One Seminar, Six Universities: A Shared Approach to Launching Learning Assistant Programs Across Computing Courses

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Abstract

This paper describes the design and implementation of the evidence-based Learning Assistant (LA) model across computing courses at six universities representing varied institutional contexts, including small private, rural regional, medium and large public institutions across the eastern and western United States. The initiative engaged 27 computer science students as LAs over four semesters (Fall 2024-Fall 2025) to facilitate active learning in 17 courses enrolling a total of 2,732 students. These courses included Data Structures, Human-Computer Interaction, and other key computing courses identified as critical to student retention and success. The overarching goal was to expand access to student-centered learning and build sustainable institutional capacity for peer-supported instruction.

Because most partner institutions were initiating LA programs for the first time, the project adopted a shared implementation structure: a centralized, online synchronous LA pedagogy seminar coupled with locally adapted faculty-LA collaborations. This approach attempted to reduce barriers typically associated with launching new programs while allowing each institution to refine the model to fit local contexts.

Assessment of implementation draws on faculty interviews (n=12), LA reflections (n=80 from 17 unique LAs) and student surveys (n=958) to examine how faculty and LAs experience and enact the model. Guided by Henderson et al.'s framework for educational change, the analysis explores how individual reflection, shared vision, and emerging institutional structures interact to support sustainable adoption. Preliminary findings reveal strongest evidence within reflective teacher development, where LAs demonstrated a shift from viewing themselves as "helpers" to "facilitators" who apply pedagogical frameworks to computing-specific contexts. The paper shares lessons learned and outlines next steps for evaluating learning outcomes and institutional change processes, contributing to broader efforts to scale evidence-based instructional practices in engineering education.

1. Introduction

As the engineering workforce face unprecedented technological changes and societal challenges [1], traditional engineering education, focused primarily on technical competencies, no longer adequately prepares graduates for sustainable careers [2]. There is a critical need to cultivate professional skills such as collaboration, reflection, facilitation, and empathy [3], [4], [5] which enable engineers to navigate rapid change and engage effectively in solving socio-technical problems.

An effective way to embed these skills is through active learning classrooms [2]. Faculty in computing programs increasingly recognize the value of active learning pedagogies, yet implementation remains challenging [6]. Managing collaborative activities in large classes, obtaining real-time feedback on instructional effectiveness, and accessing ongoing pedagogical support beyond brief workshops create significant barriers to adoption. These challenges have intensified as computing enrollments continue growing [7], requiring institutions to serve larger student populations while maintaining educational quality amid faculty hiring constraints. LAs, undergraduate students prepared to facilitate collaborative learning, offer a promising approach to address these implementation barriers. LAs provide classroom support for facilitating active learning activities, offer student perspectives on learning difficulties, and create ongoing pedagogical feedback loops with faculty. However, launching new LA programs requires faculty with the capacity and pedagogical expertise to prepare LAs, engaging and effective course materials as well as institutional support, all are barriers that limit adoption at institutions without existing LA programs.

This multi-institution project addresses these barriers through a shared implementation structure: a centralized, online synchronous LA pedagogy seminar coupled with shared computing course curriculum and locally adapted faculty-LA collaborations. Based on prior work [8, 9], the project integrates learning and engagement strategies (LESs) including collaborative learning, gamification, problem-based learning, and social interactions into computing courses. Each institution launched a local LA program, embedding LAs gradually across modalities (in-person, hybrid, fully online, online live).

This paper describes implementation and preliminary indicators through faculty interviews, LA reflections, and student surveys. These measures provide early evidence of program implementation fidelity and LA professional development that support sustainable instructional change.

2. Literature Review

2.1 The LA Model

The LA Model is a near-peer instructional model originally co-developed at the University of Colorado Boulder [10], which expanded to 606 institutions [11]. It places STEM undergraduate LAs into STEM courses to help instructors implement student-centered, active learning environments and to improve the student-to-teacher ratio [12]. First-time LAs take a pedagogy seminar where LAs learn about learning theories, reflect on their experiences, and receive feedback related to their interactions with students and instructors.

LAs are focused on facilitating collaborative learning during group work [13]. In contrast to TAs, LAs don't grade or help with administrative work but strictly focus on student learning. In contrast to Undergraduate TAs (which are common in computer science departments), LAs are part of the instructional team, and they work on a weekly basis with faculty, to prepare for class, reflect on student difficulties and create effective learning strategies. Research demonstrates LA effectiveness across STEM disciplines, including improved learning outcomes, retention, and graduation rates [10, 14].

2.2 LA Training: The Pedagogy Course (LA Seminar)

The pedagogical training of the LAs is a unique element of the LA Model. Studies have shown how first time LAs ”took up the language associated with course's essential pedagogical principles” [15], shifted their disciplinary identity [16], created a community of practice that develop facilitators, and motivates towards supporting student learning in engineering departments [17]. The original curriculum of the LA Seminar was developed by CU Boulder and is often modified to the local context of the LA Program. It was designed to introduce undergraduate STEM majors to essential pedagogical principles and practical, research-based instructional strategies. It is often co-taught by STEM faculty and a STEM education researcher or practitioner. This collaboration strengthens the connection between STEM departments and LA Programs and helps STEM faculty develop their expertise in active learning strategies through their work with first time LAs.

The course includes discussions of research and active learning strategies articles, group activities, community building activities, and projects. The seminar can be divided into sections by major or LA work discipline [15] or could be multi-disciplinary [17].

2.3 Related Work: LAs in Engineering and Computing

LAs have been integrated in courses in several engineering fields including Mechanical, Civil, Environmental, Electrical and Computer engineering [18–20]. Research on LAs has established their effectiveness in these learning environments and has identified key implementation features linked to successful outcomes. However, the computing education literature includes comparatively little work on LA-supported instruction. This multi-institution project seeks to address this gap by studying how coordinated collaboration across six institutions can enable synchronized, large-scale instructional change.

Prior work has explored scalable approaches to teaching assistant (TA) training in computing; however, it largely positions faculty as the primary instructional leads and frames TAs in instructional, grading, or administrative support roles, differing from LA–based peer learning model.

2.4 Conceptual Framework for Assessing Programmatic Change

We employ Henderson et al.'s (2011) framework to examine how multi-institution LA program implementation creates conditions for pedagogical change across individual and environmental levels. This framework recognizes that sustainable change requires interventions at multiple levels - not just training individuals but also shifting institutional structures.

Figure 1 maps the project design, activities, and data collected across all four quadrants. This paper focuses on evaluating the centralized LA seminar, our primary mechanism for developing reflective practice (Quadrant II).

2.5 Centralized LA Training: The Online Live Seminar

The course was implemented using an experimental course mechanism approved by the institutional curriculum committee, allowing the instructional model and logistics to be piloted prior to formal adoption. After two semesters of implementation, the course transitioned to a permanent offering with a designated course number. The seminar was offered as synchronous online course with weekly meetings on Zoom (1 hour 50 minutes). Meeting time was selected to accommodate participants across Pacific, Central, and Eastern time zones and kept consistent to allow for easy

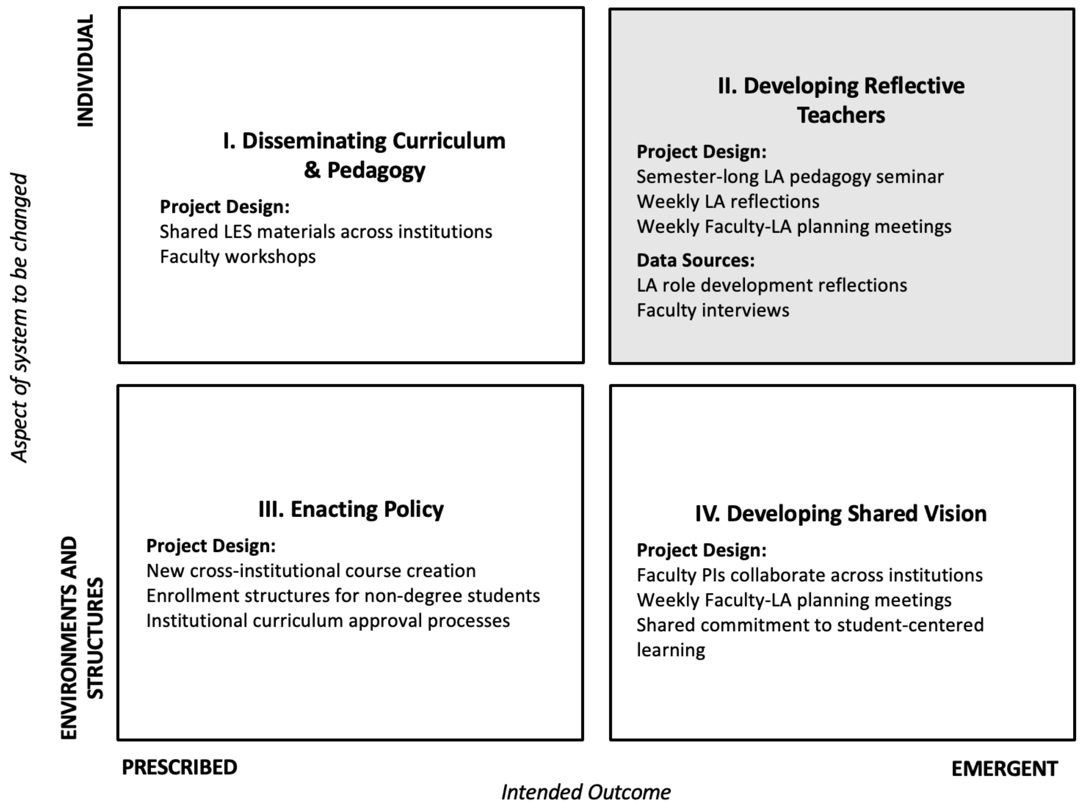

Figure 1: Project design mapped to Henderson et al.'s change framework [21]. LES, Learning and engagement strategies [9].

ongoing recruitment of LAs. To make the course affordable, it was created as a zero-credit course and application fee was sponsored by the grant.

Seminar instruction followed the academic calendar of the host institution, with flexibility built in to account for scheduled breaks and institutional closures. Students enrolled as non-degree students through the university's standard registration process; administrative coordination was required to remove enrollment holds that were not applicable to fully online participation (e.g., immunization requirements). All course meetings were conducted synchronously via Zoom.

3. Evaluation of Early Implementation

This evaluation examines early implementation of program scope, LA development, and preliminary indicators of pedagogical change with the following research questions:

1. What early indicators suggest successful implementation across institutions?
2. What motivates computing students to become LAs?
3. How do faculty and LAs conceptualize the LA facilitation role?
4. How do LAs conceptualize facilitation practices in computing-specific contexts?

Topics	Learning Goals and Skills
1. Questioning	Develop knowledge about types of questions and questioning skills
2. Discussion Techniques	Distinguish between dialogic and univocal discussions
3. Mental Models	Identify student ideas and mental models
4. Growth Mindset	Learn strategies to foster growth mindsets in students
5. Formative Assessment	Assess where students are in their understanding
6. Metacognition	Facilitate metacognitive thinking in groups
7. Bystander Awareness	Create welcoming learning environments
8. Design Thinking	Develop empathy towards others
9. Learning as Social Process	Learn to interview others to gain understanding
10. Sociocultural Theory	Consider social factors that affect learning
11. Final Project	Identify needs, reflect on LA experience, design solutions

Table 1: LA Seminar Topics and Learning Goals

3.1 Methods and Data Sources

Participants. Six universities participated in the project, representing varied institutional contexts across the eastern and western United States. Four are doctoral-granting universities (R1, R2, and Doctoral/Professional) and two are master's-level institutions (M1). All are public except one private nonprofit. Enrollment ranges from small to very large, and geographic settings span major urban, midsize city, suburban (two institutions), college town, and rural. Twenty-seven students served as LAs across these institutions over four semesters (Fall 2024–Fall 2025).

Data Collection. Multiple data sources were used to assess program implementation:

Faculty interviews (n=12) included questions about LA roles and classroom practices: ”What is an LA?” ”How do you use LAs in the classroom?” and ”Do any of these techniques encourage student participation?”.

LA reflections were submitted weekly as part of the LA seminar assignments. We analyzed reflections from the beginning and end of the semester to assess changes in role conceptualization, and reflections on specific pedagogical topics including metacognitive thinking, growth mindset, and design thinking applications.

Student surveys (n=958) assessed LA presence, interaction frequency, and participation in group activities across course modalities (in-person, hybrid, fully online, online live).

Analysis. Faculty interviews (n=12) and LA reflections (n=80 from 17 unique LAs during Fall 2024–Fall 2025) were analyzed using thematic analysis with AI aiding in initial pattern recognition and theme synthesis, but all interpretive decisions, theme selection, and illustrative case identification remained with the researchers. Student survey data were analyzed to assess program implementation and LA integration.

4. Findings

4.1 Program implementation and LA integration (RQ1)

Early indicators suggest a successful implementation across institutions. In four semesters, Fall 2024-Fall 2025, the project engaged 27 unique LAs working across 15 computing courses at six institutions. Across institutions, we were able to gradually embed LAs into courses such as Programming principles, Introduction to Human-Computer Interactions, Software Engineering, Introduction to Java Programming 1, Data Structures, Object Oriented Programming, Fundamentals of Data Science, Software Architecture, and more. Overall, LAs have worked in 52 total LA positions, with 24 positions filled by returning LAs who served multiple semesters. Student survey responses (N= 958) indicated that 51% (average over the four semesters) of students reported having LAs in their courses across modalities: 40% in-person, 24% fully online, 23% online live, and 8% hybrid. On average, 70% of students reported interacting with the LAs every class, often or sometimes, with 40% reporting interacting with the LAs every class or often.

The data indicate that LAs were present and accessible across course modalities. However, interaction frequency does not alone validate active learning adoption or instructional quality. Faculty interviews (Section 4.3.1) provided additional evidence of how LAs were viewed to support collaborative activities.

4.2 What motivates computing students to become LAs? (RQ2)

LA candidates applied to each institution's program through a centralized application asking about their motivations, allowing faculty to learn about their interests and academic background. Three main themes emerged.

Candidates expressed desire to help peers: "I would like to join...because I would like to help new students understand concepts that I also may have struggled with in the past." Many also emphasized strengthening skills, creating connections with peers in the major, and gaining experience that will help them in the future.

Beyond skill development, candidates emphasized care for peers and passion for teaching, particularly wanting to ease adjustment struggles. As one international student noted, "I understand how challenging it can be to adjust to a new academic environment." Others focused on creating supportive, inclusive environments: "I am particularly passionate about fostering a space where like-minded individuals can connect, collaborate, and share ideas."

Balancing career planning with contributing to society was highlighted throughout: "I'm looking for on the job experience because it will go good with my degree when I graduate college and am looking for a well-paying job as a Back-end Software Developer in the tech industry", and at the same time, "contributing to something bigger than myself at my institution." Students saw the LA Program as an opportunity to combine values and purpose with building professional skills and connections, developing both cognitive and affective skills.

4.3 How do faculty and LAs conceptualize the LA facilitation role? (RQ3)

Faculty perspective on LA Roles

In interviews, faculty responded that LAs serve as an extension of the instructor by walking around the classroom to facilitate student engagement and participation. They help students with hands-on activities, lab work, and exam reviews, while managing breakout rooms and guiding classroom activities. They also mentioned that LAs interact with students at their level, asking questions to facilitate learning rather than simply providing answers. They help explain simple topics and encourage reticent students to participate. During activities like Think-Pair-Share, LAs circulate to offer guidance and support. In some cases, LAs engage in co-teaching by ”repeating professors' lectures in extra sessions” and adding additional examples. They also provide valuable feedback to instructors about student difficulties, helping identify areas where students struggle. According to faculty, LAs overall increase student involvement and are particularly effective in lab settings where they can provide hands-on guidance.

How LAs' Conceptualization of Their Role Changes

LAs' weekly reflections during the LA seminar allowed an examination of how their view of their role has changed during the semester. *Initially*, LAs viewed themselves as facilitators of learning who act as student-centered guides, using inquiry and questioning to support student success rather than adopting a traditional 'teacher teaching' style.

LAs also identify as relatable peers who are ”fellow students learning alongside their peers”, emphasizing that they are "only human" and not expected to be perfect experts. Their peer status was used to build trust and create a comfortable, low-stress environment where students feel safe asking questions. LAs saw themselves as "motivators" and "supporters," particularly for shy students or those in male-dominated fields like cybersecurity and software engineering, and they emphasized the importance of proactively reaching out to students who may be hesitant to ask for help.

They viewed the role as an opportunity to develop professional skills by promoting "soft skills" such as professional interaction, collaboration, and networking alongside technical course content. LAs conceptualize their position as collaborative partners who serve as a bridge between the professor and the students, providing individualized attention that is difficult for a single instructor to manage in large classes.

By the end of the semester, LAs saw themselves become approachable peer facilitators who move away from viewing themselves as "subject matter experts" and instead identify as "knowledgeable students." They recognize that being "just a student" rather than a "trained professional" reduced student (and their own) anxiety and made them more approachable for peers who fear judgment from professors.

They report that they "learn from [students] as much as students learn from [the LA]" and that explaining the material requires a deeper level of understanding and improved communication skills. As facilitators, LAs saw their primary duty as guiding students to solve their own problems through "guiding questions" and "guiding tools" rather than providing direct answers, with success defined by witnessing "aha" moments and breakthroughs.

They distinguished themselves as feedback providers versus evaluators, focusing on providing feedback and identifying the “source of misunderstanding” rather than grading or “scoring incorrect behaviors”. LAs also viewed themselves as relatable, providing “patience, support, and efforts” to create a welcoming environment where students feel “seen, valued and understood” so that they feel comfortable taking risks and participating in class.

Lastly, LAs realized the importance of being strategic communicators who clearly articulate their specific role to students, specifically that they will not provide direct answers, to avoid confusion or mistrust.

4.4 How do LAs conceptualize facilitation practices in computing-specific contexts? (RQ4)

LAs apply growth mindset (GM), design thinking (DT), and metacognition frameworks to the technical aspects of computing by reframing failure, deconstructing complex logic, and modeling the iterative nature of software development.

Debugging and ‘Stuck’ Moments: LAs use growth mindset and metacognitive self-regulation to reframe debugging as productive rather than a source of frustration. They think about bugs as a normal step in software development: “failure is sort of welcomed because nearly 90% of programs contain bugs that require iterative refinement.” When students are overwhelmed or insist they “cannot do” a task, LAs break large coding problems into “very small steps” or “digestible chunks.” They also use metacognitive thinking to help students recognize when they are “fixated” on an unsuccessful solution and encourage them to stop and reassess rather than waste time on ineffective paths.

Algorithmic Thinking: LAs encourage students to externalize their thought processes and explore divergent solutions through questioning, asking “why this, why that?” to help students verbalize their strategies and identify the “root causes” of errors. They advocate for a “work breakdown structure” to break complex tasks into manageable subtasks before coding begins.

Imposter Syndrome: LAs reflect on whether in computer science, “imposter syndrome” is often correlated to a fixed mindset, where students ”doubt their intelligence” despite their achievements. LAs recognize the importance of empathy and breaking the hierarchy: “You should not show up as the expert... you are there as a partner to help them overcome those challenges.”

5. Discussion

5.1 Early Indicators of Pedagogical Change

Our measures, faculty perspectives, LA reflections, and student surveys, indicate an emerging pedagogical change. Evidence includes shared language about active learning and facilitation rather than direct instruction, development of LAs’ reflective practice, and structural support through centralized training, aimed at reducing barriers to starting local LA programs.

5.2 Mapping Findings to Henderson's Framework

While comprehensive assessment of change across all quadrants requires additional data (see Figure 1), we are able to identify patterns at this stage. Strongest evidence appears in Quadrant II (Developing Reflective Teachers), where LAs shifted from "helpers" to "facilitators" and applied pedagogical frameworks to computing-specific contexts. Structural changes (Quadrant III: Enacting Policy) are evident with a new cross-institutional course, 52 LA positions, and institutional approvals. Quadrant I (Disseminating Curriculum & Pedagogy) and Quadrant IV (Developing Shared Vision) will be examined in later phases of the project. Current evidence is strongest at the individual level; future work should examine how LA development interacts with institutional structures to enable program sustainability.

5.3 Limitations and Next Steps

While faculty interviews (Section 4.3) provided evidence of how LAs were viewed as supporting collaborative activities, classroom observations could assess the quality and nature of teaching enactment. LA reflections analyzed here were written as course assignments and reveal how LAs interpret their role but cannot confirm enactment of teaching practices without classroom observations or student focus groups. Data presented include early-stage formative indicators but future work is needed to triangulate with additional data including pre/post faculty surveys on pedagogical beliefs, and analysis of student learning outcomes. Implementation challenges also emerged: Logistical coordination across time zones required flexibility, some LAs began work without taking the seminar concurrently due to funding delays and recruitment timing, and administrative requirements for non-degree enrollment varied across semesters. Future implementations would benefit from deeper understanding of institutions' context and goals.

6. Conclusion

This multi-institution project demonstrates a scalable approach to implementing the LA model in computer science departments through centralized training and locally adapted integration. Early indicators suggest successful structural implementation with 27 LAs across 15 courses at six institutions, and LA professional development through the pedagogy seminar. Faculty and LAs developed shared language around facilitation-based instruction, and LAs demonstrated ability to apply pedagogical frameworks to computing-specific contexts. Future research should assess whether LA programs continue post-grant, whether faculty sustain active learning even without LA support, and whether students in LA-supported courses show improved retention and learning outcomes. This project contributes to engineering education by providing a replicable model for multi-institution collaboration and demonstrating that peer-supported instruction can be integrated across computing courses critical for student retention and persistence.

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References

[1] R. G. Hadgraft and A. Kolmos, "Emerging learning environments in engineering education," *Australasian Journal of Engineering Education*, vol. 25, no. 1, pp. 3–16, 2020.

[2] L. V. den Broeck, U. Beagon, S. Craps, K. Coppens, J. Hanssens, and G. Langie, "Learn to learn for life – how can faculty staff support the development of students' lifelong learning competencies? a systematic literature review," *European Journal of Engineering Education*, vol. 49, pp. 1488–1508, 2024. [Online]. Available: https://doi.org/10.1080/03043797.2024.2416393

[3] J. Walther, S. E. Miller, and N. W. Sochacka, "A model of empathy in engineering as a core skill, practice orientation, and professional way of being," *Journal of Engineering Education*, vol. 106, no. 1, pp. 123–148, 2017.

[4] European Society for Engineering Education (SEFI), "Drivers for lifelong learning in engineering education: SEFI position and long-term plan," European Society for Engineering Education (SEFI), Brussels, Belgium, Position Paper, Aug. 2025. [Online]. Available: https://www.sefi.be/wp-content/uploads/2025/08/Lifelong-Learning-position-paper-2025-for-online-sharing.pdf

[5] World Economic Forum, "The future of jobs report 2025," World Economic Forum, Cologny/Geneva, Switzerland, Insight Report, Jan. 2025. [Online]. Available: https://www.weforum.org/publications/the-future-of-jobs-report-2025/

[6] M. Stains, J. Harshman, M. K. Barker, S. V. Chasteen, R. Cole, S. E. DeChenne-Peters, M. K. Eagan, J. M. Esson, J. K. Knight, F. A. Laski, M. Levis-Fitzgerald, C. J. Lee, S. M. Lo, L. M. McDonnell, T. A. McKay, N. Michelotti, A. Musgrove, M. S. Palmer, K. M. Plank, T. M. Rodela, E. R. Sanders, N. G. Schimpf, P. M. Schulte, M. K. Smith, M. Stetzer, B. V. Valkenburgh, E. Vinson, L. K. Weir, P. J. Wendel, L. B. Wheeler, and A. M. Young, "Anatomy of STEM teaching in north american universities," *Science*, vol. 359, no. 6383, pp. 1468–1470, 2018.

[7] Computing Research Association, "Taulbee survey 2024," 2025, accessed: 2026-01-15. [Online]. Available: https://datavisualization.cra.org/TaulbeeSurvey/CRA_Taulbee_Survey_Report_2024.html

[8] P. Clarke, T, S. C. Allala, J. P. Sotomayor, and M. S. Ross, "Experiences of integrating learning and engagement strategies into software engineering courses," in *2020 ASEE Virtual Annual Conference*, 2020.

[9] P. J. Clarke, D. L. Davis, I. A. Buckley, G. Potvin, M. Thirunarayanan, and E. L. Jones, "Combining learning and engagement strategies in a software testing learning environment," *ACM Transactions on Computing Education (TOCE)*, vol. 22, no. 2, pp. 1–25, 2021.

[10] V. K. Otero, "Nationally scaled model for leveraging course transformation with physics teacher preparation," in *Recruiting and Educating Future Physics Teachers - Case studies and effective practices*, C. Sandifer and E. Brewe, Eds. American Physical Society, 2015.

[11] "LA alliance," 2024, retrieved on April 28, 2026. [Online]. Available: https://learningassistantalliance.org/

[12] H. Kornreich-Leshem, R. Benabentos, Z. Hazari, G. Potvin, and L. Kramer, "The cognitive and affective roles of learning assistants in science, technology, engineering, and mathematics college classrooms: An exploration of classroom experiences and students' metacognitive awareness and disciplinary identity," *Science Education*, vol. 106, no. 3, pp. 545–572, 2022.

[13] A. P. Barrasso and K. E. Spilios, "A scoping review of literature assessing the impact of the learning assistant model," *International Journal of STEM Education*, vol. 8, no. 1, p. 12, 2021.

[14] J. L. Alzen, L. Langdon, and V. K. Otero, "The learning assistant model and DFW rates in introductory physics courses," pp. 36–39, 2018.

[15] L. M. Top, S. A. Schoonraad, and V. K. Otero, "Development of pedagogical knowledge among learning assistants," *International Journal of STEM Education*, vol. 5, no. 1, p. 1, 2018.

[16] E. W. Close, J. Conn, and H. G. Close, "Becoming physics people: Development of integrated physics identity through the learning assistant experience," *Physical Review Physics Education Research*, vol. 12, no. 1, p. 010109, 2016.

[17] I. Stuopis and K. Wendell, "Work in progress: How a mixed experience learning assistant seminar functions as a community of practice," in *Proceedings of the 2022 ASEE Annual Conference & Exposition*. Minneapolis, MN: American Society for Engineering Education, Aug. 2022.

[18] V. Bracho Perez and A. C. Strong, "Exploring the effects of learning assistants on instructional team–student interactions in statics," *International Journal of Mechanical Engineering Education*, p. 030641902311663, 2023.

[19] K. Wendell, D. Matson, H. Gallegos *et al.*, "Board 53: Work in progress: Learning assistant "noticing" in undergraduate engineering science courses," in *Proceedings of the 2019 ASEE Annual Conference & Exposition*. Tampa, FL: American Society for Engineering Education, Jun. 2019, paper 32372.

[20] B. D. L. Ying Cao, Christina Smith and M. Koretsky, "Cultivating the next generation: Outcomes from a learning assistant program in engineering," in *2018 ASEE Annual Conference & Exposition*, no. 10.18260/1-2–30244. Salt Lake City, Utah: ASEE Conferences, June 2018, https://peer.asee.org/30244.

[21] C. Henderson, A. Beach, and N. Finkelstein, "Facilitating change in undergraduate STEM instructional practices: An analytic review of the literature," *Journal of Research in Science Teaching*, vol. 48, no. 8, pp. 952–984, 2011.