WIP Elevating the Unsung Heroes: Assessing Graduate Teaching Assistants' Experiences in Service-Learning Programs

Ms. Danielle N. Wagner, Purdue University

Danielle is interested in enabling transparent communication between different members of society, often with an environmental focus to increase access to natural resources. As a PhD Candidate in the Lyles School of Civil Engineering at Purdue University she specializes in Architectural Engineering with a focus in indoor air quality and the built environment. She has had several opportunities to engage in education with undergraduates and community members, and has been honored practice advising undergraduate EPICS service-learning teams. Having community-oriented discussions at Purdue, working with human-centered design in her own research, and mentoring student teams inspirited her drive to center community member and partner voices within academic discussions. She is excited to continue learning from leaders in EPICS and partnering institutions while applying to industry and academic positions.

Sukrati Gautam, Purdue University

I am currently pursuing my Ph.D. in Computational Environmental Technology at Purdue University. I am experienced Teaching Assistant at Engineering Projects in Community Services (EPICS). I am exploring human decision making behavior using ML, and NLP models to enhance human-in-the-loop sustainability solutions. Leading to an impact by implementing new policies for bridging the digital equity gap. I have a unique blend of expertise to build impactful experiences for enhancing education engagement.

Peyman Yousefi, Merck Group

Peyman is a senior User Experience Researcher at Merck Group. He specializes in using mixed methods to explore human-computer interaction and human-centered artificial intelligence. During his Ph.D. at Purdue University, Peyman adopted an ecological approach that integrates engineering and science concepts to address significant environmental challenges. His research methodology included agent-based modeling, crowdsourced human behavioral experiments, institutional analysis, and qualitative data collection. Through his work, Peyman systematically investigated the interplay of natural, physical, and institutional factors in coupled human-environment systems. He focused on understanding the prerequisites for building resilient communities at various scales, aiming to enhance adaptability in the context of climate change.

Miss Nuela Chidubem Enebechi, Purdue University

Nuela Chidubem Enebechi (Nuela) is a Ph.D. in Industrial Engineering at Purdue University. She is an international student from Nigeria and received her bachelor's in Computer Science at Minnesota State University Moorhead.

Mr. Andrew Pierce, Purdue University

Andrew Pierce is the Assistant Director for the EPICS program at Purdue University in West Lafayette, Indiana. He received his bachelor's and master of science degrees in biomedical engineering from Purdue University. He spent five years as a development engineer in the medical device industry, designing a number of commercial medical devices and generating ten patents before returning to West Lafayette to help lead the EPICS program. In his ten years with EPICS, he has developed extensive experience in the administration of community-engaged design programs. As part of the leadership team, he has led the EPICS program to be recognized with numerous awards, including the W.K. Kellogg Foundation Community Engagement Scholarship Award and Outstanding Experiential Education Program by the Society of Experiential Education.

Dr. William "Bill" C. Oakes, Purdue University

William (Bill) Oakes is the Assistant Dean for Experiential Learning, a 150th Anniversary Professor, Director of the EPICS Program, Professor of Engineering Education at Purdue University, and a registered

professional engineer. He is one of the founding faculty in the School of Engineering Education having courtesy appointments in Mechanical, Environmental and Ecological Engineering and Curriculum and Instruction. He was the first engineer to receive the U.S. Campus Compact Thomas Ehrlich Faculty Award for Service-Learning and a co-recipient of the U.S. National Academy of Engineering's Bernard Gordon Prize for Innovation in Engineering and Technology Education. He is a fellow of NSPE and ASEE and elected to the ASEE Hall of Fame.

“Work In Progress, Elevating the Unsung Heroes: Assessing Graduate Teaching Assistants' Experiences in Service-Learning Programs”

Abstract

Service-learning programs emphasizing engineering design are frequently recognized for their potential to enhance the professional development of students. Such programs are complex networks of interconnected components including students, instructors, teaching assistants, community and corporate partners, and university staff, among others. Central to the functioning of these programs, Graduate Teaching Assistants (GTA’s) have been traditionally viewed not as service users, but rather as integral components of the service itself, actively contributing to a conducive environment for community engagement and learning. This foundational assumption has often overshadowed the importance of evaluating and enhancing the experiences of the GTA’s themselves, even though these experiences significantly influence the overall success of service-learning programs. This study takes a user-centric mixed-method approach to comprehensively evaluate GTA’s' experiences within service-learning programs. This research underscores the importance of recognizing and addressing GTA’s' unique needs within service-learning program evaluation. By identifying GTA expectations and experiences, the study also highlights the acquisition of multidisciplinary skills, promoting individual growth. The evaluation framework introduced can serve as a model for other institutions and programs, emphasizing the significance of an empathetic, user-centric approach in academic settings.

1. Background

In recent years, service-learning programs, including those focused on engineering design, have become increasingly widespread in higher education[1,2], recognized for their academic promise and potential to enhance student professional development[3]. Such experiential programs involve various components including an interconnected network of dedicated staff, students, instructors, Graduate Teaching Assistants (GTA’s), and both community and corporate partners, among others. These components work together within the university’s framework to create an environment that fosters student learning experiences while addressing community needs, which is highlighted in a systems-level perspective[2,4]. The complexity of these systems underscores the

necessity for comprehensive approaches to understanding and enhancing service-learning initiatives from multiple lenses.

As GTA's are largely responsible for facilitating course delivery, playing a support role for faculty and students[5] (Figure 2), their personal and collective experiences are often overlooked. Service-learning program studies often center *other* stakeholders, including students and faculty, as well as the program structure itself [6,7]. Several studies have investigated different aspects of GTA's perspectives of general coursework, including challenges, needs, and motivation [8–19]; however, the experiences of GTA's in service-learning initiatives has not yet been the focus of a systematic investigation, to the best of the authors' knowledge. This oversight is significant because GTA's play a crucial role in shaping the learning environment, facilitating community engagement, and ensuring the smooth operation of service-learning programs [20], while maintaining their own academic roles and identities. Understanding the challenges and opportunities experienced by GTA's can help in developing frameworks and strategies to support their personal and professional growth, while also enhancing their effectiveness as educators. Additionally, their unique position as both educators and learners provides them with insights and experiences that can enhance the effectiveness of program outcomes [21,22].

This Work in Progress (WIP) is part of an ongoing study to fill this gap by adopting a user-centric mixed-method approach to examine and report the experiences of GTA's in service-learning programs at Purdue University. The current stage of this WIP outlines the system overview, developed, and completed individual surveys, and introduces a preliminary assessment method for understanding data so far. We aim to use this as a starting point for discussion that can lead to further insights based on observations and follow-up interviews. We ultimately aim to utilize a combination of a pre- and post-semester program assessment surveys, weekly intercept surveys, stakeholder discussions, and ethnographic observations involving thirteen GTA's across various disciplines to uncover their motivations, challenges, and stresses, with the goal of identifying areas for program improvement and understanding and advancing GTA's' personal and professional development.

This work establishes a preliminary foundational framework for the ongoing evaluation of GTA's' experiences to highlight the role of GTA's in service-learning programs. By centering GTA's and exploring their experiences, we offer a paradigm shift in how service-learning programs can be

evaluated. This study not only highlights the necessity of recognizing GTA's as key *contributors* to the learning environment but also proposes a systematic approach for continuously assessing and enhancing their experiences as *users*. Such a user-centric approach ensures that GTA's are not only supported in their immediate teaching roles but are also provided with opportunities for their own growth and development. In doing so, we aim to promote a more inclusive, empathetic, and effective service-learning ecosystem that benefits and recognizes all participants.

2. System Affecting Graduate Teaching Assistants' Experience

This research emphasizes the pivotal role GTA's play in the success of service-learning programs by exploring their experiences. As integral components of the service-learning system, GTA's contribute significantly to the creation and continuation of an environment conducive to community engagement and transferrable learning. In the initial phase of this research, a system of connections to the service-learning GTA's in this specific environment was mapped out to represent the multi-faceted network of dimensions influencing GTA's within the EPICS program (Figure 1).

The greater system of factors that influence the experience of an individual GTA in EPICS is multi-faceted (Figure 1). GTA's work within a complex network of people, both within the EPICS program boundaries and outside. Likewise, the infrastructure in place to facilitate the courses, whether software or physical resources, can impact the GTA experience in positive and negative ways.

The interpersonal network for a EPICS GTA is complicated, with large variation in perceived 'rank' of individuals that must be navigated by the GTA (Figure 2). These relationships can often conflict and create sources of stress for the GTA, who is likely already in an intense phase of personal formation and building self-efficacy. A common cause of such conflict arises from having 'dotted-line' management. GTA's in general often balance multiple roles with different supervisors, including at minimum their direct supervisor for their TA position and their research advisor if applicable.

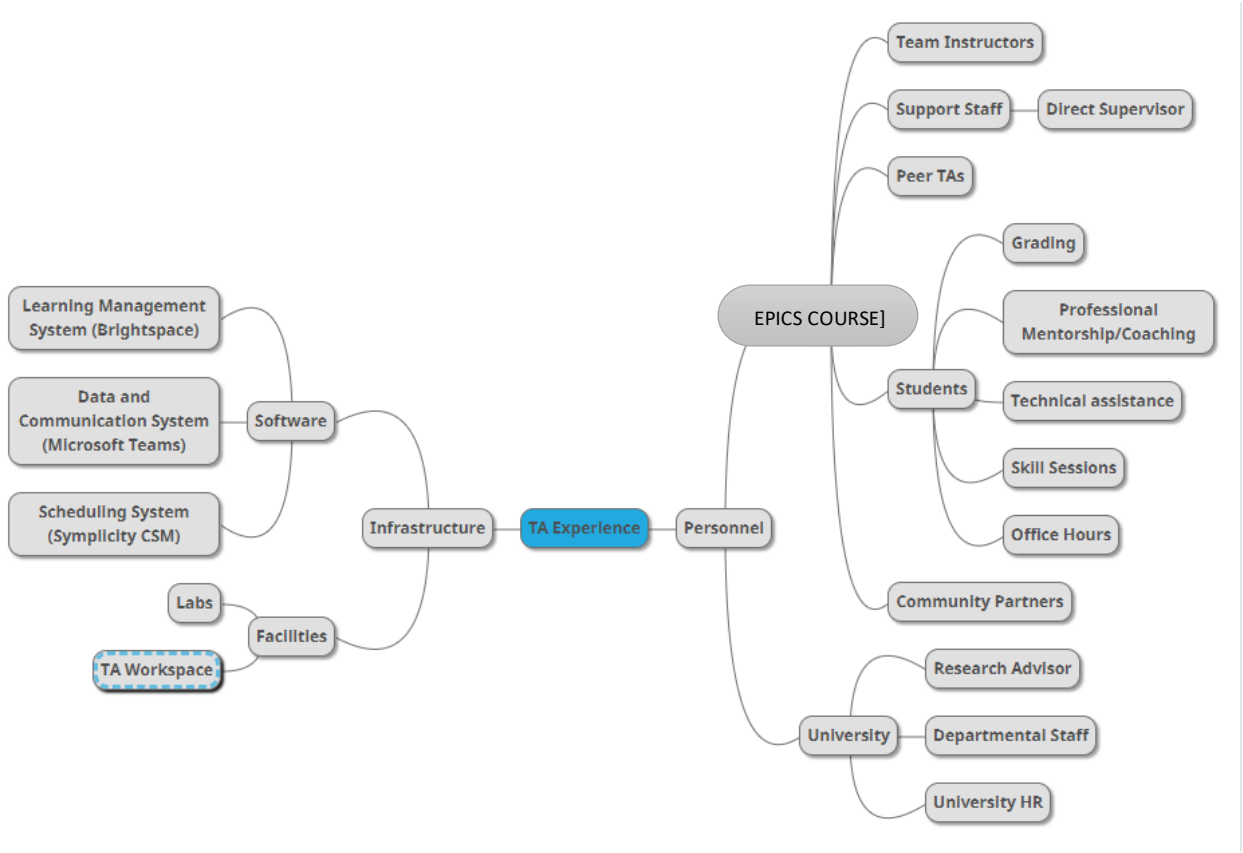

Figure 1. Network of specific factors influencing EPICS GTA experience

These various supervisors likely have different priorities that the GTA must navigate. Likewise, each GTA supports multiple instructors, who may have different expectations, and at times expectations that conflict with those of their direct supervisor for the program. Further complicating matters, each team has one or more community partner representatives who may hold yet a different set of expectations.

On the opposite side of the rank coin, the interactions of a GTA with their students can be complex. GTA's are often in their first or early position of authority. They support students through their projects, both during class and by holding external skills sessions, which may or may not fit in with their core areas of expertise, often needing to co-learn skills alongside their students. They also provide professional mentorship, work through team conflicts, assist in project management, and coach the design process.

In addition to interpersonal relationships, the EPICS TA ecosystem includes various dynamic infrastructure. This includes the curricular materials as well as the course software systems, a

learning management system, a system for communication and collaboration, scheduling systems, and course documentation, which may also vary depending on team needs. Physical infrastructure, whether the classrooms, lab spaces, or GTA office space can also influence the TA experience.

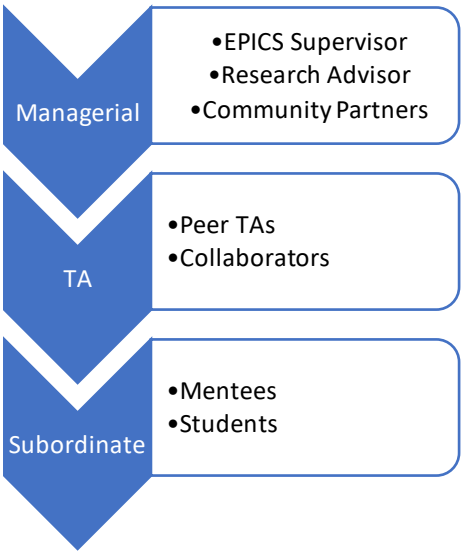

Figure 2. Top to down rank GTA's navigate management in service-learning programs

3. Methods

This exploration initiated with a curiosity about the distinction between GTA's experiences in service-learning relative to other courses, as well as their development relative to undergraduate students enrolled in the service-learning courses, with discussions revolving around important factors affecting GTA's amongst the authors, including current GTA's and Assistant Director. Discourse continued by involving long-term program personnel, and later grew to involve previous GTA's as authors for added system-level expertise and anecdotal insight. Continuous inclusion of diverse program stakeholders within this phase has enabled iterative development towards mapping the dimensions of GTAs' experiences, particularly those that intersect with program boundaries and external collaborations. Discussion insights guided the formulation of survey intentions and questions for GTA's to answer to investigate dynamic aspects of their experiences during the data collection and observation phase, as outlined in Section 2.2. By surveying the

individuals actively involved in the program with surveys informed by multiple stakeholders, this research seeks to shed light on the challenges, motivations, and unique perspectives of GTA's, ultimately enhancing our understanding of their crucial role in the broader educational landscape.

3.1 Participant Selection

This study involves the active participation of the full graduate teaching assistant team, which includes thirteen graduate students specializing in diverse engineering disciplines at Purdue University's community-based service-learning program entitled "EPICS". When originally hired for the position, GTA's are intentionally selected to represent different fields, interests, and skillsets to contribute to a well-rounded and resourceful team. This hiring process naturally encompasses individuals with varying levels of prior GTA experience. In this specific semester, five participants had prior experience as GTA's in service-learning programs, completing a full cycle of the academic session. Two participants previously completed a semester as GTA's in service-learning initiatives, providing a unique perspective on the program's mid-term dynamics. Additionally, five participants had never held a GTA position before for in any course, offering insights into the experiences of newcomers to such roles. Furthermore, three participants had GTA experience in other courses but not specifically within a service-learning program, providing comparative perspectives on their varied teaching assistant experiences.

With backgrounds spanning 7 different engineering and science disciplines, this diversity enriches the exploration of GTA's' experiences by considering the unique dynamics and challenges inherent to different academic domains. The participant cohort is comprised of seven PhD students and six master's students. This mix in academic levels adds further the potential to explore differences in experiences, responsibilities, and perspectives between these two groups. This research aims to capture a comprehensive view of GTA's' experience in EPICS service-learning program. The variation in experience levels ensures a rich exploration of challenges, motivations, and unique perspectives among GTA's while contributing to a deeper understanding of their crucial roles in the broader educational landscape.

3.2 Survey Procedure

The research adopts a survey assessment methodology, employing surveys before, during, and after a specific semester as active teaching assistants, facilitated through the Qualtrics survey

platform. GTA's were provided with links and individually coded ID's so that each answer set could be connected to individuals, as well as collectively assessed. These surveys serve as tools for initial assessment to understand the experiences and skill development of GTA's within the service-learning program.

As mentioned, the survey design was both a collaborative effort and an iterative process that was informed by discussions with EPICS staff and further leveraged by the authors' prior direct experiences. Interaction with EPICS staff provided essential insights into the challenges and achievements within the GTA realm, which eventually shaped survey questions to cover a broad spectrum of experiences. The authors' own experiences added another layer of authenticity to further align the survey with the realities of teaching and learning. Lastly, in developing the survey questions, this research drew on systematic observations and prioritized the inclusion of perspectives from across the service-learning program's stakeholder network. Observing GTAs in different settings offered further insights into their professional development and teaching strategies. This approach was intended to ensure that the survey accurately reflects the GTA experience and captures the dynamic educational environment they contribute to, aiming for an inclusive and comprehensive evaluation.

3.2.1 Pre- & Post-Semester Assessment Survey

The study commenced with a pre-semester survey designed to establish a baseline understanding of GTA's' skills and perspectives before their active involvement in the service-learning program. The skillset gauged is listed in Table 1. Administered through Qualtrics, this survey played a pivotal role in assessing the initial skill set and expectations of GTA's.

The survey questions were carefully crafted to gauge their proficiency and mindset, setting the foundation for subsequent comparative analyses with post-assessment data. By capturing this baseline, the research aimed to provide insights into the starting point of GTA's' experiences, laying the groundwork for evaluating the impact of the service-learning program.

Table 1. Pre- & Post-Semester Skills Assessment Survey
1. Speaking in front of 20 people

2. Time management
3. Problem-finding: Identifying a challenge to overcome in a real situation
4. Teaching a lesson of your expert skills
5. Applying a design process to address a challenge
6. Working on interdisciplinary teams
7. Team conflict resolution
8. Providing in-person feedback
9. Assessing student outcomes
10. Teaching people to write technical documentation
11. Motivating students to think critically
12. Motivating active participation
13. Coaching others to use the design process
14. Working with students of diverse backgrounds

2.2.2 Weekly Survey

The development of the weekly survey consisted of two sections: mandatory and non-mandatory. The mandatory section included Likert-scale questions ranging from 1 to 100, assessing the TA's enthusiasm, stress levels, and workload. These questions provided quantitative data on key aspects of the TA's experience throughout the program. By incorporating these mandatory questions, the survey aimed to establish a clear understanding of how these factors fluctuated on a weekly basis, allowing for the identification of patterns and trends over time for individuals or the group. This quantitative data provides valuable insights into the dynamics of the TA's experience within the service-learning program, facilitating a deeper understanding of their engagement, accomplishments, and potential areas for support or improvement. In addition to the mandatory questions, the non-mandatory section aimed to delve deeper into the individual TA's experience by including an option for people to share anecdotal experiences from the last week, shown in Table 2.

Table 2. Weekly TA Survey Optional Open-Response Questions
1. Over the last week to what extent were you able to gain clarity on any questions you had from another TA besides the head TA? 2. Please describe any frustrating experiences you had (if any) as an EPICS TA last week: 3. Please describe any challenges you were not able to overcome (if any) as an EPICS TA last week. 4. Please describe any gratifying experiences you had (if any) as an EPICS TA last week. 5. Please describe any personal growth you felt (if any) as an EPICS TA last week. 6. Is there anything else affecting your experiences last week, or any other information you would like to share? 7. How was your work as an EPICS TA (if at all) affected by any of your advisors last week? 8. Given the tasks that fulfilled this week as a TA, can you suggest anywhere (training, meeting, reminders, activities.) that would have better guided your experience for a specific task, and when that would've been helpful?

4. Proposed Framework for Assessing Service-Learning GTA Experience

The current system of GTA training and regular support through meetings and resources (Figure 1) may vary slightly each semester depending on the TA's perceived needs, as well as from previous experience of the others with regular, direct influence as they manage up and down (Figure *2*). We draw inspiration from existing select User Experience (UX) studies and those centering the GTA experience from different perspectives (Table 3) to propose a method of reporting outcomes for the TA experience in this context (Table 4.).

Table 3. Studies for Inspiration for Developing a Service-Learning TA Experience Framework

Study Type	*Basic Concepts or Categories used to Discuss Experiences*
UX Frameworks	· Existing conditions, capacity building strategies, specific outcomes [23] · Goal types and achievement emotional results [24,25] · Value, brand, needs, technology [26]

Conceptual TA Frameworks	· Contextual variables (institution + TA characteristics), moderating variables, outcomes (TA's cognition and teaching, undergrad skills and interest) [8] · Orientation (professional) and identity (personal) [9]	
TA Assessments	· Impact of support [10] · Capacities (competency, potential)[16,27,28] · Training[14,15] · Experience [11]	· Needs [11] · Feedback [12] · Self-efficacy [15,16] · Challenges, motivations, perceived benefits [17–19]

Most of the related literature examines either the TA's experience or skills, or uses a framework to assess TA development pertaining specifically to *teaching* experiences. We aim to emphasize the capacity to gain broader transferable professional skillets that may be unique to the service-learning TA experience, in addition to teaching-related ones, such as conflict resolution and coaching the design process. A similar study has assessed the potential for project-based learning on graduate students' employment skills [29].

The framework proposed in this service-learning context is enhanced by considering the UX principles to include tools as part of the overall system affecting the experience, such as online communication and learning software. The 4 framework components (FC's) – existing conditions, regular support strategies, intentional interventions, and individual TA capacities – were chosen to distinguish system components affecting experiences and ultimately provide a generalizable foundation for assessing interactions.

Table 4. Proposed evaluation methods and outcomes to report GTA Experiences

Framework Components	Examples in this Service-Learning Context	Artifacts to Evaluate	Predicted Style(s) of Outcome for Reporting TA Experience
1. Existing Conditions	· Infrastructure · Personnel	· Author observations · Anecdotes	· System of interaction (Figure 1) · Facilitating and challenging components
2. Regular Support Strategies	· Semesterly training · Weekly meetings · Mentoring, feedback	· Anecdotes · Training, meeting content	· Factors facilitating organization · Factors of extrinsic motivation · Suggested target areas for improvement

3. Intentional Interventions	· Workshops, activities designed to address concerns · Socials	· Anecdotes · Follow-up interviews	· Experience, identity modifiers · Interactive management strategies
4. Individual TA Capacities	· TA personal, professional skillsets, · Background · Perceived role efficacy	· Self-assessments · Anecdotes · Follow-up interviews	· Determinants and relationship between enthusiasm, stress, workload · Factors of intrinsic motivation, agency, and self-efficacy

4.1 Preliminary Outcomes and Examples of Framework Utilization

Because this is the first assessment of GTA's experiences in a service-learning context to the best of the authors' knowledge, we aim to use this pilot as an opportunity to present a framework that will be useful as a tool in this context, as well as a method of identifying and reporting TA experiences in general.

To illustrate the method of reporting outcomes for each of the 4 framework components, we include several example outcomes. From insights gathered from weekly challenges (Table 2), several GTA's reported system-related issues (FC 1) including low lesson attendances and challenges with the online learning software, which were respectively demotivating and interrupting to the workflow. Community partner interactions and the prospect of collaborative delivery are often noted as gratifying experiences, along with proactive, engaged students. When queried about improving weekly support (FC 2), GTA's often report feeling prepared due to the weekly meetings. From a preliminary review of the weekly anecdotal responses, major areas of internal TA motivation revolve around their ability to guide undergraduates towards tangible progress such as facilitating design work and proactive leadership. As an example of an outcome of "*factors of self-efficacy*" (FC 4), multiple TA's report gratitude towards agency in the classroom due to trust from the instructor, while the converse is reported as demotivating. Early results from the pre- and post- semesterly surveys for reporting self-confidence in a list of skillsets (Table 1) suggest teaching-related gains in categories such as motivating students to think critically and assessment; however there is a potential decrease in confidence in professional and personal skills including working on problem-finding and working with students of diverse backgrounds. These

results require further investigation, with planned follow-up interviews to better identify factors contributing to changes in confidence. The proposed framework is expected to evolve as more data is analyzed, with additional forms of outcome to illustrate the system of the GTA Experience.

4.2 Generalizability and Limitations

Though the framework components were developed for this specific context and style of classes, we expect that the categories will be generalizable to other teaching assistant programs, while differing in the specific examples. As the surveys used are not infallible, we will also suggest information that would have been helpful to collect to better assess individuals' experience and systematize consistent data gathering and support techniques. It is important to note that though frustrating experiences and challenges were widely noted, certain frustrations may have been knowingly withheld to spare feelings of peers and support staff. Though the outlined framework components were chosen to represent this specific service-learning experiences, we expect that they will also be relevant for gauging GTA experiences broadly, with relevant overlapping similarities between anecdotes and survey methods.

5. Summary

This research paper underscores the need to shift the paradigm in service-learning program evaluation, placing GTA's at the center and acknowledging their role as both educators and learners. By understanding GTA's' challenges and opportunities, institutions can develop frameworks and strategies to support their professional growth and effectiveness as educators. Ultimately, this study advocates for a user-centric approach in academic settings, emphasizing the significance of recognizing and addressing GTA's' unique needs within service-learning programs.

Our work sheds light on the often-overlooked role of GTA's in service-learning programs, particularly in design contexts. Despite being integral to the success of such programs, GTA's' experiences have not been systematically evaluated. This ongoing Work In Progress study aims to fill this gap by employing a mixed-method approach to comprehensively assess GTA's' experiences within service-learning programs, emphasizing the importance of recognizing and addressing their unique needs. The research, conducted at Purdue University, involves thirteen GTA's from diverse engineering disciplines participating in the EPICS program.

The methodology integrated into this project ultimately intends to include pre- and post-assessment surveys, weekly intercept surveys, and ethnographic observations of 13 GTA's in the EPICS program at Purdue. Upon further investigation of the data, follow-up stakeholder interviews are planned. The study aims to uncover GTA's' motivations, challenges, and stresses, to identify areas for program improvement, and to advance GTA's' personal and professional development by highlighting the complex network of factors influencing GTA's' experiences, including interpersonal relationships, infrastructure, and support systems. A framework is then proposed aimed at continuously assessing and reporting GTA's' experiences, to promote a more inclusive, empathetic, and effective service-learning ecosystem that benefits all participants.

References

1. Oakes WC, Duffy JJ, Jacobius T, et al. SERVICE-LEARNING IN ENGINEERING. *32nd ASEE/IEEE Frontiers in Education Conference*. Published online 2002:2-7.
2. Salam M, Awang Iskandar DN, Ibrahim DHA, Farooq MS. Service learning in higher education: a systematic literature review. *Asia Pacific Education Review*. 2019;20(4):573-593. doi:10.1007/s12564-019-09580-6
3. Gayle Andrews P, Leonard SY. Reflect, analyze, act, repeat: Creating critical consciousness through critical service-learning at a professional development school. *Educ Sci (Basel)*. 2018;8(3). doi:10.3390/educsci8030148
4. Harkavy I, Hartley M. Pursuing Franklin's Dream: Philosophical and Historical Roots of Service-Learning. *Am J Community Psychol*. 2010;46(3):418-427. doi:10.1007/s10464-010-9341-x
5. Brown E, Pelco L, Hise S. Providing Peer Mentors through a Service-Learning Teaching Assistants Program. *CompactOrg*. 2013;I(1):1-16. http://www.compact.org/wp-content/uploads/2013/03/C2C-VCU-FINAL.pdf
6. Astin A, Vogelgesang L, Ikeda E, Yee J. How service learning affects students. 2000;14(10):i-104. http://digitalcommons.unomaha.edu/slcehighered/144/
7. Piper B, DeYoung M, Lamsam GD. Student perceptions of a service-learning experience. *Am J Pharm Educ*. 2000;64(2):153-165.
8. Reeves TD, Marbach-Ad G, Miller KR, et al. A conceptual framework for graduate teaching assistant professional development evaluation and research. *CBE Life Sci Educ*. 2016;15(2):1-9. doi:10.1187/cbe.15-10-0225

9. Volkmann MJ, Zgagacz M. Learning to teach physics through inquiry: The lived experience of a graduate teaching assistant. *J Res Sci Teach*. 2004;41(6):584-602. doi:10.1002/tea.20017
10. Haque A, Meadows KN. Impact of the Lead TA Program on the Perceived Disciplinary Instructional Competence of Graduate Teaching Assistants. *The Canadian Journal for the Scholarship of Teaching and Learning.* 2020;11(2). doi:10.5206/cjsotl-rcacea.2020.2.11103
11. Thomas K, Worthen. Graduate Teaching Assistant Experience. Published online 1992.
12. Parker MA, Ashe D, Boersma J, Hicks R, Bennett V. Good Teaching Starts Here: Applied Learning at the Graduate Teaching Assistant Institute. *Canadian Journal of Higher Education*. 2015;45(3):84-110. doi:10.47678/cjhe.v45i3.187546
13. Korpan C. From Teaching Assistant Training (TA) to Workplace Learning. *Collected Essays on Learning and Teaching*. 2014;7(2):149. doi:10.22329/celt.v7i2.4002
14. Young SL, Bippus AM. Assessment of Graduate Teaching Assistant (GTA) Training: A Case Study of a Training Program and Its Impact on GTAs. *Communication Teacher*. 2008;22(4):116-129. doi:10.1080/17404620802382680
15. Prieto LR, Altmaier EM. The relationship of prior training and previous teaching experience to self-efficacy among graduate teaching assistants. *Res High Educ*. 1994;35(4):481-497. doi:10.1007/BF02496384
16. Chiu PHP, Corrigan P, Hui SKF. A study of graduate teaching assistants' self-efficacy in teaching: Fits and starts in the first triennium of teaching. *Cogent Education*. 2019;6(1). doi:10.1080/2331186X.2019.1579964
17. Wheeler LB, Chiu JL, Maeng JL, Bell RL. An exploratory study of teaching assistants' motivation for inquiry-based teaching in an undergraduate laboratory context. *Chemistry Education Research and Practice*. 2019;20(1):53-67. doi:10.1039/c8rp00157j
18. Nasser-Abu Alhija F, Fresko B. Graduate teaching assistants: motives, difficulties and professional interactions and their relationship to perceived benefits. *Higher Education Research and Development*. 2020;39(3):546-560. doi:10.1080/07294360.2019.1681374
19. Nasser-Abu Alhija F, Fresko B. Challenges of being a graduate teaching assistant. *Higher Education Research and Development.* 2021;40(6):1220-1235. doi:10.1080/07294360.2020.1806790
20. Heffernan K. SERVICE-LEARNING IN HIGHER EDUCATION. :2-8.
21. Arellano I, Jones SJ. Exploration of University Faculty Perceptions and Experiences of Service-Learning as Engaged Scholarship of Teaching and Learning. *Journal of the Scholarship of Teaching and Learning*. 2018;18(4):111-129. doi:10.14434/josotl.v18i4.23178

22. Hollis SA, January N, Kerlinger F, Lee HB, Holt NY. Capturing the Experience : Transforming Community Service into Service Learning Author (s): Shirley A . Hollis Published by : American Sociological Association Stable URL : https://www.jstor.org/stable/3211383 REFERENCES Linked references are available. 2002;30(2):200—213.
23. MacDonald CM, Sosebee J, Srp A. A Framework for Assessing Organizational User Experience (UX) Capacity. *Int J Hum Comput Interact*. 2022;38(11):1064-1080. doi:10.1080/10447318.2021.1979811
24. Hassenzahl M, Tractinsky N. User experience - A research agenda. *Behaviour and Information Technology*. 2006;25(2):91-97. doi:10.1080/01449290500330331
25. Pucillo F, Cascini G. A framework for user experience, needs and affordances. *Des Stud.* 2014;35(2):160-179. doi:10.1016/j.destud.2013.10.001
26. Zarour M, Alharbi M. User experience framework that combines aspects, dimensions, and measurement methods. *Cogent Eng*. 2017;4(1). doi:10.1080/23311916.2017.1421006
27. Korpan C, Le-May Sheffield S, Verwoord R. Teaching Assistant Competencies in Canada: Building a Framework for Practice Together. *Collected Essays on Learning and Teaching.* 2015;8:219. doi:10.22329/celt.v8i0.4246
28. Fairbrother H. Creating space: Maximising the potential of the Graduate Teaching Assistant role. *Teaching in Higher Education*. 2012;17(3):353-358. doi:10.1080/13562517.2012.678601
29. Jollands M, Jolly L, Molyneaux T. Project-based learning as a contributing factor to graduates' work readiness. *European Journal of Engineering Education*. 2012;37(2):143-154. doi:10.1080/03043797.2012.665848