RICE UNIVERSITY

In-Class Learning Assistants

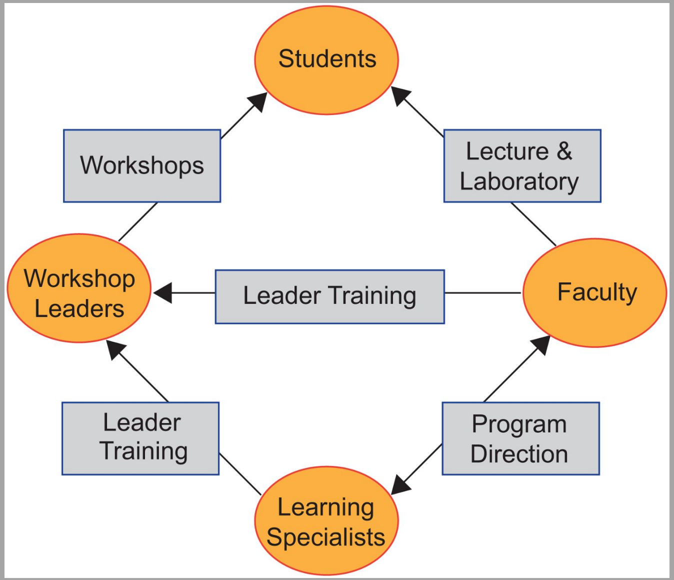
HHMI Learning Community
Spring 2025

Types of Near-peer instruction:

- Peer-led team learning
- Peer-assisted learning,
- Team-based learning,
- Peer tutoring,
- Education through student interaction,
- Peer mentoring,
- Supplemental instruction
- Learning assistants

Common elements of Near-peer instruction:

- "Students helping other students learn"
- The near-peer instructor is a student who has recently passed the course
- Interact with small groups of students during regular class time
- Compensation ranging from modest salaries or college credit to promises of meaningful recommendation letters



Theoretical Frameworks of Near-peer instruction:

- Social Constructivism:
  - "Knowledge is constructed in the mind of the learner."
  - This knowledge construction process is aided through social interactions.
- Equity:
  - Equity of outputs: the demographics/background of successful students is analogous to the demographics/background of the overall student population
  - Equity of inputs: all students are granted equal opportunity to educational resources.
    - Peer leaders attribute gains in content learning and critical thinking skills.
    - Students of different demographic backgrounds should have the opportunity to benefit from PLTL leadership roles.

"Critical Components" of Near-peer instruction:

- **Faculty involvement.** The faculty members teaching the course are closely involved with the workshops and the training of workshop leaders.
- **Integral to the course.** The workshops are an essential feature of the course.
- **Leader selection and training.** The workshop leaders are carefully selected, well-trained, and closely supervised, with attention to knowledge of the discipline and teaching/learning techniques for small groups.
- **Appropriate materials.** The workshop materials are challenging, intended to encourage active learning and to work well in collaborative learning groups.
- **Appropriate organizational arrangements.** The particulars, including the size of the group, space, time, noise level, etc., are structured to promote group activity and learning.
- **Administrative support.** Workshops are supported by the department and the institution as indicated by funding, recognition, and rewards.

Hallmarks of the Learning Assistant Program :

Three features that distinguish LAs from other near-peer instructors:

Practice:

- LAs do not provide direct answers to questions or systematically work out problems with students.
- Instead, **LAs facilitate discussion about conceptual problems** and they focus on guiding students **in their learning processes** and helping students make connections between concepts.
- **LAs are not necessarily course content experts!**

Preparation:

- LAs meet weekly with the course instructor **to discuss course content, plan for upcoming lessons, and reflect on activities from previous weeks.**
- This also serves as an opportunity for LAs to provide input on the student perspective to the instructor.

Pedagogy:

- First-time LAs attend a pedagogy-focused seminar typically staffed by a school of education faculty member.
- **The seminar is an opportunity for LAs to learn about teaching, reflect on their experiences, and get support from fellow LAs** when they face challenges with students or their working relationship with instructors.

What are the benefits of in-class learning assistants?

Satisfaction and attitudes toward science improved among students

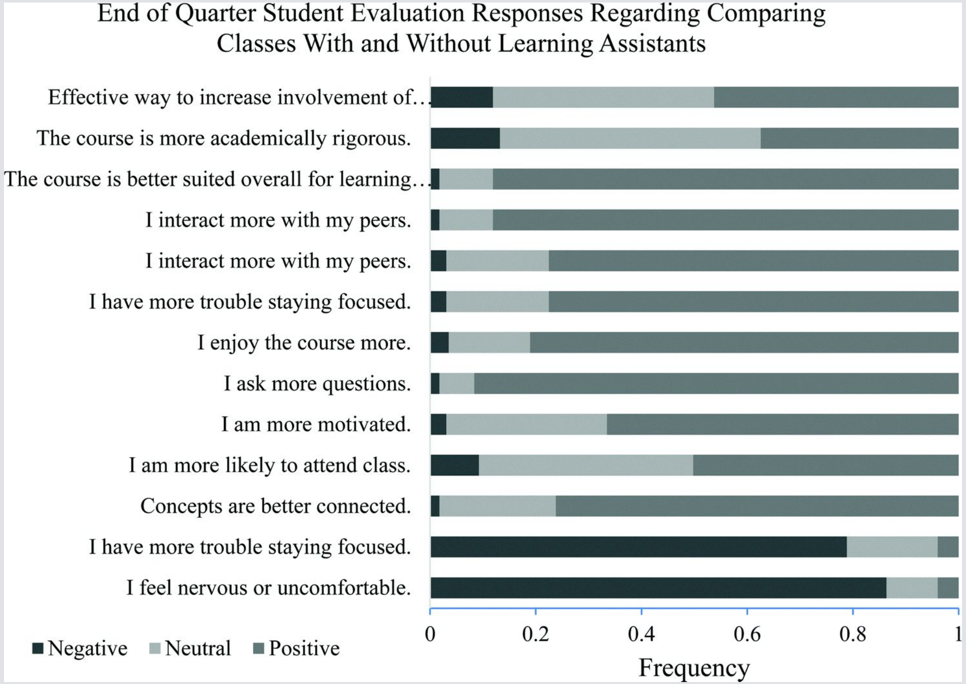
Students report that LAs made class more engaging, interactive, and personal, and helped them better understand concepts.

Intro Bio/Chem at CU-Boulder (Talbot et al., 2015):

- ~58% use their LAs during class at least once a month;
- “Close to two thirds” of that population seek help from LAs during class more than once a month.
- nearly 70% of students either “agree” or “strongly agree” that LAs helped them learn, increased their overall satisfaction with the course, and increased their satisfaction with the teaching of their course

Gen Chem at Cal-Poly SLO: (Kiste et al., 2017):

- Students agree that in this course, compared to courses without LAs,
  - they interact more with their peers (≈90%)
  - concepts are better connected (≈75%)
  - they can focus better (≈80%)
  - they ask more questions (≈90%)
  - They are more motivated (≈65%)

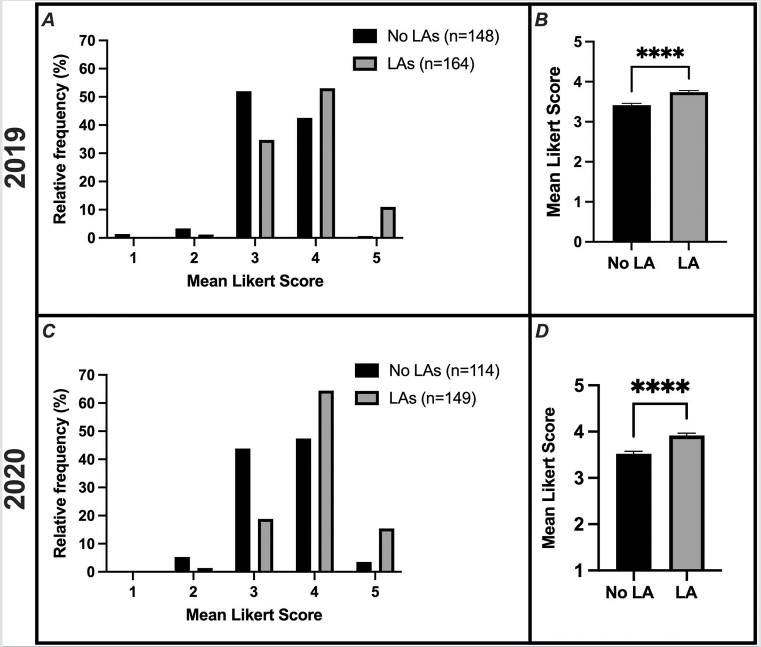


Satisfaction and attitudes toward science improved among students

Intro Bio course at Vanderbilt (Clements et al., 2022)

Used a Likert scale to measure students' sense of belonging in a single class, including items that emphasize

- student–student interactions (e.g., "Other students in this course take my ideas seriously.") and
- student–instructor interactions (e.g., "There's at least one instructor in this course I can talk to if I have a problem.")



Focus group written interview responses indicated that LAs promoted a sense of belonging in STEM by:

- decreasing feelings of isolation (in this specific course, and in STEM),
- serving as inspirational role models,
  - In both of the above, students noted the importance of LAs with whom they shared identities
- clarifying progression through the STEM educational system, and
- helping students become more engaged and confident in their STEM-related knowledge and skills.
  - Students emphasized their increased ability to ask questions.

DFW rates in STEM courses **improved**

A logistic regression analysis at CU-Boulder (Alzen, Langdon, & Otero, 2017) found that students who were enrolled in at least one LA-supported STEM gateway course (n = 3696) experienced a 4–15% lower probability of failing or withdrawing from introductory physics courses (Physics I and II) compared to students who were not enrolled in any LA-supported courses (n = 1245).

- Additionally, this study suggests that the impact on DFW rates was larger among female students, and first-generation college students.

A follow-up study (Alzen, Langdon, & Otero, 2018) explored DFW rates in Physics, Gen Chem I and II, Calc I and II, and Calc I and II for Engineers. Here, the authors report a 6% reduction in failure rate for students with LA support in STEM gateway courses, (n=23,074) compared to students who were not enrolled in any LA-supported courses (n = 8997).

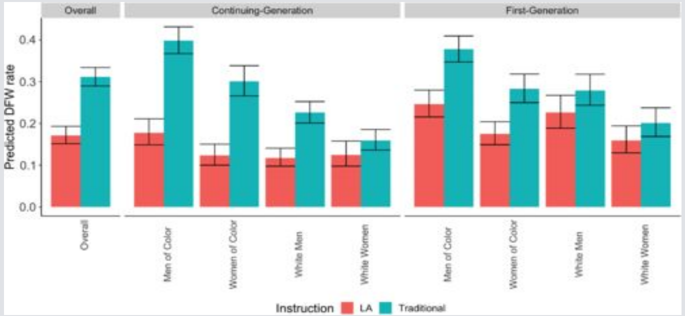
- In contrast to their previous findings, regression analysis demonstrated that exposure to LA support had a larger effect on male students than female students.

Their analysis controlled for high school GPA, standardized admissions test scores, and standardized credits at entry.

- the relationship between LA support and course failure rates is stronger for those students with lower prior achievement than those with higher prior achievement (measured by high school GPA)

A study at CSU-Chico (Van Dusen & Nissen, 2020) conducted on 2312 students in introductory physics courses from Fall 2012 to Spring 2019 demonstrated that students had lower average DFW rates in LA-supported sections.

- The student demographics with the largest changes in DFW rates were non-first generation men and women of color.
- Additionally, among first-generation students, men and women of color show the largest differences in DFW rates when comparing LA-supported and traditional sections.



Predicted DFW rates for each group of students with and without LAs, after accounting for instructor types.

Student outcomes and performance improved*

LA support improves student learning gains as measured by concept inventories and performance on higher-order assessments, and LAs have much deeper content knowledge than their peers.

- (Kohlmyer et al., 2009; Otero et al., 2006, 2010) found average normalized learning gains for LA-supported intro physics courses ranged from 44 to 66%, which is 2–3 times higher than national averages observed in traditional courses.
- (Miller et al., 2013) compared student learning gains before and after LA implementation at WVU. Before LAs, students (n = 263) averaged a normalized learning gain of 32.4% (32%), and after LAs were added (n = 462), the average increased slightly to 35.8% (47%).
- (Van Dusen, Langdon, & Otero, 2015) found that gender, race, time spent working with LAs, and instructors' experiences with LAs all had significant correlations to student outcomes at CSU Chico.
    - Male students had higher effect sizes than females, and
    - Black students had higher average effect sizes than white and Asian peers.
    - Average effect size of students who spent 16–30 min/week interacting with LAs more than doubled that of students that spent 0 min/week interacting with LAs.

(Van Dusen, White, & Roualdes, 2016) found LA support was associated with removal, and in some cases, reversal of traditional learning gaps in physics. The learning gap was significantly negative (i.e., dominant students outperformed their non-dominant peers) in courses without LAs, and in courses with LA support, the learning gap was significantly positive.

Using HLM, (Van Dusen & Nissen, 2017) found that

- LA support is meaningfully associated with improvement in overall student performance.
- However, LA support did *not* eliminate the learning gaps between dominant and non-dominant student demographics. Their model predicts:
    - Students from dominant and non-dominant genders who begin the class with the same pre-test scores will have a difference in posttest scores of 3.5%,
    - A similar gap (4.1%) emerges between students from dominant and non-dominant races/ethnicities.
    - Students with non-dominant gender and races/ethnicities will score 7.6% lower than dominant peers that score equivalently on their pre-test.

LA supported classrooms have gains over “just” collaborative learning.

At CSU Chico, (Herrera, Nissen, & Van Dusen, 2018) compared

- lecture-based instruction (18 courses, 791 students),
- collaborative instruction alone (24 courses, 1068 students),
- and collaborative instruction with LAs (70 courses, 4100 students)

Their model shows that

- collaborative learning alone results in post-semester scores 1.07 times higher than traditional courses, and
- collaborative learning with LA support is associated with a 1.14 times higher average score.
- There is significant variation depending on LA usage (1.12 times higher in lecture vs 1.3 times higher in lab), but all gains are larger than with collaborative learning alone.

At UCLA, (Sellami, Shaked, Laski, Eagan, & Sanders, 2017) found that

- LA-supported students in a flipped classroom (n = 411) did not have significantly better learning gains than the unsupported, flipped classroom cohort (n = 97) on an adapted concept inventory.
- However, LA-supported students did perform better on exam questions that require higher order cognitive skills (using Bloom’s taxonomy)
  - If either the intellectual task or the topic/data of the question were new to the students, the question was classified as HOCS. Otherwise, the question was designated as LOCS.
- and this improvement was greater among underrepresented minority students.
  - On HOCS questions, URM students scored on average
    - 64.6% (SD: 9.9%) without LAs, and
    - 73.2% (SD: 9.9%) with LAs.
  - Non-URM students without LA implementation scored
    - 74.8% (SD: 11.8%) and
    - 77.5% (SD: 9.9%) with LAs.

Benefits for LAs

At Texas State, (Close et al. 2013, 2016) explored how LAs develop a strong "physics identity" using a qualitative analysis on written reflections, LA program applications, and interviews:

LAs gain experience as educators and recognition from others (helping students is rewarding)

- *"…there was a moment in the help center where I was helping a student, and afterward they told me I was good at physics. I don't get that kind of feedback from anywhere and I wasn't expecting it at all"*
- *What made her feel valued was not being told that she had been helpful, but the experience of guiding the student to the correct understanding and hearing him say that the physics made sense*

Being an LA strengthens relationships with peers and faculty, and LAs feel like part of a supportive and collaborative community

- *"One of the things I really enjoyed about [being an LA] was that I became way more involved in the department and I feel like I have a larger network of help if I need it because of it"*
- *"One of the best parts about being an LA is how much more comfortable I have become approaching professors with questions. I love the community and the academic benefits from being an LA"*
- *"I'm completely part of the [physics] community. I have friends in there, in the program. In classes right now, I go and I help students and I know them by name, and that's pretty awesome… I have supervisors I can go to as an employee, as a student, as someone who just kind of needs advice at the time. I feel like, that whole thing is pretty awesome."*

Participating in the LA program strengthens LAs' own physics understanding and confidence:

- When asked by the interviewer whether being an LA had made him better at anything else, Mike responded *"It made me better at physics, that's for sure."*
- *"[Online homework problems] used to scare me if they came in looking for help with it in the tutoring center, and now it's still intimidating but I feel like I have a much better handle on it because […] I know I can figure it out"*
- *"I find myself discovering new things about a topic I felt I fully understood"*
- *"I'm pleased with my grades in physics and I think that the LA program has definitely impacted my ability to succeed in these classes"*
- *"I'm finally feeling comfortable in a role where I help them think instead of boiling everything down to 'right' or 'wrong.'"*
- *"I learned to be patient when trying to solve a physics problem; I have learned to avoid knee-jerk or wild-goose-chase approaches to physics. I used to read a problem and then quickly go to the kinematic formulas and try them all to see which one would work. Now I have a planning period where I really do think about the best way to approach a particular situation"*
- *"I have also learned something new from students every semester I've been an LA; they always bring up new questions and new ways of looking at things that I hadn't considered before and it helps me to broaden my views and think about problems in new ways. Instead of building rigid definitions, I'm able to think in a more complex way about physics"*

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