

Introducing and institutionalizing a Learning Assistant program helped a campus transform ALL gateway STEM series

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Overview of the history, components, and assessment of our LA program

The co-authors founded an undergraduate Learning Assistant program in January 2016, and in the 2.5 years since then, it has expanded to become more than 20 times as large. Over the past two years, LAs have been in 100 different lecture sections and worked with more than 20,000 enrolled students! This expansion was only possible through taking advantage of existing and emerging synergies and program innovation to address the challenges the expansion brought.

We first provide an overview of the program history components and assessment. We then describe in detail the key challenges and how we leveraged synergies and innovation to further expansion and institutionalization of the program.

Description of program initiation

Following national calls for the improvement of student retention in STEM fields, many universities, including UCLA, are increasingly transforming their large-enrollment STEM gateway courses to student-centered classes using a high amount of active learning.

While it has been demonstrated that active learning increases student performance (Freeman et al., 2014), it can be challenging to implement fully in large-enrollment courses due to the high student to instructor ratios. A great way to lower this ratio in a cost-effective way is to implement an undergraduate learning assistant (LA) program (Otero et al., 2010, 2011; Goertzen et al., 2011). In contrast to other peer instructors (such as undergraduate teaching assistants, peer tutors, or peer learning facilitators), LAs are required to participate in an accompanying training in pedagogy. They are specifically trained in methods that foster student collaboration and stimulate discussion by asking open-ended questions and eliciting student reasoning rather than providing explanations (Otero et al., 2006).

The pedagogy seminar is one of the three pillars of the program as developed by a team at CU Boulder and promoted by the Learning Assistant Alliance (Fig. 1). The other two pillars are teaching practice and content mastery / preparation. LAs receive upper division credit and accordingly build workforce-relevant skills in facilitating collaborative learning in diverse environments, while mastering the associated content knowledge.

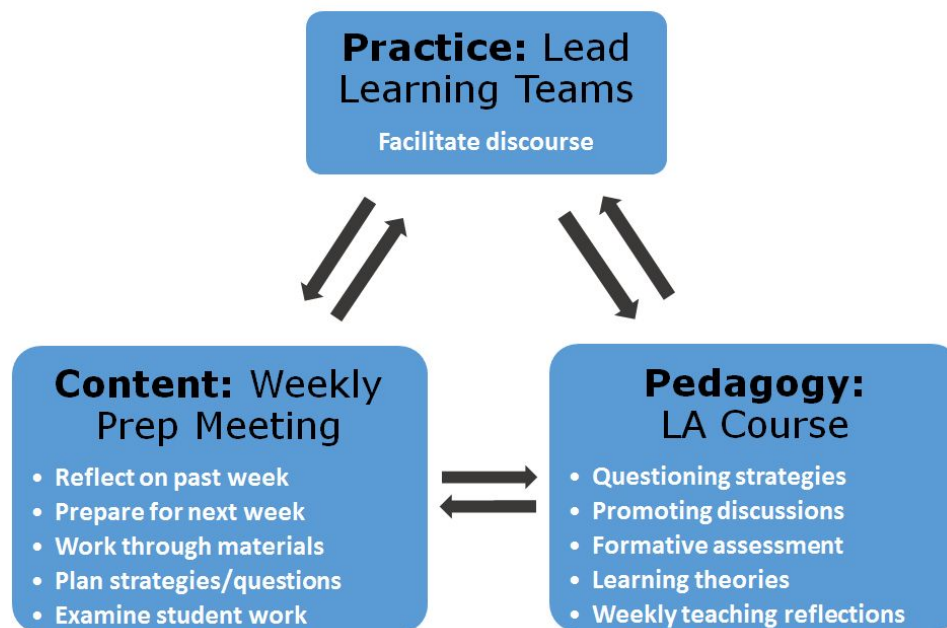


Fig. 1. Throughout UCLA's LA program adaptations, we maintained the core components listed here.

The program was initiated and adopted by five cross-disciplinary instructional faculty who worked closely together (Fig. 2). The faculty represented the departments of physics, chemistry and life sciences and had previous training in active learning and pedagogy. This cross-disciplinary team was very motivated to implement the LA program in their courses and worked closely together. Existing peer teaching programs (i.e., undergraduate assistants (UA)) were incorporated into the LA program.

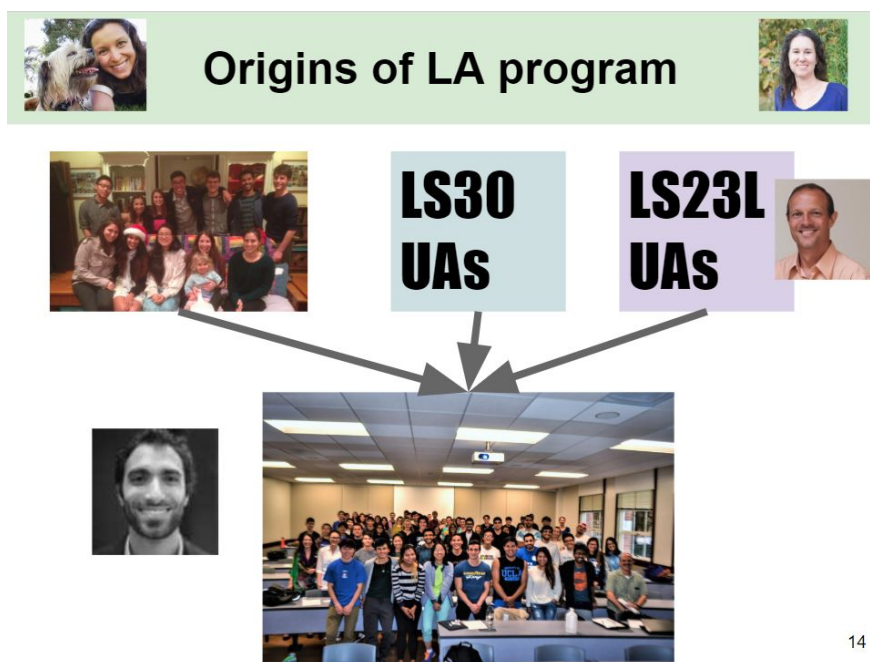


Fig. 2. The LA program started at just 16 LAs for three cross-disciplinary faculty, and integrated existing UA programs and interested professors to rapidly expand.

This collaboration was facilitated through mentorship and collaboration with UCLA's Center for Education Innovation and Learning in the Sciences (CEILS). The mission of CEILS is to "create a collaborative community of instructors committed to advancing teaching excellence, assessment, diversity, and scholarship, resulting in the enhancement of student learning experiences in the sciences." This mission overlapped with the mission of the LA program and fostered a collaboration and synergy that led to the expansion of the program to other faculty and courses. The initial implementation of the LA program facilitated course transformation and the increased use of active learning.

Assessment of initial implementation

The initial implementation of LAs was promising, and we published our results as outlined below.

In August 2017, we published a paper associating adding LAs to a life science course with increased student performance on questions demanding higher-order cognitive skills (Sellami et al. 2017). The pedagogical strategies LAs were trained to employ particularly foster higher order thinking. We also saw a positive effect of LAs on overall exam performance. Importantly, we found that URM students benefited more from LAs than non-URM students in their higher order thinking performance, which indicates that this intervention may help to decrease performance gaps.

In November 2017, we presented a poster (Shaked et al. 2017; manuscript in prep) associating the use of LAs with increased conceptual learning. Using a standard physics pre- and post-test (the Force Concept Inventory), we analyzed conceptual learning gains for students in fall quarter 2016 sections of Physics 6A, all taught by the same instructor. Those in LA-supported discussion sections had average learning gains that were 25% higher than those in non-LA-supported sections, even students enrolled in the exact same lecture section.

Synergized with campus efforts to help LAs be part of every STEM gateway series transformation

Given the mission of CEILS to broaden student success at a research-intensive university, in part by transforming STEM gateway courses, all of UCLA's STEM gateway series have begun undergoing some form of transformation during the last five years. Course transformations included:

1. Design of new math for Life Science (LS) majors
2. Flipped intro biology courses
3. Revised lectures and labs in Physics for LS majors
4. Two new "Endowed Professors in General Chemistry" to coordinate and transform Chemistry for LS majors
5. Shifting students out of precalculus and into supported sections of calculus, for Physical Sciences and Engineering (PSE) majors
6. Collaborative discussion sections introduced in some introductory physics and chemistry courses for PSE majors.

When analyzing the factors that contributed to these transformations (Fig. 3), we noticed that LAs were part of every transformation, and sometimes the only factor that was pushing forth any transformation.

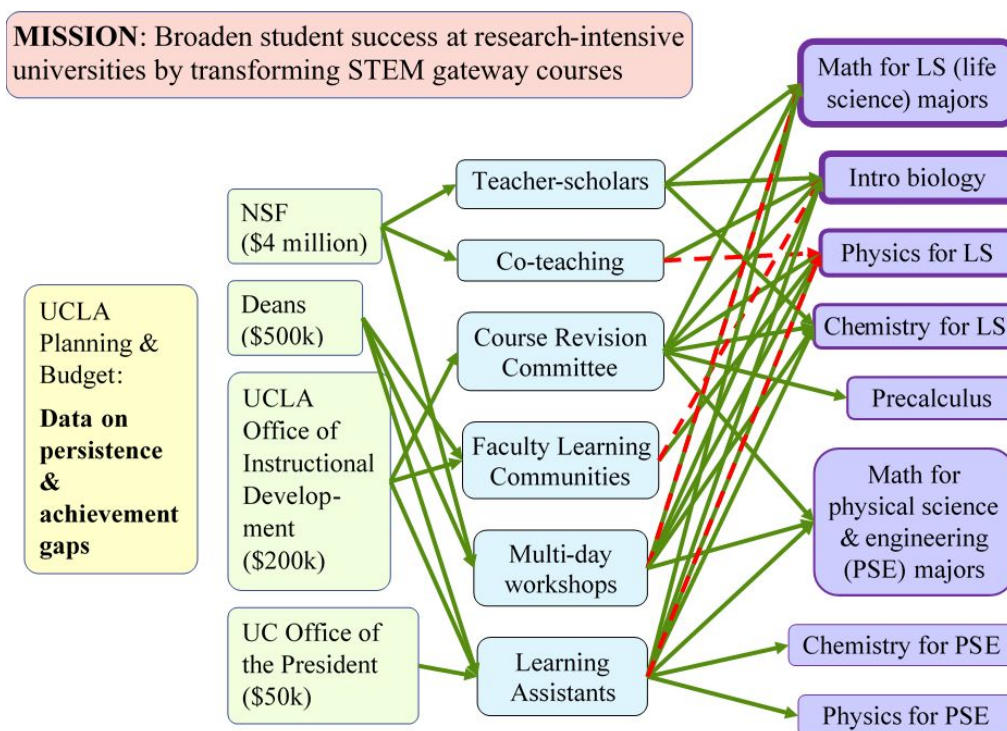


Fig. 3. Data, funding and resources that contributed to STEM gateway course transformations.

Within 2.5 years, the LA program was successfully expanded and institutionalized

The LA program expanded rapidly due to the factors described above, bringing in increasing numbers of instructors and LAs (Fig. 4). A more detailed budget is provided below, and it comes out to less than \$4 per student enrolled in an LA-supported course, with more than half of these costs going to pay undergraduate returning LAs who help guide and mentor the other LAs.

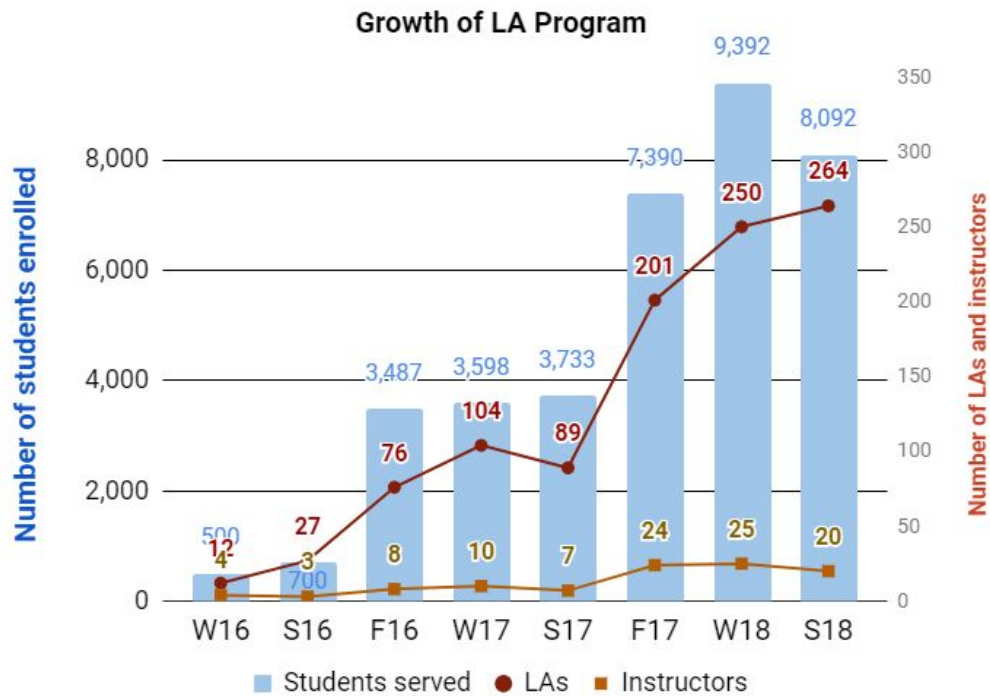


Fig. 4. The program more than doubled in size each academic year, becoming almost 20 times as large after 2.5 years.

We continued our assessment of the effects of LA implementation, especially focusing on continued effectiveness after expansion of the program to many more courses. These assessment efforts and results are described in more detail in the last challenge below, balancing program expansion with effectiveness.

What were the challenges in institutionalizing the LA Program?

There were challenges in expanding and institutionalizing the LA program at UCLA. We used both *institutional factors and synergies* as well as *programmatic innovations* to address each of them.

Our challenges are discussed in the chronological order they appeared. The first hurdle to overcome was to scale the highly interactive LA pedagogy seminar from 16 students to up to 150 without losing its effectiveness. Secondly, the core components of the traditional LA program needed to be adjusted to allow flexibility in accommodating different course and instructor requirements. While teaching faculty immediately saw the benefit of implementing LAs in their courses, research faculty with limited time devoted to teaching activities had to be supported to be able to also work with LAs. Next, in order to be sustainable, the funding source had to switch from grant to institutional funds.

And last but not least, the expansion of any successful but small program to a much larger institutional effort bears the risk that key factors contributing to the effectiveness won't scale. We wanted to expand and institutionalize but one of the big dangers of program expansion can be that it affects the effectiveness of the intervention. We expanded with particular focus on maintaining program quality and effect on student learning.

Challenge #1: Scaling the LA pedagogy seminar

The pedagogy seminar is a key component of the LA program and typically capped at 25-30 students due to the large amount of active learning and instructor-student interaction. With 250 LAs, this would require 8-10 seminars per quarter, three quarters per year, with the program director as the main pedagogy instructor. After one quarter of offering two separate 30-person seminars, we identified ways to increase seminar capacity while maintaining LA involvement. We now have up to 150 New LAs enrolled in pedagogy seminar, with most being actively involved, and with self-reported learning gains (based on pre- and post-surveys), consistent with those when the seminar had an enrollment of only 12 students.

Innovating the LA program model to support seminar scaling

To support the 100+ student pedagogy seminar, we applied the LA model to itself by recruiting “Pedagogy LAs”. These were returning LAs who attended a weekly planning meeting for the upcoming LA pedagogy seminar. During the seminar, they would then facilitate discussion and learning for the New LAs. This encouraged us to (1) include more small-group activities into seminar as opposed to whole class discussion and (2) have LA input into improving the seminar -- both of which helped the seminar stay very effective!

Through trial and error, we have now found a way to make the pedagogy seminar planning meeting very engaging to the more than 20 Pedagogy LAs. At the beginning of the quarter, pairs of Pedagogy LAs choose the week they want to focus on. Before that week, they come to the pedagogy planning meeting ready to lead a discussion on how last quarter went and go through the interactive activities together. They encourage the other Pedagogy LAs to discuss activities in pairs and then share out. They are encouraged to suggest improvements and solicit ideas from the group. After the seminar has happened on their chosen week, the pair of Pedagogy LAs come to the next planning meeting ready to lead a debriefing discussion about how it went and what to improve next time. In this way, we’ve found that the Pedagogy LAs stay more engaged during the planning meeting and take ownership of one week. Their ideas also help strengthen the seminar.

Another way that we innovated the LA program model is with the weekly teaching and reading reflections. LAs are always expected to write a reflection on how the previous week went and on what they read to get ready for the upcoming seminar. These have typically been submitted on the course website as an assignment. As the seminar increased in size, we asked the students to instead post weekly teaching and reading reflections on the Piazza discussion forum and asked Pedagogy LAs to respond to each student’s posts at least once every few weeks. This made the reflections more meaningful, in that they were publicly posted and guaranteed response at some point. All LAs in a given content course could see what their fellow content LAs were struggling with and how they were responding.

Synergized with other observation efforts on campus to support seminar scaling

One major concern in this seminar scaling was to ensure that LAs were still implementing key practices when working with students (e.g. wait time, fostering collaboration, responding with questions). New LAs especially struggle with this, and the seminar can be a time to address this struggle.

Fortunately, other CEILS colleagues were implementing various observation and reflection protocols through various initiatives (Stains et al. 2018), and we were able to build on and adapt

these to the LA program. LAs were trained in COPUS (Smith et al. 2016) to try implementing that, but it was deemed more detailed than necessary for these purposes.

Some CEILS colleagues that were developing a TA training course had implemented a video observation and reflection project, which we adapted and implemented in the LA program. With guidance from Pedagogy LAs, every LA now has themselves filmed at least once per quarter, and they are guided through a reflective set of questions to identify in what ways they can continue to improve implementation of evidence-based practices.

Assessment of pedagogy seminar scaling

“Being an LA is such a gratifying and eye-opening experience. In addition to all the techniques and tools you will learn in the pedagogy seminar, there are a lot of things you learn “on the job” from interacting with students. For me, these students have taught me just as much as I have taught them.”
-Jennifer, Learning Assistant

All of these changes left us wondering if LAs were still achieving the LA program learning outcomes.

In terms of LA satisfaction and desire to take the program: Despite the almost exponential growth of the program, we continued to get almost twice as many applicants than needed, indicating substantial student interest in joining the LA program. Student ratings of instruction for the LA pedagogy seminar range between 8 and 9 for both instructor and course, with a median of 9 for every metric, every quarter.

The table below shows that even as the program expanded from 15 LAs to more than 200, pre- and post-surveys of LA assessment of attitudes and abilities reflected LA cohorts who considered themselves increasingly more qualified upon entering the program, and who still left the program with substantial gains in program learning outcomes (Table 1). In particular, LAs are reportedly feeling increasingly more prepared to help students from different backgrounds or experiences.

Table 1. Shifts in LA self-reported attitudes and capabilities through participation.

Averaged LA responses, with 1 as “not very” and 5 as “very”.	W16 - 12 LAs		F16 - 76 LAs		F17 - 201 LAs	
	Wk2	Wk10	Wk2	Wk10	Wk1	Wk10
How likely are you to seek a career that involves teaching?	3.2	3.5	2.9	3.4	3.2	3.4
How much do you think a teacher's actions affect student learning?	4.6	4.7	4.7	4.7	4.8	4.7
How well-prepared do you feel to help others learn the content?	4.2	4.5	3.8	4.2	3.9	4.4
How much do you know about research on strategies for teaching?	2.4	3.8	2.6	3.6	3.0	3.9
How well-prepared do you feel to help students from different backgrounds?	3.1	3.8	3.3	4.1	3.9	4.3

“I feel I have drawn significant lessons from my time...within your Learning Assistant program that have been transferable to my work as a crisis line counselor, specifically the principle of providing the framework to help a person come to their own conclusion regarding a problem....So, I believe your work in developing peer-to-peer student instruction and support really does have far-reaching implications for students entering a medical profession.” - LA

Challenge #2: Balancing core program components with need for flexibility

Each series of courses, and often each individual course, had a different set of needs from the LAs. The program started out with each LA signing up for the same number of units and having the same set of duties, but some instructors wanted LAs in lecture and others didn't; some needed LAs in longer labs; some had online discussion forums where the LAs could help with responses; and some wanted to involve LAs in the design of new activities. The standard LA model made it challenging to incorporate these elements in a consistent way.

Innovating LA program model to be more flexible

We designed a flexible set of LA duties that LAs and/or instructors could choose from (Table 2 - columns for New LAs and Returning LAs). LAs then sign up for the amount of units corresponding to the amount of time they spend learning to improve their LA practice. Note that the yellow highlighted rows at the top include the core LA duties that are required of all LAs.

Table 2. LAs select from a range of required and optional educational tasks.

	<u>New LA</u>	<u>Returning LA</u>	<u>Pedagogy Head LA</u>	<u>Logistics Head LA</u>
Prerequisites (in addition to succeeding in content course as a student) -->	<i>none</i>	<i>Pedagogy seminar</i>	<i>Pedagogy seminar</i>	<i>Pedagogy seminar</i>
	Foster collaborative learning in evidence-based ways	Experiment with + refine collaborative learning techniques	Learn to help LAs improve evidence-based techniques.	Use spreadsheets + email to schedule + manage LAs
Assignments	Hours per week [for credit]			Paid
Read and learn about effective practices outside of seminar	1			<p>We require that Head LAs are simultaneously enrolled as Returning LAs, so that they can stay better connected with the course. So we still ask them to do assignments for credit.</p> <p>Logistics Head LAs may get assigned multiple courses and are thereby expected to do anywhere between 2 and 10 hr/wk of paid duties, with a lot of work in the first two weeks.</p>
Attend and participate in weekly pedagogy seminar	1		1	
Write (and respond to) weekly reflections, online, related to LA learning outcomes; reflect on facilitating learning across environments; complete written projects.	1	1	0.5 - 1	
Attend weekly content meeting w/ course instructor, who guides LAs through activities	1 - 2	1 - 2	1	
Practice facilitating collaborative instruction in 1 - 3 discussion/lab sections per week	1 - 6	1 - 6	1 - 6	
Practice facilitating collaborative instruction during content lecture	0 - 4	0 - 4	0 - 4	
Review content each week	0 - 2	0 - 2	0 - 2	
Practice responding online to questions in ways that are still student - centered	0 - 1	0 - 1		
Practice facilitating at collaborative workshops, with TA/instructor present	0 - 3	0 - 3	0 - 1	
Practice facilitating collaboration at office hours held by TA/instructor	0 - 2	0 - 2	0 - 1	
Practice facilitating collaboration at review sessions with TA/instructor	0 - 1	0 - 1	0 - 1	
Provide pedagogically - based feedback to content instructor on lecture slides/activities	0 - 1	0 - 1	0 - 1	
Make material related to subject area, with instructor feedback	0 - 2	0 - 2	0 - 2	
Work with LA program development team to summarize and assess benefits to LAs		0 - 1	0 - 1	
Devise course - specific scenarios where students ask questions about week's content		0 - 1	0 - 1	
Attend pedagogy seminar planning meeting to provide input + prepare to facilitate			1 - 3	
Observation project: Learn how to observe LA practices + provide feedback 2x per LA.		0 - 2	1 - 4	
Practice responding to LA reflections, addressing questions, and consulting Head LA/instructor.		0 - 1	1	
Help run weekly content meetings, ensuring evidence - based practices are being discussed.			1	1
Visit other content meetings to learn what else can be incorporated.			0.5	
Regularly communicate with pedagogy and content instructor to troubleshoot and optimize			0 - 1	0 - 1
Coordinate with LA schedules to organize weekly content meeting and assign discussion/lab sections				1
Provide feedback to content instructor and/or TAs on LA concerns about worksheet				0 - 1
Organize logistics and materials for LA - facilitated workshops (always with instructor/TA present)				0 - 1
Assist with recruitment and selection of next set of LAs			0.5	0 - 1
Attend biweekly head LA meetings and write weekly posts about what challenges they are encountering				0.5-1

One key addition to the core model was LA-facilitated office hours. There is still an instructor or TA present at these office hours (for content expertise and supervision), but the students are encouraged to sit in groups, while the LA circulates to address any questions that have come up over the week. A few courses used this flexibility to design LA-facilitated weekly workshops, where students get additional worksheets that they can work on.

Synergies between the more flexible LA program and institutional efforts

These LA-facilitated office hours and workshops often had significantly higher attendance than an instructor's typical office hours. At the same time, the UCLA Library was looking for ways to increase student use of certain spaces. This prompted a collaboration with the UCLA Library to pilot our STEM Collaborative Learning Center (CLC). Starting in Fall 2017, the UCLA Library committed 40 seats (half of a large space) to accommodate LA-associated structured collaboration sessions and office hours. This was enough space to allow for a structured course-specific collaborative learning in one portion, while simultaneously allowing for smaller office hours for other courses (see Fig. 5). By having these all in the same location, our goal was for students to increasingly gather in the CLC and use it as a general study and collaborative learning space for introductory STEM courses.

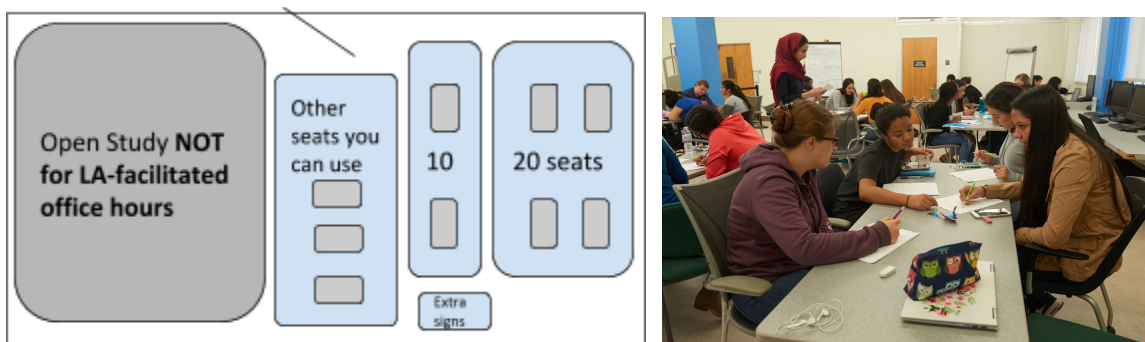


Figure 5. The library requested that at least half the space remain available for open study, leaving the remaining space with “workshops” (structured instructor-approved activities) and “Consultation stations” (drop-in office hours). [Photo credit: Don Liebig]

A sign-up sheet was made available to all instructors using LAs, and it quickly filled up with workshops and office hours, spanning more than ten different introductory STEM courses. In its first quarter (Fall 2017), the CLC was fully booked at almost all available hours (M-F 8am-6pm), and the schedule was disseminated to all LA-supported classes. The library recorded a 25% increase in use of the space. Based on LA sign-in sheets and student worksheets, we conservatively estimated at least 3,000 attendees (300 per week). Students had generally very positive feedback about the CLC (Fig. 6).



Figure 6. Word cloud from the more than 1,000 student responses to “What would you change about this LA-supported course to improve how LAs can help you learn?” Most said “nothing”, and many others said how helpful it was. The most common requests were for “more” space and LAs.

In this way, we leveraged existing resources to incentivize instructors to hold more inclusive and evidence-based office hours. Only instructors using LAs could reserve STEM CLC space. This fostered conversations about how office hours are typically held and what could be better. Some instructors shifted TA office hours into the CLC to increase student attendance and impact. Multiple sets of instructors designed weekly workshop activities to make use of the space. In this way, our CLC project is helping to transform instructor and TA office hours into additional opportunities for collaboration and interaction with LAs.

Challenge #3: Engagement of more faculty, including research-focused

At the outstart of the program, the only instructors interested in having LAs were adjunct lecturers and teaching-focused faculty. It was of course challenging to institutionalize a program without buy-in from research-focused faculty and with only a limited number of faculty users.

Innovating the LA model to engage more faculty, including research-focused

When the program started, the faculty using LAs would take on the task of assigning them to sections, handling the first few crazy weeks as student schedules shifted, and generally ensuring that LAs were fulfilling responsibilities. To onboard research faculty, we experimented with having the director (S. Shaked) do these logistical tasks and lead weekly content meetings (with the instructor still present), such that less was expected of the faculty member. But that became too time intensive as well, and illogical in the departments that were not in her area of expertise.

Instead we created the position of a “Logistics Head LA” (see Table 2). This is an experienced LA who spends an average of 5 hr/wk managing the logistics for a given content

course. For example, they get student schedules and assign them to sections, then rearranging as necessary. They also track LA absences at content meetings to help the program directory identify LAs that should be losing points or that need reminders about the specific responsibilities.

These logistics Head LAs became invaluable in onboarding new faculty, because they could help guide faculty to get started, while connecting faculty to the program director when needed. This also provided an extra incentive for students to become LAs; after sufficient training, they became eligible to get paid. In addition, being a Head LA is a valuable leadership experience for students. We have been experimenting with various models each quarter and ultimately found that we need one Logistics Head LA for every course or every ten LAs, which means 5-10% of LAs get paid.

This let us design a “For Instructors” portion of the LA website that could detail the many ways the LA program would support instructors in implementing LAs:

<https://ceils.ucla.edu/learningassistants/for-instructors/>

Using the “Head LA” innovations described above, along with support from an LA program development team, new instructors could begin implementing LAs with very little effort on the part of the instructor. This led to a form of “peer pressure”, in which faculty would see colleagues implementing LAs and want to try them as well.

The program expanded faster than funding could be brought in to support the demand, so we phased in an instructor application form. This further increased the synergy with other campus efforts to transform teaching; rather than decrease demand of LAs, this instructor application form encouraged faculty to think more deeply about how to best use and support LAs, which resulted in deeper thinking (and discussions with the LA director) about student learning.

Synergizing the use of Head LAs with the CEILS mission to engage more faculty

The other approach we used to integrate research-focused faculty was by leveraging the mission and engagement of CEILS (our STEM center for teaching and learning) (Fig. 3). The LA program was well aligned with the CEILS efforts to foster more evidence-based and inclusive teaching. The LA program helped faculty feel more confident integrating active learning, knowing that LAs could be offered to support these efforts.

CEILS has strong support from the deans and and associate deans, which facilitated getting the associate deans to support the LA program. One of the associate deans took LAs into his course, and the other associate dean integrated them into the course transformation she was leading, resulting in both becoming strong advocates. As they talked about the program with colleagues, and as the teaching-focused faculty shared their positive experiences, some key research-focused faculty decided to try using the program.

The associate deans were also leading and/or involved in the gateway STEM course transformations, and this led to the LAs being integrated into these transformations. Each transformation rolled out in a different way, but all led to research faculty willingly (rather than reluctantly) taking on LAs, because they were seen as part of the transformation rather than a burden to the instructor.

“[LAs] have enabled much more meaningful integration of active engagement in lecture and discussion — LAs dramatically increase the number of meaningful, impactful conversations students have about course concepts. ... I now find it hard to imagine running courses without LAs.”
-- UCLA faculty member

As a result of the efforts described above, the number of faculty involved more than doubled each year, and 10% of instructors using LAs are research-focused. Out of the more than 40 instructors who have used LAs, only two chose not to implement LAs in subsequent courses; all research-focused faculty who have used LAs continue to request them.

Challenge #4: Transitioning from grants to more institutionalized funds

We received about \$100k in grants (mostly internal) to support the first two years of the LA program, so the challenge during the second year was finding a way to institutionalize these funds.

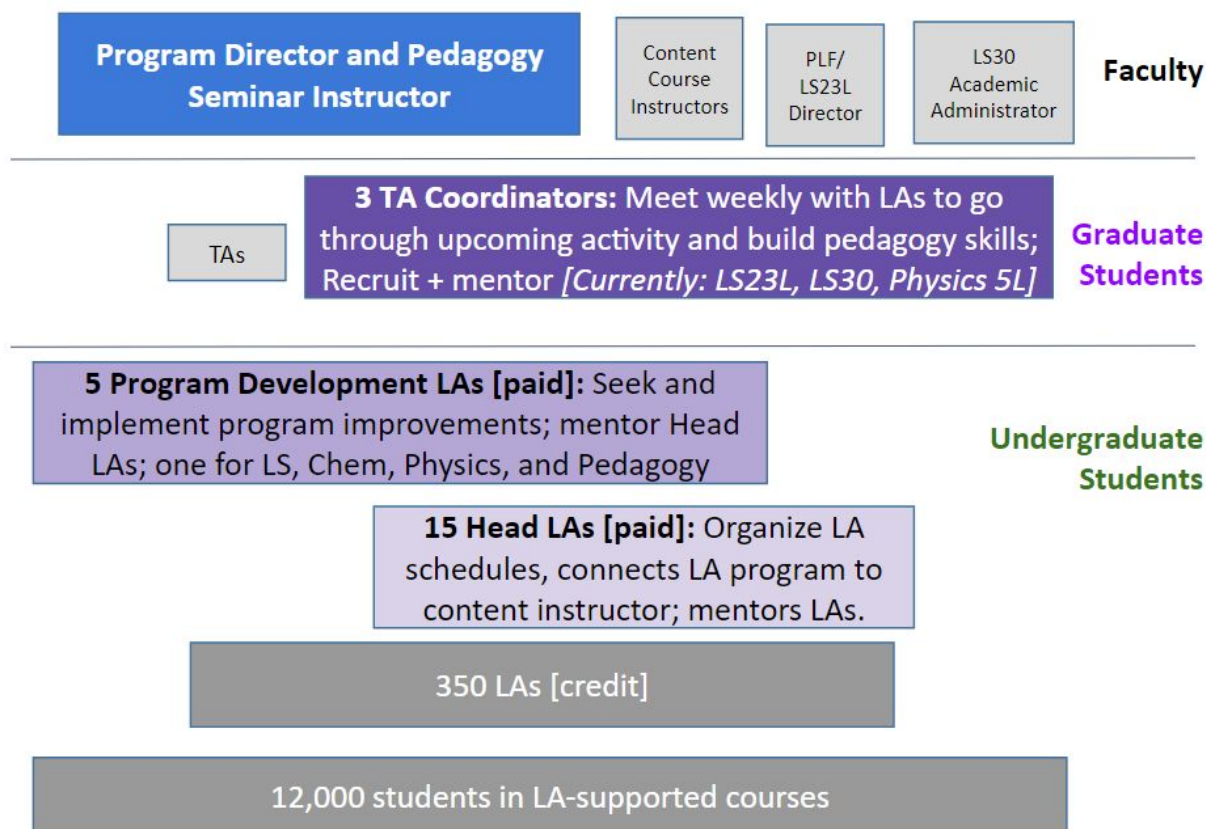


Fig. PEOPLE. The LA program consists of a huge number of people, and the budget goes toward the program director, pedagogy seminar instructor, TA coordinators, program development LAs and Logistics Head LAs.

As the budget table shows below (Table 3), more than two thirds of the program budget goes to undergraduates and graduate TAs, with the remainder spent on the program director and pedagogy seminar instructor. The total of \$129k per year serves an estimated 34,900 enrolled students, involving 1,000 LAs and covering more than half of the STEM gateway courses; this amounts to less than \$4 per enrolled student or \$125 per LA that benefits from being part of the program. To put this into perspective, the TAs working with this same number of students are paid a total of \$2 million, which amounts to more than \$50 per student for the cost of the TA.

Table 3. 2018/19 annual budget for the LA program

	2018/19	
Head LAs	\$60k	<ul style="list-style-type: none"> • Per quarter: pay 20 Head LAs to manage 300-400 LAs • Head LA spends 50 hr/course for \$1000 each
TA coord.	\$27k	<ul style="list-style-type: none"> • Some labs have TAs coordinate LAs instead of another Head LA.
Director	\$40k	<ul style="list-style-type: none"> • Run the program, teach the pedagogy seminar; focus on improvement, faculty outreach, and assessment
Other	\$2k	<ul style="list-style-type: none"> • Materials and events - cookies, pizza, bringing faculty together to discuss LAs, etc.
Total	\$129k	<ul style="list-style-type: none"> • \$4 per enrolled student; \$125 per LA

Innovating the LA model to keep administrative costs down

We experimented with various ways of paying LAs. At first, we tried paying Returning LAs, but we found this too costly, while also noticing that a portion of Returning LAs were actually less engaged than New LAs. We also found that we had far more applicants than we could accommodate in the LA program, so payment was not needed to recruit LAs. Because of this, we shifted to a model of paying Head LAs to do the logistics specific to their content course.

We found that the best people to administer the LA program were in fact the LAs themselves. So each quarter, we identified LAs that were vocal about ways to improve the program and started offering them jobs; these became the Logistics Head LAs (see Table 2). Once we reached a number of ten such Head LAs (managing more than 100 LAs per quarter), it became challenging to efficiently train and track all of them, so we again took the most constructive Returning LAs and created a team of three “Program Development LAs”.

In this way, the LA program became truly “student-centered”. The director made final decisions and engaged most with faculty, but it was the Program Development and Head LAs that determined schedules, synthesized feedback (informal and formal), and suggested improvements. This also turned out to be an incredibly cost-effective model. As described under Challenge #1, we also scaled the pedagogy seminar, using “Pedagogy Head LAs”, which helped keep instructional costs down while maintaining LA learning gains.

We are cognizant that by not paying LAs until they reach the position of “Logistics Head LA”, we may be further disadvantaging students who need to receive payment to make time to participate in the LA program. For some, the units received fulfill major requirements, but for others, the units are unnecessary. We are continuing to look for ways to have the LA program better support students in financial need, including making larger efforts to select Work-Study qualified students for Logistics Head LAs.

These innovations in the LA model reduced costs, but the budget was still substantial for such a large program. We needed to demonstrate how the program synergized with other UCLA goals, while identifying the correct units to take on each portion of the budget.

Synergizing the LA program with strategic plan to institutionalize budget

The LA program aligns with our campus strategic plan by providing a cost-effective approach to accommodate increasing undergraduate enrollments without compromising educational quality and impact. LAs facilitate implementation of many of the practices

recommended in a report commissioned by the executive vice chancellor; in particular, they facilitate implementation of active learning, which is associated with decreased failure rates.

By making these arguments and leveraging the support of CEILS and the associate deans, we were able to shift the grant-funded components into funds provided by CEILS (for the director's salary), the divisions of life and physical sciences (for the Logistics Head LAs), and individual departments (for the TAs coordinating the LAs in lab) (See Fig. 7).

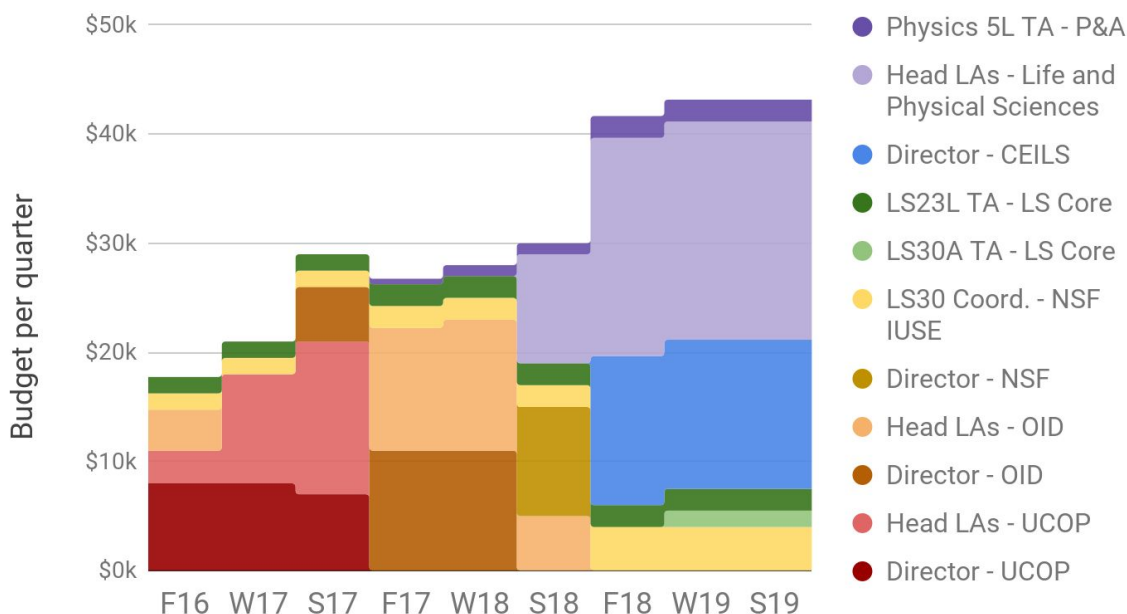


Fig. 7. From Fall 2016, we shifted from grant funds (UCOP - University of California Office of the President; OID - UCLA Office of Instructional Development; NSF) to mostly departmental and division funds (P&A - Physics and Astronomy).

Challenge #5: Balancing expansion with effectiveness of LA program on student learning

LA presence is intended to facilitate active learning, and active learning in transformed courses is associated with higher learning gains, decreased failure rates, and decreased achievement gaps (Freeman et al. 2013; Haak et al. 2011). LA training is designed to foster active learning in ways that improve sense of belonging (Talbot 2015). But we made substantial changes to the original LA program model, so we conducted consistent assessment throughout to ensure that LAs were still receiving sufficient training and opportunities for growth.

Are LAs actually causing transformations causing transformations to more inclusive and effective practices?

“An issue that I feel heavily impacts the UCLA STEM community is the lack of collaboration. As an LA, I would like to minimize if not remove the sense of competition and instead a fostering an environment of growth.” - UCLA student response in LA application; representative of many students at UCLA

The LA program is designed to help instructors better implement some of the AAC&U “Educationally Purposeful Activities” . These activities are associated with increasing first year GPAs and closing achievement gaps (<https://www.aacu.org/leap/hips>), and they include the following: Ask questions in class or contribute to class discussions; Work with other students on projects during class; Use an electronic medium to discuss or complete an assignment (online forum facilitated by LAs); and Have serious conversations with students of a different race or ethnicity.

As the LA program expanded, we found that in at least half of the LA-supported discussion, lab, or lecture sections, the instructor ONLY decided to incorporate increased collaborative or inquiry-based learning BECAUSE of LAs helping with facilitation; thousands of students per quarter are therefore having more interactive environments due to the LA program.

Survey: Are students interacting with LAs in the intended LA model?

“The LA asks me if I need help even though sometimes I don't go to her for help in the first place. This makes her more approachable in the future and I am more willing to ask for her help.” - representative student comment; most are very positive.

Every quarter, we conduct a mid-quarter survey to ALL students in LA-supported courses. Through small amounts of credit, we are able to get respondents from almost every supported course, with more than 3,500 students responding in Spring 2018 (see Fig. 8). We use these data not only to assess the LA program as a whole, but we break it down by course and LA, such that LAs can see their own data to reflect on and improve. We find that there is little variation among courses, but also identify courses where LAs may be used less effectively, so that we can have conversations with the instructor and Head LA.

How much do you agree? Your LA...

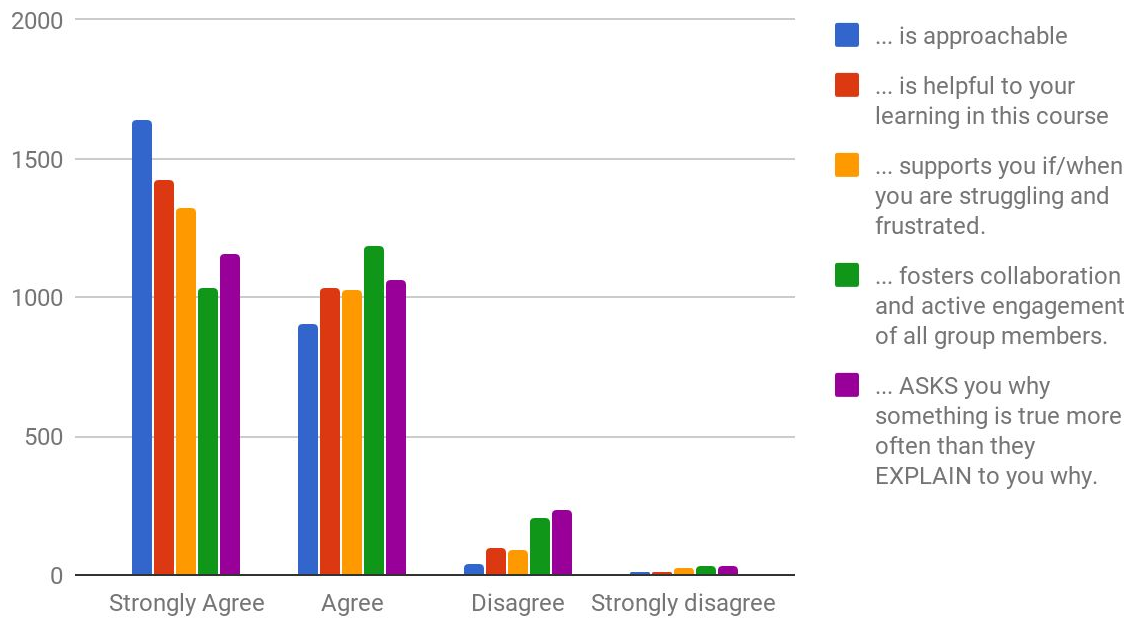


Fig. 8. In a Spring 2018 survey of 3,500 students across 24 courses, they indicated the level of agreement with various statements about LAs.

Students in LA-supported courses spend an average of 1.9 hr/wk learning in an environment with LAs present (e.g. discussion, lab, lecture, or instructor office hours). Even with such rapid expansion, 96% of students agree or strongly agree that LAs helped them learn. 90-97% agree or strongly agree that LAs are approachable, knowledgeable, good communicators, supportive during struggles, and prompting for reasoning (Fig. 8). In particular, these data suggest that the LA program is generally achieving its goals in not having the LAs provide individual answers or explanations, but instead supporting struggling students, fostering collaboration and prompting for reasoning (Knight et al. 2016).

The open-ended comments from students support these observations of LAs being extremely “help”-ful and “approachable” in helping with “questions” and “concepts” (Fig. 9).

Conclusions and Future Work

By synergizing LA program innovations with institutional transformation efforts, we were able to create and expand our LA program quickly and effectively, with minimal costs and most of those costs going to pay students. In particular, the LA program was housed within our STEM center for teaching and learning (CEILS), which made these synergies much easier to identify and implement. The critical components were as follows:

1. Scaling the LA pedagogy seminar to reduce instructor costs while providing Pedagogy Head LAs with valuable experience as facilitators and planners. The simultaneous development of a new life-sciences based TA training seminar led to synergies and shared observation protocols that benefited both sets of seminars.
2. Devising a flexible task of LA responsibilities, including the introduction of LA-facilitated office hours, in order to maintain core program elements while allowing instructors and LAs to tailor the program to their interests and needs. We found a synergy here with the UCLA Library and were able to pilot UCLA's first STEM Collaborative Learning Center, with LA-facilitated collaborative office hours and workshops.
3. Creating "Logistical Head LAs" to help onboard new faculty and reduce administrative time and costs. The synergies between the LA program goals and CEILS mission to transform faculty helped more easily identify faculty who were considering integrating more active learning; Logistical Head LAs helped make the decision to take on LAs even easier.
4. Using the innovations above to keep program costs down, while finding synergies in the LA program and the campus strategic plan. This helped us identify the appropriate divisions and departments to take on various LA program costs as we transitioned from grant funding.
5. Using consistent and varied forms of assessment across the entire program to ensure that the program innovations are being done in ways that still support LA model practices and implementation.

For future implementation, we want to continue to expand to reach more of the highest-disparity and highest-failure STEM gateway courses, including more sections of calculus, physics and chemistry for physical science majors. At the same time, we want to continue using the "instructor application form" to be more selective about which faculty get LAs, thereby encouraging faculty to implement LAs in the most evidence-based ways.

There are many ways we want to continue assessing the impacts of the program. One main goal of the LA program is to influence affective factors, such as improved sense of belonging and scientist identity (Beasley and Fischer, 2012; Eddy and Hogan, 2014). Sellami et al. (2017) observed a resulting decrease in achievement gap (small but significant), while in the physics course (Shaked et al. 2017), we saw equal conceptual learning gains for all groups, with no decrease in achievement gaps. Further research should be conducted to understand if and how LAs decrease achievement gaps.

In particular, we are working with education research-focused faculty in physics, chemistry and biology to design, implement and assess similar controlled studies, in which we can compare groups of students that experience almost equivalent learning experiences, but some with and some without LAs.

One way in which we hope to have the LA program foster greater inclusivity is by having over-representation of LAs from underrepresented groups. In 2016/17, 23% of students served were from underrepresented groups (URG), and approximately 14% of the undergraduate learning assistants (LAs) came from URGs. Approximately 57% of the LAs were female. In 2017/18, we took greater efforts to recruit underrepresented LAs, and we slightly increased the percentage of LAs from URGs. We will continue these efforts and assessment.

In terms of the impacts on LAs, we have a large enough cohort of LAs that we can now work with UCLA's Office of Instructional Development (OID) to assess if students who became LAs had other positive outcomes on their undergraduate careers. CU-Boulder compared their LAs to matched non-LAs and found significantly higher graduation rates, significantly lower time-to-degree and significantly higher GPAs for the LAs (Alzen et al. 2018).

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