



Putting the Service into Service Learning: A Report on a Survey of CS Faculty

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ABSTRACT

Service learning is an experiential pedagogy in which students learn through providing services or products for community partners. Computer and information science students can develop valuable products for community organizations. However, while service learning is shown to serve students and has potential to serve the field's diversity goals, community partners' needs are often not served. We explored this asymmetry using an exploratory survey. Faculty from across the U.S. were able to describe learning goals for students, including how they were assessed. In contrast, fewer than half of respondents had explicit partner goals; partner goals were often not assessed. Also, most respondents judged reaching student goals as more important than partner goals, with about 25% of respondents seeing benefits to partners as only a bonus. Faculty justified their choices by appealing to their mission as educators. Yet for a nontrivial partnership commitment under condition of scarce resources, the community partner may be seen as being taken advantage of, which may explain why some respondents have difficulty finding or keeping partners. Further, faculty may not accomplish civic duty goals, since students may tacitly learn that community organizations' needs are secondary. To aid faculty in making decisions and better integrating community partners' needs, we offer advice from survey respondents.

CCS CONCEPTS

• Social and professional topics • Computer science education

KEYWORDS

Service Learning; Community Partners; Asymmetry Problem



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1 INTRODUCTION

Service learning is an experiential pedagogy in which students learn through providing services or products for community partners. Student outcomes combine domain-specific knowledge with professional skills and identity development, but many faculty also seek to engender understanding of community needs, care for the welfare of others, and awareness of civic duty [10, 11]. Educators design authentic learning experiences that require critical inquiry of real-world problems as well as interaction with other students and community partners [21]. However, educators often design service learning courses to maximize student outcomes, with less regard for outcomes of the community partners they serve [24, 30, 32]. Such an asymmetry of goal attainment limits benefits to both communities and students, since privileging students' personal and professional growth can inhibit cultivation of socially responsible selves who actively care for others [11]. This paper presents a study of computer and information science (CIS) faculty to explore the asymmetry of concern among students and partners in CIS service learning. Below, we briefly review scholarship on the benefits and costs of service learning participation. We then present the methods, sample and service learning course profile, and results of the study. We then present advice from respondents on how to maximize value for community partners in CIS service learning.

2 BENEFITS & COSTS

Administrators promote service learning as a “high impact practice” with potential to retain students through active, personally meaningful learning; increased engagement; greater confidence, belonging, and responsibility; and improved relationships with the community [1, 9, 13, 18]. Hundreds of empirical studies demonstrate support for benefits to both students and institutions in multiple meta-analyses [5, 10, 43]. Positive outcomes for students who take well-designed service learning courses include meeting academic learning objectives, acquiring professional skills, ability to transfer classroom learning to the real world, and improved civic engagement.

CIS faculty describe service learning courses at all postsecondary levels, as summarized in a recent review of literature [42]. CIS faculty have integrated service learning in many topic areas for many reasons, such as to teach computer literacy; provide real-world, hands-on experience with real clients; and partner with capstone courses [6, 7, 12, 14, 20, 27, 34, 35]. Faculty goals are socially-oriented (e.g., to meet broadening participation in computing goals [4, 16, 28]), community-oriented (e.g., to support nonprofits’ IT or learning needs [8, 23]), and student-oriented (e.g., to provide opportunities for gaining professional, social, and ethical outcomes [25, 37, 39]). Faculty report satisfaction that their students gain knowledge and experience, civic awareness, and professional skills along with providing benefits for community partners, such as knowing their students improved computer networks, constructed quality websites, enhanced information security, educated partners’ clients, and much more [23, 26, 29, 30].

Notwithstanding their satisfaction, faculty often describe more costs than benefits of service learning, citing heavy workload and lack of institutional resources [17, 36, 41]. Similarly, community partners are typically under-resourced, often unable to purchase technology required to support students’ final products, supply staff for student interaction, or maintain deliverables [2, 3, 19, 22, 40]. Unfinished projects can lead to net negative outcomes [15, 30]. When educators design to maximize benefits to students, costs to the partner can also limit students’ realistic understanding of community needs or cultivation of civic awareness [10, 11]. While scholarship in CIS has argued that faculty disproportionately emphasize benefits to students, many faculty members describe strong benefits for partners. To better understand what makes some service learning courses symmetrically beneficial for both students and community partners, we conducted a survey to address three research questions: (1) What outcomes do CIS faculty members intend for students and partners? To what extent are these assessed? (2) Is reaching student and community partner goals equally important? And (3) What are the features of service learning offerings that realize benefits to community partners?

3 METHODS

3.1 Survey Design and Analysis

We designed the survey based on an extensive review of service learning literature, both general to undergraduate education and specific to CIS. Once drafted, the survey underwent three rounds of revisions to ensure construct validity. First, we asked an expert advisory board of professors with experience researching service learning to comment on the content and flow of the survey. Second, four computer science faculty colleagues who had taught service learning courses at our institution took the revised survey and provided feedback. We received a final round of feedback from colleagues at three other institutions. The final revised survey was approved by the university institutional review board and can be found at [33].

In the first survey task, respondents read a definition of service learning to ensure agreement between respondents and researchers on the concept we were studying: “Service learning is an authentic education experience in which students provide service to a community partner while learning content knowledge, professional skills, and critical thinking.” Of the 159 responses, 84 respondents reported using service learning at least once. Below, we focus our analysis on four sets of survey questions asked only of those 84 who had used service learning:

- Student intended outcomes (open-ended), student outcomes assessment (select all that apply);
- Partner intended outcomes (open-ended) and partner outcomes assessment (select all that apply);
- Importance of student v. partner goals (11-point slider from 0 to 100 asking respondents to choose placement; open-ended explanation of slider placement); and
- Advice, experiences, and concerns for using service learning in CIS (open-ended).

In addition, we asked respondents questions related to their department, teaching experience, and service learning offerings as well as demographic questions, including their gender identity and whether they identify as a member of a historically marginalized group.

We conducted inductive, thematic analysis of all open-ended data, resulting in descriptive categories that characterized the breadth of responses; inductive analysis is ideally suited for exploratory data as it privileges the voices and experiences of participants [31]. We summarized select-all-that-apply questions as frequencies and percentages. Respondent and course data are presented in section 4 as counts, percentages, and averages. We designed the survey to be largely exploratory, using open-ended questions rather than asking closed-response questions. As a result, inferential analysis comparing groups’ responses was only possible for the question comparing importance of reaching students’ v. partners’ goals (section 6).

3.2 Sample Development

We sent the survey link to 2,088 CIS faculty at 1,218 institutions in the United States. [38]. Research assistants created a list of

faculty email addresses in the U.S. that had graduated at least one associate's or bachelor's degree in CIS in 2015. The mailing was stratified by type of institution (Historically Black Colleges and Universities (4%), Hispanic-serving (9%), Ph-D granting institutions not included in the first two categories (31%), 2-year (15%), 4-year colleges and technical institutes (34%), tribal college (1%), and the remainder unknown). We sent invitations using SurveyMonkey and incentivized participation with a random drawing for one \$100 gift card and eight \$50 gift cards. Although the survey itself was completely anonymous, we asked respondents to enter their email for the drawing in a form that was separate from the main survey.

4 RESPONDENT AND COURSE PROFILES

Among faculty who had taught at least one service learning course, the respondent profile was as follows:

- *Field.* Computer science (n=61), information science (n=15), computer engineering (n=4), software engineering (n=9), data science (n=10), web development (n=8), other (n=9) (not presented as percentages because many respondents selected more than one field).
- *Years taught.* Range 2-45 years, average 18.4.
- *Gender identity.* Men (n=49; 64%), women (n=23; 30%), prefer not to disclose or nonbinary (n=5, 6%).
- *Member of a historically marginalized group.* Yes (n=14; 18%), no (n=59; 78%), prefer not to disclose (n=4; 4%).

To find out their level of experience with service learning, we asked respondents to think about and report on the most recent service learning course they had taught. Respondents had taught this course from one to 25 times, with an average of six times and a mode of two (not including an outlier of 42 times). Course level was more often upper than lower division, ranging from introductory (n=14) and lower division non-introductory courses (n=11) to upper division capstones (n=28) and non-capstones (n=34). Ten courses were graduate level. Enrollment ranged from 2 to 150 students, averaging 28, with mode and median of 20. Service projects were described as website development (45%), open source software (14%), non-implemented software (e.g., prototypes) (27%), implemented software (44%), data analysis (24%), user testing (24%), user experience design (29%), hardware design (3%), teaching (15%), mentoring (17%), and research or threat assessment (20%).

5 FACULTY'S INTENDED OUTCOMES

5.1 Outcomes and Assessment for Students

We prompted respondents to provide descriptions of outcomes from the most recent service learning course they had taught either by pasting them in from an actual syllabus or assignment or by typing them in. Seventy participants answered this open-ended question. Consistent with service learning scholarship, responses fell into three categories, technical skill and knowledge attainment specific to the course or assignment, professional skill development, and social or civic duty outcomes. To understand how the partner was presented to students in outcome

descriptions, we counted mention of partners or implied partner. Half of the outcome descriptions (35 of 70) did not mention a project partner at all, focusing only on technical, personal, or professional skills to be acquired by students. For example, one respondent pasted these outcomes from a syllabus,

1. Understand the paradigms of supervised and unsupervised machine learning.
2. Explain the fundamental issues and challenges of machine learning.
3. Identify the strengths and weaknesses of multiple machine learning approaches.
4. Formalize a task as a machine learning problem.
5. Identify suitable algorithms to tackle different machine learning problems.
6. Work in teams to develop models and apply machine learning frameworks to solve practical problems.

In contrast, 29 respondents directly or implicitly mentioned a partner, a "real client," or larger social or ethical problems. An example is shown in the last two lines of this description:

By the end of this course students will be able to: Explain what a project is, provide examples of IT projects, list various attributes of a project, and describe constraints of project management; Be able to write a project scope and definition; Be able to use software to create budgets, charts, schedules, etc.; Use critical thinking to identify and determine the risks of a project for risk management; Use the concepts learned in this course to propose and develop an IT based project that can provide assistance to help improve a small business or organization within the community (citizenship); Complete proposed IT based project within the community.

By including the partner, using the word "citizenship," and stating that the project is to be complete, this example implies that partner needs are important. Syllabus and assignment statements have authority; whether delivered in class orally or written on a syllabus, they may differently influence students about what is important to learn and do as related to social good.

We asked a select-all-that-apply question regarding the methods of assessment for intended student outcomes. Most courses included multiple assessment methods. The most frequently selected method was a presentation of the project (n=64), with deliverable evaluations (n=49) and reports (n=48) also being commonly used. Less commonly used methods included a portfolio (n=19) as well as use of surveys (n=12) to evaluate students at the end of the semester.

5.2 Outcomes and Assessment for Partners

We also asked professors what outcomes they intended for their community partners. Seventy respondents answered the question. We categorized two types of intended outcomes with clear partner benefits, including providing a product that genuinely serves the partner's needs (29 of 70) and providing partners with ideas to solve a problem (but not a product) (12 of 70). An example of a product that genuinely serves the partner's needs is "Improve their ability to do their job through the use of technology and a back-end database." An example that is an idea, but not a product, is "A prototype to help them envision a computer system for something they currently did on paper, so it could help them understand the software development process and make informed decisions about proceeding with a professional system later."

Many respondents wrote outcomes that were not actually benefits for partners, however. In 15 descriptions, the partner is described as doing a service for the students. For example, the partner in the following description is expected to donate time and give feedback to students, but the benefits for them are unstated: “That they engage actively -- and course-correct the student team when they diverge from the partner's priorities: 1-2 hrs/week.” Another partner outcome was to be exposed to students as potential employees, such as “Have a work force they need.” Three participants wrote “none.” Unlike specifying student learning outcomes, respondents seemed less able to specify outcomes for partners. Had this been an interview-based study rather than survey, the research team would have probed on these responses to determine whether the respondent was thinking of partners as only having a role in serving student outcomes or had other partner benefits in mind.

With respect to assessing partner outcomes, we asked respondents to select all that apply among the following: “I did not assess outcomes for community partners,” “Survey,” “Informal feedback through email, conversation,” or “Other” with a comment box. More than a quarter, 26%, selected “I did not assess outcomes for community partners.” The most selected method of assessment was informal feedback (70%), with about 19% of respondents using surveys, and a small percentage of professors using other methods, which mostly consisted of evaluating the students’ deliverables to the partners by course outcome documents. Several (11%) used both surveys and informal feedback. Evaluation is done to measure success. To not assess outcomes for the partners may suggest a lack of concern for whether students succeed at meeting a client’s needs. To the extent that students and partners draw that inference, a faculty member’s prosocial goals for both groups may not be met.

6 COMPARING GOAL ATTAINMENT FOR STUDENTS & COMMUNITY PARTNERS

We asked professors to “compare the relative importance of reaching student and community partner goals” using a “slider” format. The slider appeared continuous from 0 to 100, but actually presented an 11-point scale in increments of 10. The slider was set to the midpoint of 50 by default, under the statement “Student + Community Partner goals equally important.” We asked respondents to drag the slider to indicate their attitude about reaching stakeholder goals. A response of 0 indicates that achieving student goals was important but partner goals unimportant; a response of 50 indicates both groups’ goals are perceived as equally important; and a response of 100 indicates that partner goals are important, but student goals are not. Seventy respondents answered the slider question with a mean response of 35 and a standard deviation of 17. We compared responses of professors identifying as male and female and responses of professors identifying as members and nonmembers of historically marginalized groups and found no significant difference for either comparison ($p=.14$, $p=.98$, respectively). The distribution of slider placement is shown in Figure 1. Overall, a significant majority (42) of respondents believed that reaching

student goals was more important and a significant minority (6) felt that reaching partner goals was more important. Slightly fewer than a third (22) believed that achieving both groups’ goals was equally important.

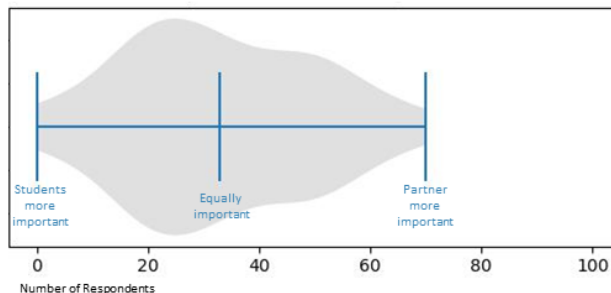


Figure 1 Comparing Importance of Reaching Goals

An open-ended question followed the slider placement asking respondents to explain their choice about the importance of goals for students and partners. The most common category of explanation for privileging student goals was that an educator’s mission is to teach students or that classes are for student learning ($n=18$). Some respondents were quite adamant that partners’ goals were unimportant. One wrote, “Student learning is the reason for offering this course -- it isn't an outreach clinic” while another shouted, “TEACHING, IS MY JOB. Learning can be experiential” (but wrote in lower case throughout the rest of the survey). In the “real world,” clients will not be happy if they do not receive the benefits they seek. Framing partners as charity cases or focusing exclusively on students may tacitly convey to students that partners are secondary, at best, and may impede development of civic awareness or disposition toward civic duty.

Among the 42 who considered reaching partners’ goals to be less important than students’, (slider placement 0/10/20/30/40), a quarter ($n=13$) described partner benefits as only a bonus to student outcomes. For example, “My job is to teach students. We use community partners to accomplish this, with the side benefit of helping them.” Two respondents mentioned that the projects were not complete enough to provide true benefits to partners, with one suggesting that there may be benefit in the future. Partnering with a class of students is a nontrivial commitment and a kindness. To take advantage of this kindness without caring about a reciprocal relationship, however, seems exploitative, and likely to exacerbate the difficulty of finding community partners who are willing to participate in prosocial and civic educational projects.

Among the 22 who considered reaching students’ and partners’ goals to be of equal importance, the most common explanation was pragmatic: service learning works best when both groups’ needs are met. For example, “A project for a community partner must serve both my students and the partner. A project that meets the goals of just one or the other is a failure.” Similarly, “If partners are not happy they won't take on more students.” Two others stated that being perceived as a credible partner to the local community was part of their department’s or

institution's strategic plan and that only by providing service could they be perceived as credible.

Six of the 70 respondents privileged the partner's needs over students, offering several reasons. One reason was closely aligned with the National Science Foundation's Broadening Participation in Computing program to create a high quality, diverse technical workforce. The respondent wrote, "Our primary goal is to support the expansion of computer science courses in area high schools that lack access to both CS curriculum and teachers." Another explained that there were too many students in their class to evaluate well, so they used the partner's need for a useful product as a motivator for student learning and engagement.

7 ADVICE FOR IMPROVING SYMMETRY

The goal of this study is to discover how faculty improve the symmetry of concern for students and community partners. Our final request of respondents was "Please share any advice, experiences, interests, or concerns related to service learning in CIS undergraduate education." About half of respondents wrote comments in this box. In addition to these comments, many respondents described or implied practices that they believe work to ensure students produce a viable product for partners. We have compiled these below in the hopes that faculty using service learning can improve service to community partners.

7.1 "Real Clients, Real Users" (Not Charity)

Many respondents argued that something useful must be delivered to community partners and suggested ways of communicating this both for providing value to partners and for making sure students realize their prosocial and civic duty goals. One respondent wrote,

We do not want to deliver something that the partner cannot use, as that is a negative experience for the partner and a negative learning experience for the students. We frame the project around students learning how to leverage and apply what they have learned about technology and how to build it for real clients, real users, and have them think about how to identify value. We often ask not just "did we build it right?" but also "did we build the right thing?"

(underline added). In fact, the word "real" as related to projects and partners was used repeatedly in explanations about why partners' goals should be important. Another respondent similarly advised, "I let students know that they are not allowed to slide in the commitment to the partner, who has put skin in the game and deserves a good outcome (like a "boss" or "client")." Others referred to the partner as a "customer" or the project as developing a product to be used by a "business." These quotations suggest that faculty and students should explicitly describe partners as "clients" rather than implying in any way that this is charity work or that it is a "pretend" product created just for a grade. Respondents also suggested that faculty use these terms in the syllabus, project descriptions, and other documents as an important communicative strategy. Including this language in official documents frames partner benefits as part of the learning experience and elevates its importance.

As mentioned in section 5, many respondents described only personal or professional outcomes for students but did not mention civic outcomes involving students' relationships with community partners. In contrast, many of the descriptions, which appeared to be copied and pasted from course materials, described social goals of projects and students as "agents of change." By explicitly encouraging social good, faculty can tacitly charge students with improving conditions for the community partner. While some students may not want to make a difference for partners, some faculty argued that many do, which is consistent with research on CIS students [17].

Including the benefits brought to partners in student assessment is another tacit way of communicating the importance of meeting partners' needs. One respondent wrote, "students are being evaluated on their understanding of their customer and the problems they encounter in their lives." Another argued that quality assurance on behalf of clients is "crucial to project success and time-consuming," supporting the idea that project evaluation be built into course design.

7.2 Up-front Expectations Management

Respondents emphasized the importance of managing community partners' expectations for service learning before the experience begins. Community partners need to understand that students are students, not paid working professionals. Before agreeing to work with a community partner, faculty should have an open conversation about what students know about and what they know how to do, then choose only those who are willing to participate despite the limitations. Partners also need to understand and be willing to accept the risk that a product may not turn out as desired, or they should not be included as partners—both for their own benefit as well as for faculty and students. As one respondent put it, "In a few isolated cases clients did not have appropriate expectations, which made project management an excessive burden for faculty." Another respondent stated that partners know they may not get a viable product but they are offered the option to continue the partnership in the following term, with a new set of students picking up where the first set left off.

On the other hand, respondents acknowledged that in rare cases, students may also be paired with a community partner who is noncommunicative and not available for feedback. Some respondents described partners who stopped replying to email, including requests for feedback on product design. Students need to know in advance that they can "cut off a bad partner." In this case, having a backup plan is the only way to ensure that students benefit. It may be possible, for example, to ask faculty colleagues to provide feedback on behalf of a no-show partner.

Student expectations also need to be explicitly discussed. They need to understand the role of the community partner, the amount of involvement, and when to check in with their partner. This helps ensure that students are not only meeting class deliverables, but that they are iterating on the product based on community partner feedback.

One final expectation that must be set for all parties is that things may not go according to plan, so all stakeholders need to be flexible. According to one respondent, "...by partnering with an outside organization, the timing of meetings and progress is not completely in your control."

7.3 Project Management is Critical

Respondents also emphasized that project management is critical. In response to the question about intended student outcomes, some respondents shared extensive steps that provide substantive scaffolding for students' project management. Here are the first few lines of a response that appears to be pasted from a comprehensive project plan:

Conduct a project kickoff meeting with all project stakeholders. Differentiate between the Product Owner, Development Team, and Scrum Master roles in a Scrum team. Organize and conduct regular project meetings, including Sprint Planning meetings, Daily Scrum meetings, Sprint Review meetings, and Sprint Retrospective meetings."

With high quality scaffolding, students can manage the project on their own, which respondents argue can reduce considerable faculty overhead and support the development of crucial metaskills. In fact, one respondent argued that "students need to have control over the project, even if they make mistakes, because this is a learning experience."

7.4 Project Types and Components

Finding appropriate projects can be a significant challenge according to some participants: "It is difficult to find projects that are small enough to complete in several months but weighty enough to provide real meaning." Incomplete projects can mean non-delivery for partners. It is important to have a plan for managing students' expectations and scoping of projects so that they can fit within the time frame. When considering scope, it is also essential to consider the hidden costs of products, "such as hosting, maintenance, updating, etc." Thus, rather than only developing a product to hand over the wall, students should be asked to do realistic evaluation of what it will take to keep a product working for an organization for the long term. This may include training and many other concerns for under-resourced organizations.

Evaluating students' ability to participate is also critical. Many students work to earn a living and pay for school or may have dependents to care for. If the service project is too large or requires more meetings than is typical, it may place a burden on students. In that case, offering both service-oriented and non-service related projects as assignments may support students who can and who cannot participate. It may be possible to allow students to "build their own adventure," supplying some small need to a partner based on students' existing knowledge. Also, faculty can consider Humanitarian Free and Open Source Software (HFOSS) projects, which do not require working on site, face-to-face with community partners.

7.5 Get the Institution Involved

Two respondents mentioned departmental or institutional plans to demonstrate value to the local community, which can benefit both students and partners, since the local community is made aware of the value of students. If community partnership is part of a strategic plan, institutions can assign real campus resources for developing partnerships and maintaining connections. In addition, faculty described heavy time commitments of service learning, but with administrative support and understanding, a service-oriented class such as a capstone could be counted as two courses instead of one, as suggested by this respondent: "The places I know of that make this really work dedicate significant resources to it, including an instructor who can devote much more time to making sure projects succeed than I can possibly devote to teaching a class. It needs to be a full-time assignment, not a normal course assignment." This extra time could ensure that students are able to devote more of their resources to ensuring that the final product is beneficial to their community partner.

8 CONCLUSION, LIMITATIONS, & FUTURE

This study found that faculty could easily describe intended outcomes for students and usually had clear assessment plans for them. In contrast, while many respondents described products or services with intended benefits for partners, they often did not specify any other intended outcomes for community partners. Also, faculty rarely conducted any formal evaluation of partners' experiences. Indeed, many more faculty believed that reaching students' goals was more important than reaching partners' goals, often justified by their role as educators. Nevertheless, survey respondents shared many promising approaches for improving the symmetry between student and partner outcomes.

Our survey was largely exploratory, depending on qualitative responses to questions. As a result, inferential analysis and generalization is limited. In future work, we hope to conduct multi-stakeholder design research to develop resources that support symmetry in CIS service learning offerings and support faculty hoping to use this pedagogy for students' technical, professional, and civic learning.

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