1, Max=7	29
Fall 2013	5	Min=1, Max=6	21
Spring 2013	5	Min=1, Max=5	18
Fall 2012	5	Min=1, Max=4	13
Spring 2012	4	Min=1, Max=4	8

7. CONCLUSIONS

It is this paper’s contention that IT service learning has value and impact for students and community partners. Students received real-work experience and community partners received IT service that would not have otherwise been economically feasible to them.

The results of this study are consistent to similar service learning studies such as Mertz and S. McElfresh (2010) and Bloomfield, Sherriff, and Williams (2014). This research adds to the literature regarding the value and impact of IT service learning activities/experiences.

It is important to note that this research is not without limitations. First, the data collected varied by service learning activity and was consistent through all three studies. Second, data was limited to geographical location and one university. Finally, data samples were limited in size. Future research that addresses these limitations should be explored. Nevertheless, this research is important because it provided descriptions about various types of IT service

learning activities/experiences for institutions and faculty to explore.

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