

Enhancing Engineering Education through Student-Led Leadership Development

Elika Shams, University of Connecticut

Elika Shams is a Ph.D. student in Biomedical Engineering at the University of Connecticut, where she studies the molecular mechanisms of rare genetic diseases using computational modeling and molecular dynamics simulations in Dr. Anna Tarakanova's lab. Her research focuses on elastin gene mutations and their effects on extracellular matrix proteins. She earned her Master's degree in Biotechnology from the University of Tehran and previously worked as a research assistant at Biotechnology Pioneers, contributing to bioink development for soft tissue bioprinting. Beyond research, Elika is deeply involved in leadership and community building. She has served as President of the John Lof Leadership Academy (JLLA) since last summer and has also been President of the Iranian Cultural Organization at UConn since 2024. Through these roles, she has strengthened her passion for collaboration, mentorship, and inclusive leadership. Outside of academics, Elika is a runner and hiker who loves exploring trails, traveling, and discovering new places through running.

Tingkai Li, University of Connecticut

Tingkai Li is a Ph.D. candidate at the University of Connecticut School of Mechanical, Aerospace, and Manufacturing Engineering. Tingkai serves as the Social Media Director for the John Lof Leadership Academy under UConn College of Engineering during the 2025-2026 academic year. Tingkai received his B.S. in Mechanical Engineering, with a minor in Energy Systems, summa cum laude, from Iowa State University.

Maxwell Bartlett, University of Connecticut

Maxwell Bartlett is a Ph.D. student in Mechanical Engineering at the University of Connecticut, where he studies transport phenomena in architected porous media in Dr. Wilson K.S. Chiu's lab. His research focuses on the relationship between structure and transport behavior in triply periodic minimal surface (TPMS) structures, with an emphasis on tortuosity and thermal transport. He received his B.S. in Mechanical Engineering from the University of Connecticut in 2022. Beyond his research, he is actively involved in leadership development through the John Lof Leadership Academy, where he serves on the E-board as the finance director. Outside of academics, he enjoys skiing, hiking, and traveling.

Miss Aayushi Verma, University of Connecticut

Aayushi is a second-year Ph.D. student in Computer Science at the University of Connecticut, where her research explores the intersection of computer vision and AI security. Under the mentorship of her advisor, her current work focuses on investigating vulnerabilities in machine learning systems used in voting infrastructure, and developing technical strategies to make these systems more secure, transparent, and resilient. Now in her second year of JLLA, Aayushi is serving as co-Finance Director on JLLA's executive board, and is excited about connecting JLLA's mission to graduate student needs across engineering. The leadership skills she gained through JLLA have also inspired her involvement in her department's GradLife Committee, where she is working to build a stronger, more connected community for computer science graduate students.

Aayushi's academic interests lie in developing rigorous, usable, and ethical AI systems. Her long-term goal is to become an industrial research scientist who not only contributes to impactful systems, but also builds and leads diverse, forward-thinking research teams. She views leadership as the ability to act with intention, communicate with clarity, and build resilience in both ideas and people.

She believes JLLA has been instrumental in helping her grow into a leader who listens deeply, navigates conflict respectfully, and drives positive change through collaboration. Her advice to aspiring graduate students: seek out communities like JLLA that challenge you to lead with purpose and help you grow beyond the technical. Through her work with JLLA, Aayushi hopes to carry forward Dr. John Lof's legacy of excellence, innovation, and service.

Alireza Miraliakbar, University of Connecticut

Alireza Miraliakbar is a Ph.D. student in the Department of Chemical and Biomolecular Engineering at the University of Connecticut, where he focuses on process optimization and hybrid modeling of complex chemical systems. He earned both his bachelor's and master's degrees in chemical engineering from the University of Tehran, where his academic foundation in systems engineering began to take shape. Alireza also serves as the Public Relations Director at the John Lof Leadership Academy (JLLA) at UConn College of Engineering for 2025-2026 academic year.

Kaitlyn G Mahoney, University of Connecticut

Kaitlyn Mahoney is a second-year Ph.D. student in Environmental Engineering at the University of Connecticut. As Co-Public Relations Director of the John Lof Leadership Academy (JLLA), she plays an active role in shaping the organization's communication strategy, coordinating member engagement, and supporting the student-led workshop model described in this paper. Beyond JLLA, Kaitlyn holds leadership roles in the Student Association of Graduate Engineers (SAGE) and brings experience in coaching and mentoring collegiate athletes. Her doctoral research, advised by Dr. Abi Lawal, applies computational modeling to urban air quality challenges.

Mr. Yinyu Wang, University of Connecticut

Yinyu Wang is a 3rd year PhD student majoring in Materials Science and Engineering. His research is about fuel cells and hydrogen energy. Yinyu Wang is also involved in student leadership training by participating in the John Lof Leadership Academy in the University of Connecticut.

Mohamadamin Rajabinezhad, University of Connecticut

Mohamadamin Rajabinezhad is a Ph.D. student in the Department of Electrical and Computer Engineering at the University of Connecticut. He serves as the Activities Director for the John Lof Leadership Academy (JLLA) under UConn College of Engineering during the 2025–2026 academic year. Mohamadamin received his M.S. in Electrical Engineering from Iran University of Science and Technology. His academic and research interests focus on control systems, smart grids, and resilient cyber-physical systems.

Oluwaseun Moses Akinola, University of Connecticut

Oluwaseun Akinola is a Ph.D. student in the Environmental Engineering Department, University of Connecticut, where his research investigates the impacts of sector-specific emission transitions on ozone formation dynamics and particulate matter burdens under changing climatic conditions. His work integrates atmospheric chemistry modeling and air quality analysis to better understand how evolving emission profiles and temperature variability influence urban air pollution regimes. He currently serves as the Parliamentarian in the John Lof Leadership Academy within the University of Connecticut College of Engineering for the 2025–2026 academic year. Oluwaseun holds a bachelor's degree in Industrial Chemistry from the University of Ilorin, Nigeria, and a master's degree in Analytical Chemistry from the University of Lagos, Nigeria.

Aida Ghiaei, University of Connecticut

Enhancing Engineering Education through Student-Led Leadership Development: A Work-In-Progress Practice Paper

Abstract

Developing effective leadership in engineering education requires frameworks that foster collaboration among students, faculty, and administrators. Current leadership educations fall in a traditional “teaching-learning” manner. However, such a model is not suitable for graduate students. Here, we propose an interactive learning model of “by us, for us” that promotes self-learning and teamwork, enabling engineering graduate students to actively learn and practice leadership. The John Lof Leadership Academy (JLLA) was established in 2018, engaging members with designing and conducting workshops themed around future leadership challenges, such as inclusive leadership and emotional intelligence. Members also sharpen their skills through committees and community outreach, enhancing their practical leadership experiences. The program’s effectiveness is evaluated through member feedback, revealing high rates of improvement in leadership and communication skills. JLLA illustrates how student-led initiatives can enrich technical education by promoting collaboration and mentorship, which aligns with the ASEE LEAD strategic initiatives in inform and explore.

Introduction

Leadership education has gained considerable attention in the past decade within engineering education societies. The importance of teaching professional skills such as communication, decision-making under uncertainty, teamwork, etc., in industrial and academic settings has led institutions and companies to put significant efforts into leadership education [1]. Generally, the efforts in designing programs regarding leadership training can be classified into two themes: (1) Faculty-led, (2) Student-led models. The faculty-led model follows the traditional training where students are enrolled in a curricular program and gain credits towards their certificate or degree. This model is abundantly used in US, Europe, and Canada [2]. On the other hand, the student-led initiatives let students take the lead over their learning experience and direct it according to their needs. [3, 4].

Existing leadership education models differ for undergraduate and graduate student bodies, with multiple institutions across the nation utilizing more faculty-led and curricular-based model on undergraduate students [1]. This model shows limitations on graduate students due to differences in age, experience, and perceptions in leadership [5]. This difference is critical because graduate students come from wider and more diverse backgrounds, with experiences from both academia and industry. To address this, we established John Lof Leadership Academy (JLLA) at University of Connecticut (UConn) [6] based on a student-led model, which we argue is better suited to these unique needs. Grounded in a “by us, for us” philosophy [7] variant of transformational leadership [8], our approach empowers members to collaboratively design their own leadership education

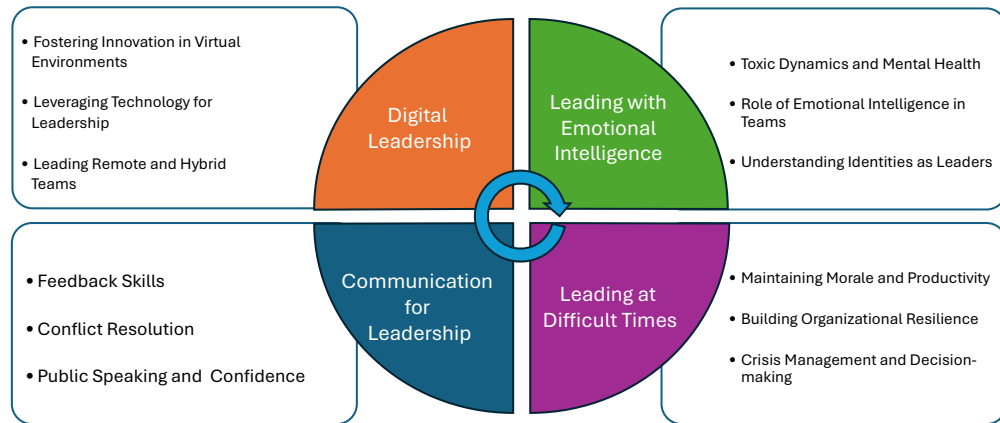


Figure 1: Themes and topics of workshops

through hands-on activities, workshops and interactive learning. JLLA's mission is to develop future leaders in engineering and provides members with opportunities to grow beyond traditional engineering roles and pursue leadership in academia, industry, and other professional contexts.

Organization of Leadership in Practice: A member-selected executive board (E-board), with various responsibilities, manages and monitors the organization. JLLA fosters member-engaged leadership education by designing activities throughout each school semester such as (1) member-only leadership workshops, centering on real-world leadership challenges and topics that align with contemporary trends (i.e. Digital Leadership, emotional intelligence) shown in Figure 1 ; (2) leadership-focused events open to all students on topics such as engineering leadership, entrepreneurship, and academic writing in collaboration with College of Engineering, external partners, and other graduate student organizations; (3) five member-led committees (outreach, volunteering, event planning, social media, and representation) enabling structured involvement with UConn at large.

From 2018 to present, JLLA has inducted 130 members representing all seven engineering departments within the College of Engineering, with the largest representation from Civil and Environmental Engineering (the distribution of membership from all departments is summarized in Figure 2) . During these 8 years, the organization has successfully organized 46 workshops covering a variety of topics in leadership. It's worth noting that 77% of new members had no previous leadership experience.

Application Process: The E-board interviews applicants, and selects for demonstrating their interest in personal growth and interpersonal skills, reflection on previous leadership experiences if applicable, and willingness to actively participate in the organization. Applicants are admitted annually for a two-year tenure in the academy, and are restricted to graduate engineering students. The two-year tenure allows senior members to transfer institutional knowledge to, and act as a mentor for junior members.

This work-in-progress paper is intended to report on the data gathered from graduate student members of JLLA at UConn. The data gathered are from multiple complementary sources,

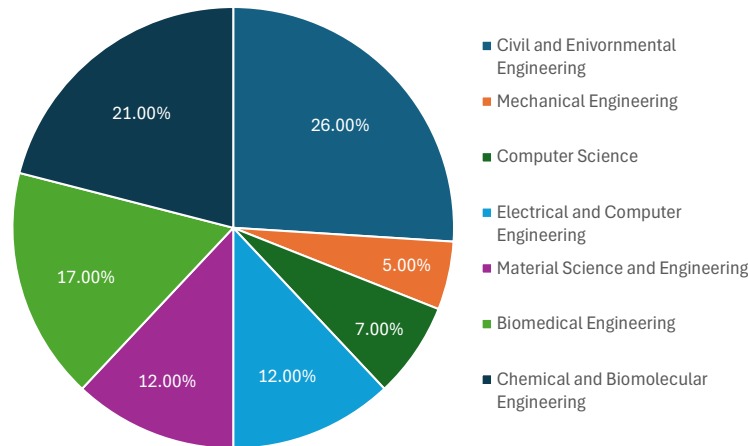


Figure 2: Members departments from 2018 to 2026

including entry and exit surveys, participation records, and post-workshop reflective journals. These assessments are designed to assess the effectiveness of the organization's "by us, for us" philosophy, which cultivates leadership through student-led workshops, committee activities, and broader community engagement initiatives. The analysis primarily focuses on continuous evaluation and self-reported growth in key domains such as communication, teamwork, and inclusive leadership. Detailed examples of member progress and engagement trends are included in the Results section.

Methodology for analysis

Quantifying Progress: Program effectiveness and member development are evaluated using multiple complementary data sources designed to capture both participation and perceived leadership growth. These measures emphasize formative assessment and reflection, consistent with the program's design. We adopt a pragmatist epistemological stance, which prioritizes understanding of program outcomes over theoretical abstraction. As student leaders within this organization, we approach this evaluation with knowledge of the program's goals and culture while maintaining commitment to honest assessment of both strengths and areas for growth.

Data Sources: The data used in the Results and Discussion sections is obtained through member surveys, workshop reflection artifacts, make-up activities, and participation records. Member evaluation consists of two primary components: continuous, in-workshop engagement through interactive activities, and post-workshop reflection through structured journal prompts. In workshops, activity groups create interactive exercises that engage all members in applying leadership concepts through role-playing, case studies, simulations, and structured problem-solving. Members complete a reflective journal prompt developed by the workshop planning team following each workshop. Journal prompts are designed to assess members' understanding of key workshop concepts (e.g., "What strategies would you implement if you faced a crisis management situation?") and encourage connection to personal experience (e.g., "In what ways have your personal background or life experiences influenced how you show up as a leader today?"). Make-up activities consist of curated multimedia resources, accompanied by

guided reflection questions ensuring access to program content. Survey instruments capture different perceptions of leadership development and participant backgrounds. These are administered to new members upon entry and to current as well as former members to assess perceived skill development.

Qualitative Analysis: The responses of the open-ended surveys and the reflective journal prompts were analyzed using pattern identification. These patterns emerge from the survey data rather than from predetermined categories made by the E-Board. The E-Board familiarized themselves with the data, found candidate patterns, and refined these patterns through group discussion until consensus was reached. Some of these patterns are identified in the Results section. To ensure trustworthiness the data includes rich, direct quotations from participants that grounds our interpretations in members' own words. The E-Board acknowledges that as student leaders in JLLA, our positions can shape our analysis. However, we view this insider perspective as enabling an understanding of member experiences while recognizing the importance of transparent reporting.

Results

In a member reflection questionnaire, current and alumni members were asked: **“What leadership skills have you acquired or strengthened through the workshops, and how have you applied them outside the organization in your career?”**. Respondents described perceived development across multiple competencies, with the most frequently cited areas including collaboration and teamwork, communication, equity and inclusion, problem solving and critical thinking, public speaking, conflict management, and presentation skills. Participants also emphasized the transfer of these skills to professional and academic settings beyond JLLA. For example, one respondent noted that effective communication and rapid problem-solving were essential in a work environment requiring frequent communication beyond their research group (Respondent 2). Another respondent highlighted that learning to work in teams—despite initial discomfort—supported perspective-taking and strengthened listening skills, with direct relevance to their responsibilities as a teaching assistant and instructor (Respondent 4). Respondents also described increased empathy and active listening (Respondent 7) and improved conflict-resolution abilities in diverse workplace contexts (Respondent 9). Finally, one respondent highlighted the value of role-play activities for practicing realistic responses, describing the workshops as a structured space to reflect on and refine approaches they plan to apply in research, teaching, and other professional environments (Respondent 11). In addition to the open-ended reflective question, respondents were asked to select the top 3 skills they improved the most during their time in JLLA. The predefined choices include: communication, critical thinking, problem solving, collaboration/teamwork, and equity/inclusion. They were allowed to input answers beyond the five preset choices. The response statistics are summarized in Fig. 3.

Members were also asked to reflect on their experiences as workshop organizers: **“As an organizer of a workshop, what did you learn, and what challenges did you overcome?”**. Selected responses are summarized in Table 1. Respondents specifically emphasized that organizing workshops provided early practice in leading peer teams, adapting messaging for participants with varied backgrounds, and navigating real constraints (e.g., planning, delegation, and stakeholder coordination). In addition, workshop activities frequently used interactive,

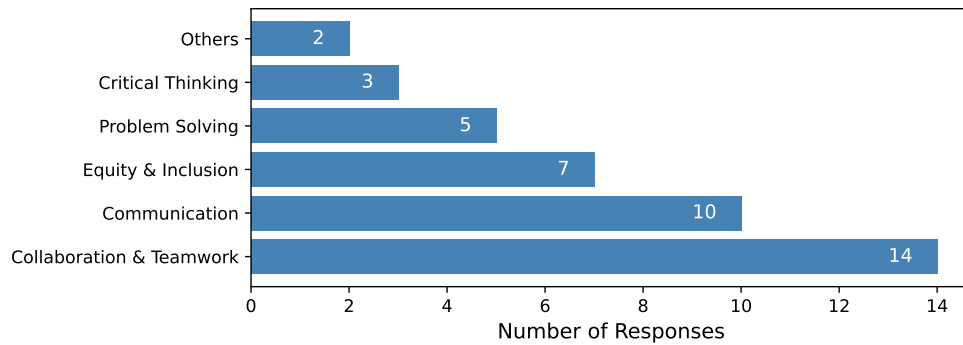


Figure 3: Statistics of response for the top skills improved.

role-based scenarios, giving members repeated opportunities to rehearse leadership responses in realistic situations and reflect on what effective leadership looks like in practice.

Table 1: Answers from respondents about what they have learned and what challenges they encountered during their time in the organization

What they have learned?	What were the challenges?
• Set clear objectives and circle back to them • Move forward without being perfectionistic • Collaborate under different leadership styles • Balance when to push and when to hold back • Network with people from various backgrounds • Set a reasonable and attainable schedule	• Find speaker for workshop • Get people engaged in the team • Work in a large group • Achieve consensus among team members • Motivate team members to complete tasks • Lack of engagement and encouragement • Ensure equitable distribution of workload

Conclusion

Over its eight years of activity, JLLA has made a meaningful impact by empowering members to develop leadership, interpersonal, problem-solving, communication, and creative thinking skills. Through its “by us, for us” leadership model, members are motivated to create and sustain initiatives that engage the broader College of Engineering and UConn communities. These efforts demonstrate a sustainable, student-led approach to leadership development that remains responsive to member input while integrated within the academic ecosystem. The model promotes shared ownership, proactive engagement, and continuity across cohorts. Its structure aligns with the ASEE LEAD IDEA strategic plan by elevating the visibility of engineering leadership, leveraging institutional expertise, guiding program direction through member-driven decision-making, and supporting continuous improvement through reflection and feedback. Looking ahead, the organization aims to establish an active alumni network to sustain long-term engagement, mentorship, and collaboration between alumni and current members. Additionally, plans to expand membership and community impact will require more robust, data-driven

assessment methods to systematically evaluate outcomes and support evidence-based growth. Collectively, this work offers a replicable framework for empowering graduate engineers as leaders within and beyond the university.

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