

WIP: A Systematic Approach to Screen and Align Service-Learning Projects for Optimal Student Outcomes

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Abstract—This innovative practice work in progress paper presents a systematic approach for screening and aligning service-learning projects that maximize student learning outcomes. We introduce a feasibility assessment model with criteria evaluated through a standardized rubric that guides instructors to critically assess the project fit to help in proactively identifying risks to student outcomes. The rubric serves a dual purpose: guiding the assessment process and prompting discussions with potential project partners. These discussions elicit crucial details about the project scope, potential challenges, and other critical factors. This not only facilitates effective project selection but also allows for necessary adjustments to project parameters, significantly improving the chances of successful student completion. This work builds on the experience accumulated by CCSU’s Software Engineering Studio which connects community project partners with teams of 4-5 seniors working on software development projects spanning one or several semesters. Since 2014, the Software Engineering Studio has facilitated over 65 distinct projects and engaged over 550 students. By capturing the lessons learned across a wide range of successful service-learning projects, we show the value of using a feasibility assessment model to evaluate potential projects based on criteria including alignment with course goals, student skill sets, workload manageability, educational engagement, and other considerations. The application of this model is illustrated with a case study, which demonstrates how this model helps instructors align projects with academic goals while considering scope, risks, and other critical elements. This example demonstrates how the model facilitates communication with project partners, identifies potential risks, and guides project adjustments to ensure a successful learning experience for students. The approach is transferable to other disciplines with adaptations for project types and student skills. This work contributes to the field of service learning by offering a practical framework for integrating valuable real-world projects into the curriculum while prioritizing student learning outcomes.

Index Terms—Service learning, Software projects, Software engineering

I. INTRODUCTION

The computing education community has widely recognized the value of experiential learning through real-world projects,

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citing the profound impact such experiences can have on student engagement, skill development, and career readiness. Likewise, service learning in computing has been shown to better engage a diverse range of students by highlighting the practical applications and societal impact of technology, helping students from various backgrounds see themselves as integral contributors to the field. While the value of these initiatives is widely acknowledged, integrating them into the curriculum continues to be a challenge. Among the top of these challenges is ensuring the project is well aligned with course goals and objectives. The systematic approach outlined in this work offers a structured model for assessing and improving the alignment of potential service-learning projects, aiming to bolster instructor confidence in their potential to yield positive student outcomes before committing to a project.

When service-learning projects are integrated into a course/curriculum, ensuring alignment with programmatic constraints is vital to maintaining the integrity of learning outcomes. By ensuring that projects are relevant to student skills and knowledge, manageable in terms of workload, and ethically sound, educators can create a conducive learning environment. This environment promotes student engagement and motivation. Using a systematic approach to evaluate potential projects helps filter out projects that may not be a good fit within the academic environment, and aids in identifying necessary adjustments to project scope. Consequently, this process ultimately leads to increasing the likelihood of successful project completion.

Unlike using an ad hoc approach, we have found that employing a specifically developed rubric for assessing project feasibility enables instructors to pinpoint common challenges and areas that should be addressed, thereby increasing the likelihood of favorable student learning outcomes. This approach not only guides instructors in selecting projects that align with academic objectives but also facilitates communication with project partners to refine project requirements and set clear expectations. Through a case study, we illustrate how this feasibility assessment model can be applied, highlighting

its effectiveness in maximizing student learning outcomes and fostering civic responsibility.

II. PRIOR WORK

A. Service Learning in Education

The concept of service learning can be framed as a "teaching and learning strategy that integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities" [1]. Participation in service-learning projects that impact society or serve the greater social good has been shown to strengthen students' interest in computing and related careers, especially among female and minority students [2], [3]. Service-learning projects have a long history of being used as a context for integrative experiences in a variety of disciplines, such as engineering [4] and computing [5].

Service learning helps us place teaching and learning within a meaningful real-world social context along with a full spectrum of its social implications [6], [7]. With service learning, students can be exposed to a broad range of societal issues, diverse communities, and new perspectives, which entails many positive impacts [8]–[10]. Students can benefit academically with improved abilities to apply knowledge [11], [12], increased persistence [13], [14] and motivation [15], [16]. Furthermore, service learning has been shown to improve students' self-efficacy [5], [17], [18] and leadership abilities [6], [11], helping them define meaningful career goals [8], [19], and strengthen their sense of civic duty [20], [21].

Current research suggests that the amount of time dedicated to service-learning projects must be substantial, in order to have a meaningful impact. A variety of reports, e.g. [22], [23], indicate that students who participated in at least 40 hours of service learning work are most likely to benefit the greatest from their participation, resulting in a strong computing identity, improved leadership skills, and increased self-efficacy.

B. Challenges of Project Selection

With computing education transitioning from a knowledge-based to a competency-based approach [24], service learning can provide an excellent platform for students to practice their application of knowledge and skills in a practical and authentic setting, helping them to solidify their professional competencies [25]. However, as noted in many reports, service learning still remains under-utilized in many computing programs [8], [9], [26].

Implementing service-learning experiences is challenging from a variety of perspectives as instructors adopting service-learning projects must address several key questions. How to reconcile the variable length of meaningful projects with the fixed length of a single academic term? If not aligned with one term, they need to decide how to span terms and consider the associated pros and cons. Other questions include: How to embed a project into the existing program curriculum without creating a new course? How to evaluate the suitability of the project to the student skills and expectations of workload?

How to make sure the project outcome addresses the needs of the project partner? Perhaps most importantly, will the project be a good fit for ensuring a positive learning experience for the students, while advancing the academic learning outcomes?

Working with project partners and ensuring that the project is a good fit for the program and students is particularly challenging. Partners often do not understand academic constraints related to timelines [27]. Project partners' goals focus primarily on the working software, while students typically care more about good grades [28]. Many project partners find it difficult to fully grasp the complexity of most software projects and what it takes to deliver them [29].

Traditionally, most project negotiations focus on project scope, cost, and schedule [8], [30]. In service-learning settings, there is typically no cost to the project partner, while the schedule must align with the academic term(s). However, discussing project scope is far from trivial. Student teams find it very difficult to plan and estimate the scope of a project [31]. This is equally challenging to most service-learning partners who typically represent non-profit or community organizations and lack experience in project management. Given that such project partners typically have little to no understanding of the software development process, discussing project scope must be the main focal point of the project negotiation process, which should occur well in advance [32]. In our prior work, we identified several other focal aspects that should be discussed with the prospective project partner that might mitigate some non-technical project challenges [33]. These aspects include gauging whether the partner has a clear understanding of their needs, making sure that there is a match between the partner's expectations and the capabilities of the student team(s), ensuring alignment of the project goals with the academic goals, along with a range of other academic constraints that may vary between institutions and programs. It is also important to ensure that the prospective partner understands what options there may be for any post-delivery maintenance, whether this might be a burden on the partner or if the developers and/or the institution may play any role in it [8].

III. METHODOLOGY

A. Overview of the Feasibility Assessment Model

The feasibility assessment model is a structured approach to evaluating the potential success of a project. It involves identifying and assessing various factors that may impact the project's outcome. The assessment rubric seen in Figure 1 is a tool that is used as part of this process to help screen projects and provide guidance on how they might need to be adapted to ensure positive student outcomes.

The rubric provides instructors with guidance on how to evaluate projects using standardized criteria such as alignment with course goals and objectives, relevance to student skills and knowledge, workload manageability, partner engagement, clarity of project requirements, resource requirements, and privacy and ethical considerations. The rubric helps instructors identify common challenges and areas requiring further clarification. By mitigating these potential risks identified

Project Feasibility Evaluation Rubric					
Dimension	1 (Least Suitable)	2	3	4	5 (Most Suitable)
Alignment with Course Goals	Project minimally relates to course objectives	Partial alignment with course objectives	Some relevance to course objectives	Mostly aligned with course objectives	Perfectly aligned with course objectives
Student Skill Relevance	Skills required are not applicable to students	Some skills applicable but hard to acquire	Basic skills needed, time to learn additional	Most skills applicable, some learning needed	All necessary skills applicable or easily adaptable
Workload Manageability	Project demands extensive time & resources	High workload, requires significant resources	Manageable workload, moderate resources	Slightly elevated workload, minimal resources	Appropriate workload, no additional resources
Educational Engagement	Little engagement, shifting project requirements	Limited engagement, frequent changes	Moderate engagement, occasional adjustments	Active engagement, stable project scope	Highly engaged, consistent, well-defined project scope
Requirements Clarity & Guidance	Project requirements are vague and confusing	Unclear requirements, need for clarification	Basic understanding but needs clarification	Clear requirements with minor gaps	Crisply defined, clear requirements
Project Outcome Assessment	Lack of defined metrics for assessing outcomes	Basic criteria, insufficient for evaluation	Defined metrics for some outcomes	Comprehensive measurement for most outcomes	Comprehensive, tailored assessment for all outcomes
Resource Requirements	High infrastructure / resource costs	Moderate infrastructure / resource costs	Manageable infrastructure/resource costs	Minimal additional infrastructure/resource costs	No additional infrastructure/resource requirements
Privacy / Ethical Considerations	Privacy/ethical challenges that still need to be resolved	Privacy/ethical challenges may need to be addressed/mitigated	Privacy/ethical challenges may need to be addressed	Privacy/ethical challenges addressed in project	No potential privacy / ethical challenges

Fig. 1. Project Feasibility Evaluation Rubric.

through the rubric, instructors can improve the likelihood that proposed projects will be a good fit and reliably lead to positive student learning outcomes. This information can help instructors make informed decisions about project selection and provide guidance on areas where the projects might need to be adapted to maximize their potential for success.

We have also found these assessment criteria useful for communicating with partners about what instructors perceive as potential risks to student learning. Experience has shown that this can lead to a better understanding of the realities of these collaborations and the priority of student learning outcomes. This results in fruitful discussions on project adjustments to better fit the needs of the academic partnership while still providing measurable benefits to the partner.

Overall, the feasibility assessment process provides a valuable framework for evaluating, refining, and selecting projects most likely to contribute to positive student learning outcomes.

B. Implementation of the Feasibility Assessment Model

Once a potential service-learning partner and instructor are paired for a potential project, the feasibility assessment process unfolds through a series of conversations and refinements. The process begins with an initial conversation to understand the partner's organization, mission, and proposed project. The rubric guides the instructor's inquiry, prompting questions about various project aspects that will determine its score on the rubric's criteria. During this discussion, the instructor identifies any immediate "red flags" that might render the project incompatible with the course's service-learning goals. These concerns are discussed with the partner, along with potential alternative project ideas that could be a better fit.

Following this initial conversation, the instructor provides the potential partner with a standard form to complete a written project proposal. This form prompts the partner to

break down their understanding of key aspects of the project including project requirements, overall scope, timeline, data requirements, and partner participation throughout the project. The written proposal serves two purposes. First, the act of writing down their understanding helps the partner solidify their ideas and potentially uncover areas where they might require further clarification. Second, the completed proposal allows the instructor to score it using the rubric, pinpointing areas that might still pose a risk to successful implementation.

Subsequent conversations delve into these identified risk areas. Together, they discuss aspects of the project that might not prioritize student learning outcomes or pose potential risks to these goals. This collaborative discussion focuses on potential adjustments or negotiations to align the project with the course's educational goals. A key part of this conversation is also helping the partner recognize the non-negotiable nature of prioritizing student course learning outcomes and the realities imposed by being tied to a semester.

Following these conversations, the partner revises the project proposal to incorporate the agreed-upon adjustments. This iterative process of discussion, revision, and review repeats until a project is developed that demonstrably aligns with the academic context and effectively prioritizes student learning. Only at this point, after a mutually agreeable project description is finalized, can the project be incorporated into the course-based service-learning experience. It's important to note that the effort invested by the partner in creating the detailed project description is not wasted. This document becomes a crucial resource for student teams when they are introduced to the service-learning project. By distributing this co-created document, both the instructor and the partner establish a clear set of expectations for all parties involved.

IV. CASE STUDY

The following case study is based on real conversations with a potential partner and illustrates the application of the feasibility assessment model.

1) Overview: We were approached by a regional food bank that facilitates food donation and distribution through a network of volunteers, charities, and non-profits. For the upcoming American Thanksgiving holiday, they wanted a system to streamline the collection of information about families in need across multiple locations that will be used to generate a master list for efficient meal distribution. Currently, their process is paper-based, requiring countless hours to consolidate information from various partners using different formats. This often leads to data duplication, further complicating distribution efforts. The partner envisioned a solution where individuals could sign up for Thanksgiving meal assistance at any of their partner locations. The system would then automatically organize and generate a master list to eliminate duplicates to help distribute meals more effectively. The system needs to balance collecting enough information to eliminate duplicates and fulfill regional reporting requirements while protecting privacy. Additionally, the system should be scalable to accommodate future growth of the organization.

2) Application of the feasibility assessment model: The feasibility assessment model helped evaluate this project against course goals and student capabilities. While the project aligned with the technical objectives and student skill sets, several concerns emerged through the rubric scoring process.

Workload manageability: The three-month timeframe for a mission-critical system posed a major challenge. We needed to ensure realistic expectations regarding what students could achieve within a term, *while* prioritizing learning outcomes.

Educational engagement: Successful collaboration requires timely communication and regular meetings with the partner to address student questions. Assessing the partner's capacity for this level of engagement was crucial.

Privacy considerations: A thorough understanding of the data privacy regulations and how the system would handle sensitive information was necessary to ensure that the target students had the appropriate skills to protect the collected information.

Requirements clarity and guidance: The scope required further clarification regarding user types of the system, expectations for duplicate elimination with limited data, and the core needs of the system to be useful.

3) Outcomes: Through ongoing discussions, we collaboratively refined the project scope and data handling to align with student capabilities. The project's development will begin this fall, targeting deployment the following fall. This extended timeline allows the partner to ensure the envisioned application is compatible with their existing processes and partner organizations, and potentially refine their existing processes to allow a smooth transition next year. It also offers them the opportunity to pilot a smaller system this year, validating its effectiveness and minimizing risk. The ultimate goal remains a fully functional application by next fall, providing the partner

with a system that meets their needs and empowers them to serve their community more efficiently.

This case study highlights the importance of clear communication and realistic expectations when collaborating with external partners. Utilizing the feasibility assessment model identified potential risks to student learning outcomes across multiple areas. Working with our partner we then found solutions that should benefit both students and the community.

V. DISCUSSION

A. Using a feasibility assessment model to manage student service-learning projects

The use of the feasibility assessment model has enhanced collaboration with service-learning partners by allowing instructors to identify potential risks to student learning outcomes before project selection. Common challenges frequently encountered have included unclear project scope, partner responsiveness, and mismatches between partner expectations and the abilities of the target students. The rubric, and process for iterative discussion driven by the rubric, addresses these through a concrete mechanism that facilitates open discussions and collaborative solutions that prioritize student learning.

The model's core principles are: identifying both technical and non-technical risks, facilitating communication about these risks with collaborators, and collaborating to develop strategies to mitigate the risks before including the projects in a course. These principles are transferable to incorporating service-learning projects across disciplines.

B. Benefits and Limitations

The model offers numerous benefits, including:

Risk identification: Proactive identification of potential challenges allows for adjustments before impacting project success.

Enhanced communication: The assessment process fosters open discussions about project feasibility, leading to solutions that prioritize student learning.

Project alignment: Systematic evaluation ensures chosen projects align with course goals and student skills, maximizing learning experiences.

However, the model's effectiveness relies on candid collaboration. If either party lacks transparency, the model's effectiveness is reduced.

VI. CONCLUSION

This study demonstrates the feasibility assessment model's value in managing service-learning projects. It facilitates communication, identifies potential challenges, and ensures project alignment with student learning outcomes.

A key aspect of successful projects is ensuring the partner understands the importance of student learning as a shared priority. Through collaborative discussions, project adjustments can be made to create mutually beneficial endeavors. As our case study demonstrates, the model can help identify challenges, facilitate communication, and prioritize student learning outcomes, leading to successful projects.

The transferable approach can be adapted to other disciplines and project types. This paper contributes to the field of service learning by offering a practical approach to fostering successful student projects with external partners. The model acts as a framework to evaluate project suitability, ensuring a positive learning experience for students while delivering value to the partner organization. Future research will examine data from both service-learning partners and students involved in these classes. This data will be used in a future report to explore the process's impact on service-learning partners, student perceptions of the projects, and how these course-integrated projects have ultimately impacted student competencies and attitudes towards service learning.

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