



Creating a STEM Collaborative Learning Center: A Case Study

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What happens when campus units come together to create both a shared physical space and a shared mission space? This case study highlights a unique cross-campus partnership between the UCLA Science Libraries and two academic support programs to create a STEM Collaborative Learning Center. This space serves to help decrease achievement gaps in STEM courses through peer-to-peer active learning and collaborative study. The results of the collaboration have helped to promote student success, increase the value and visibility of the library, inform space design decisions, and innovate new ways campus partners can work together to achieve shared goals.

Introduction

Many learning spaces have variable usage patterns: very busy for parts of the day, but otherwise under-leveraged. At the same time, campus units developing new programs may not have access to the spaces they need to help their services grow. To make space available for growing and successful programs, learning space managers need to accurately map usage patterns and work creatively and collaboratively across campus units to facilitate the creation and growth of new services. This case study explores how multiple campus partners overcame historical challenges to collaboration in order to support service growth and innovation for high impact programs while also maximizing daily and weekly learning space usage. The case study also shows how articulating the purpose and mission of a space can open up new possibilities for collaboration and partnership.

For this project, UCLA's Center for Education Innovation and Learning in the Sciences (CEILS), the Undergraduate Research Center (URC)-Sciences, and UCLA Library focused on rapidly repurposing a library learning space in order to support the expansion of peer-to-peer academic support services for two growing programs. Leading up to this

project partnership, CEILS and URC-Sciences were each running active learning programs to promote student success and decrease opportunity gaps in STEM courses; however, both programs had significant space needs. Further, CEILS was looking to expand the service offerings of their Learning Assistant (LA) program, a rapidly growing peer-to-peer academic support service, in order to provide additional time for active learning outside of class time. To make this expansion of services possible, UCLA Library staff advocated for a new mission and purpose for the space, as well as a related set of space usage policies focused on inclusive academic excellence and campus partnerships. These advocacy efforts paved the way for a redesigned layout of the learning space, and improved policies guiding space usage by campus partners. This was made possible by mapping usage patterns throughout the day in order to determine the percentage of the space that could be allocated to support peer-to-peer learning, while also providing adequate availability for open study.

In rapidly redesigning the space, and simultaneously reframing space usage policies around a shared mission and vision for supporting STEM education, this project has led to more campus visibility for the Library, new opportunities for library engagement and partnerships, increases in overall space usage, and the establishment of a successful new approach to providing high impact academic support. The project also included collection of data on best practices in space design for one-on-one and small group collaborative learning in the sciences that will inform future redesign efforts. In this case study, the authors also highlight the stakeholder approval process, the logistics of running the multiple service offerings in a single space, as well as lessons learned and ongoing assessment activities.

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Background

“Having had LAs in all of my STEM courses, I couldn’t imagine mastering the material in lecture without being able to easily speak with and communicate with the LAs I have had.” --UCLA student

In early 2017 the UCLA Science Libraries and the UCLA Center for Education Innovation and Learning in the Sciences (CEILS) began discussing space related challenges for STEM learners on campus. At the top of the list was the need to find collaborative learning spaces for the large and growing Learning Assistant (LA) program sponsored by CEILS. An LA is an undergraduate student who has succeeded in a given course and subsequently receives credit to help students learn during discussion, lab, and/or lecture, with structured training and feedback from faculty, TAs, and advanced undergraduates. The LA program currently serves all introductory Life Science courses and labs as well as half of the introductory Physical Science courses at UCLA.

The LA model has been adopted at many institutions, and has demonstrated that introducing LAs into college science courses improves learning (Otero et al., 2006), engages students in more in-depth questions about course concepts (Knight et al. 2015), and increases student satisfaction with their coursework (Talbot et al., 2015), all factors that can enhance retention rates in the sciences and reduce gaps between students in different racial/ethnic and socioeconomic groups (Haak et al., 2011). More specifically, researchers at Syracuse University found that Peer-Led Team Learning (which shares many characteristics with the Learning Assistants model) led to decreased DFW (grades of D, F, or Withdrawal) rates in an introductory biology class with a disproportionately higher effect for underrepresented minority (URM) students (Snyder et al., 2016).

The CEILS LA program, despite demonstrated success improving the development of higher-order cognitive skills and closing gaps between URM and non-URM students (Sellami et al., 2017), did not have a dedicated space for Learning Assistants to meet and collaborate with their fellow students outside of the classroom. The measurable impact of the LA program is vital at UCLA, where URM students make up 24% of the student population, but only 18% of the STEM major population. And while non-URM students have a 6-year STEM graduation rate of 72%, only 42% of URM STEM majors ultimately graduate with a STEM degree after 6 years (Hurtado & Sork, 2015).

In conversations about the learning space needs required to support the LA program, library staff learned that many LAs had tried to offer weekly collaborative office hours outside of class but often could not find adequate locations. CEILS staff reported that LAs had been trying to hold these sessions in overcrowded campus dining spaces or outside on benches and in green spaces. Since the same space was not always available from week to week, sessions would move

or at times have to be canceled due to lack of an adequate location. In addition, LAs lost time trying to find enough space for all of the students who wanted to attend their sessions; they felt that more students might attend if the sessions were held in the same location each week. An equally urgent challenge was that the LA program was growing to serve additional courses and students. After rapidly expanding to serve over 3,000 students per quarter from Winter 2016 to Spring 2017, the program needed additional, dedicated space to be able to sustain growing demand for peer-to-peer collaborative office hours outside of class time.

To address these needs, library and CEILS staff proposed the joint development and investigation of a STEM Collaborative Learning Center (STEM-CLC), located in the Science and Engineering Library and consisting of well-designed learning spaces for student-led, drop-in, and collaborative learning in undergraduate science courses. The goals of the STEM-CLC project were to:

- Repurpose an existing space, with minimal budgetary impact, in order to rapidly address the learning space needs of STEM students.
- Provide dedicated space for LA drop-in and scheduled collaborative office hours and group consultations.
- Continue to provide support for open study in the space, particularly at high usage times of day.
- Investigate the impact of peer-to-peer academic support services in the sciences, with a focus on learning space design and development for STEM collaborative learning.
- Develop new services and approaches to engagement with STEM students in the UCLA Science and Engineering Library.

In addition to partnering with CEILS and the LA program, Library staff extended the collaboration to include UCLA’s Program for Excellence in Education and Research in the Sciences (PEERS), part of the Undergraduate Research Center, in the project proposal. The PEERS program had also demonstrated significant success in closing (and even flipping) the academic achievement gap for students from underrepresented groups (Toven-Lindsey et al., 2015). PEERS staff emphasized that having a designated space to meet and study together would facilitate the achievement of a sense of belonging for the particularly vulnerable student populations served by the program.

Proposal: From Protectionism to Partnership

In collaboration with staff from CEILS and PEERS, a space in the Science and Engineering Library, formerly known as the Research Commons, was selected for its open floor plan that allows for hosting up to 78 students. The space already

served as a collaborative, open group study space in the Library with its mix of easily movable furniture, whiteboards, and computers.

Our proposal was to dedicate a percentage of space in the SEL Research Commons during a specified number of hours per week to accommodate LA-led collaborative office hours and PEERS-led structured collaboration sessions. The room’s size allowed for a structured, course-specific collaborative learning review session in one area of the room, with simultaneous drop-in hours occurring in another section. This would leave about 50% of the space available for open study, as it was a priority for the Library to ensure continued access to learning spaces for open study.

In order to determine the amount of space needed for open study, library staff leveraged space usage data, in the form of hourly headcounts, that had been collected over the past several quarters. An analysis of this data helped the Library determine when the spaces would be most needed for open study, and how much space could be allotted for LA consultations and PEERS workshops (Figure 1).

While the library's campus partners were quick to buy in and support the proposal, it was initially more challenging to garner support and buy-in within the Library. Successfully making the case for this collaboration involved working closely with library stakeholders to rewrite our policies, and more importantly, reframe our thinking about our spaces. A history of budget cuts and downsizing had left many library leaders wary of “giving away” spaces to other campus groups. In evaluating this project, many library leaders began from a “space as territory” mindset, and used words like “ceding,” “losing,” and “giving away” space when discussing the project. As such, it was important to demonstrate to library stakeholders that the proposal did not involve dedicating the space entirely to other campus groups. Instead, the proposal focused on campus partner collaboration, emphasizing that the STEM-CLC would be a Library administered space that supported collaborative learning in many forms, and in partnership with multiple campus groups. The breakthrough came in affirming that

Stakeholder Buy-In

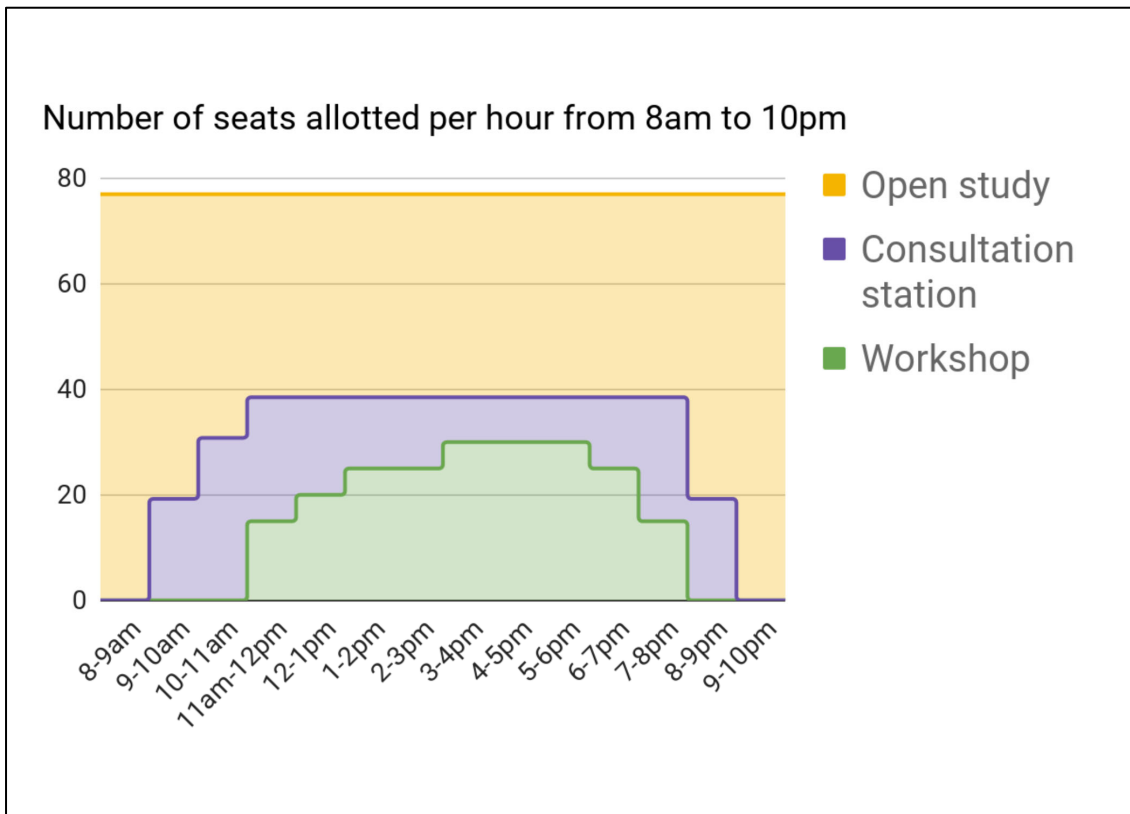


Figure 1. Seat Allotment in the STEM CLC

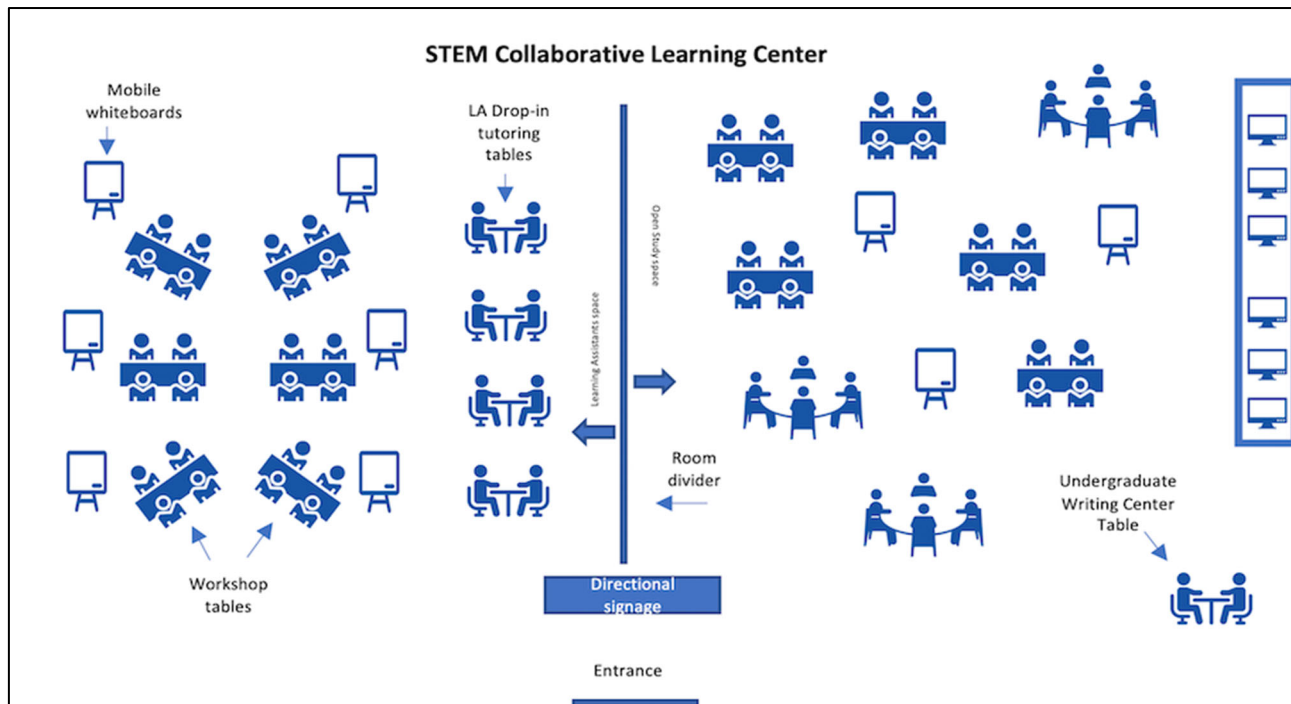


Figure 2. Layout Design of the STEM CLC

the Library's ongoing management of the space could be guided by a shared commitment from multiple campus groups to promote inclusive excellence and student academic success. In focusing the conversation on the *mission* of the space, all partners were able to come together around their common goals for supporting STEM student success. Budget concerns were also raised, and as such, the team made a commitment to initiate the project with almost entirely pre-existing furniture, making the budgetary impact negligible. Finally, the impact on the availability of open study space was also a concern. The existence of space usage data was crucial in this respect, as it allowed the project team to create a plan that would allow sufficient open study space based on a historical understanding of how the space had been used. In the end, the Director of the Science Libraries found that the pilot “met with the Library’s vision for using our spaces in a way that supports our students, solidifies the Library as a connection point for our community, and demonstrates our partnership in learning.”

Implementation

In order for the Library to rapidly repurpose this space and approach to services, we focused on a DIY, low budget, experimental approach, which required open-mindedness, flexibility, and experimentation from our staff and sponsors. We primarily re-purposed existing furniture and supplies, only purchasing a few necessary items, including stanchions, whiteboards, and poster sign holders for

directional signage. All told, the total supplies budget for the project was \$785.76 (Table 1) plus approximately 16 hours of total staff time to plan and implement the new furniture set-up (Figure 2):

Table 1. STEM CLC Budget	
Materials purchased	Amount
Stanchions (x4)	\$140.00
Mobile whiteboards (x2)	\$303.98
Poster sign holders (x2)	\$341.78
TOTAL BUDGET	\$785.76

In setting up the space, the project team sought to optimize group interaction and active learning, as outlined by the Evidenced-Based Teaching Guides on group work published by the *CBE-Life Sciences Education* journal (Wilson et al., 2017). These guides summarize recent literature which demonstrates that small tables with multiple sight lines and mobile dry erase boards can help facilitate collaboration. In their study comparing high- vs. low- technology active learning environments, Soneral and Wyse (2017) concluded that students and faculty found that seating arrangement and whiteboards were significantly more important for student success and engagement than the presence of technology. For these reasons, we took a low-tech approach to this active learning space, which in turn decreased budget costs.



Figure 3. Examples of LA Program in the STEM CLC

Results

“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.” --UCLA student

The STEM CLC opened in September 2017 and immediately started facilitating active learning in large introductory science, engineering, and math courses, as well as the PEERS program workshops. The photos shown in Fig. 3 demonstrate the space and furniture use, as well as the low-tech, learner-centered configuration.

CEILS, PEERS, and library staff worked together to track student attendance and evaluate the program’s impact on student academic performance. Preliminary results from a pilot study in a large enrollment (500+ student) chemistry course indicate that student attendance at collaborative office hours in the STEM CLC is correlated with significantly higher course grades. Most importantly, providing a dedicated library learning space designed for collaboration has led to significant growth in the total number of students served. Overall, more than 20% of students served through the LA program attended sessions hosted in the STEM-CLC. In the 2016-2017 academic year, before opening the CLC, the LA program served 10,818 students. The total number of students served increased to 24,874 following the opening of the STEM CLC in 2017-2018. The total number of LAs increased from 90 per quarter to 238 per quarter; instructor involvement more than doubled as well, increasing from 7-10 to 20-25 courses per quarter. Perhaps the most significant impact of the program was that opening the STEM CLC provided a new type of engagement between students and LAs, which led to significant increases in the total number of

hours of collaborative learning and engagement each quarter (Figure 4).

In 2015 and 2016 the LA program fostered LA-guided collaborative learning during discussion and lab sections, but there were few options for engagement outside of class time. In Fall 2017 the STEM CLC pilot supplemented this in-class engagement with Collaborative Office Hours, providing 5000+ students with opportunities to work together with their LAs outside of class. By Winter 2018 the program began requiring a TA present during Collaborative Office Hours (for content expertise), and, inspired by the STEM CLC space, other departments on campus adopted the model and began offering Collaborative Office Hours in their own spaces. As a result, exposure to collaborative learning still increased overall on campus by 30-50% (as demonstrated in Fig. 4).

“[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

Feedback about the STEM CLC from students, faculty, and TAs has been overwhelmingly positive. Eighty-six percent of students who attended workshops and collaborative office hours agreed or strongly agreed that those interactions helped them learn the material. As one student noted, “I really enjoy the workshops, because it allowed me to work together with other students. When we run into problems, the learning assistants were very helpful and tried to guide us through the problems rather than simply giving the answers, which would not have helped me at all.” Most students who responded to our assessment survey also

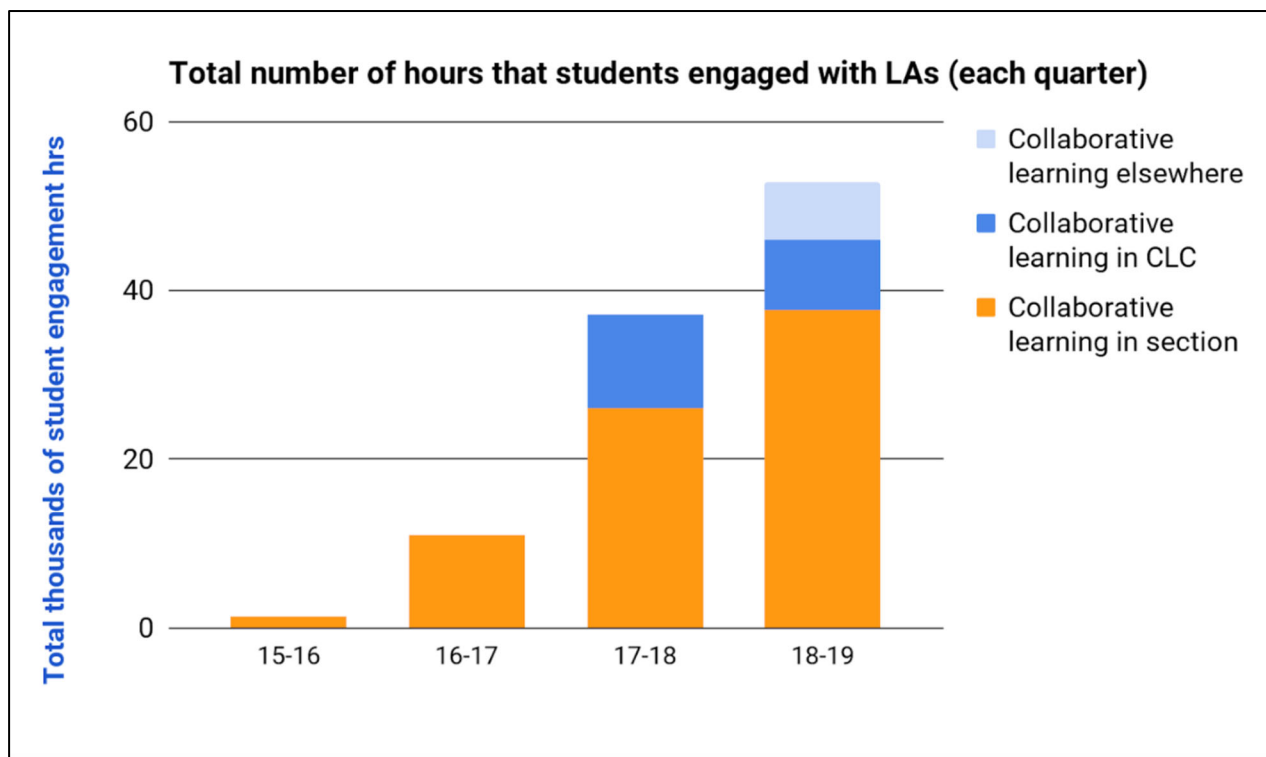


Figure 4. Total Number of Hours that Students Engaged with LAs

indicated that they wanted even more space for collaborative activities. TAs also have seen the benefit of the STEM CLC. One stated, “[The STEM CLC] is a place to strengthen critical thinking and social skills that will have impacts on student outcomes beyond their undergraduate educations and influence their collaboration in future careers and relationships.”

In addition to these program specific results, the Science and Engineering Library has seen a 17% increase in the overall use of the space (for all purposes), increasing from 68,199 in 2016-2017 to 79,524 in 2017-2018. As a result of this exposure, the Library has also seen an increase in requests for space usage, both in the STEM CLC and with some of our other teaching and learning spaces that were previously not available for reservations by non-library staff. At the time, the Library’s space usage policies did not always support or encourage use of spaces by campus partners. However, after examining usage data, library staff determined the space policies could be revised to both support the Library’s mission and priorities and also support campus partners. The Library developed a Learning Spaces Policy to dedicate half of their classroom space to accommodate campus groups focused on scholarship and research. The intent behind this decision was to maximize the use of space, continue to create and develop successful campus partnerships, and continue to increase the visibility of the Library, which still ensures that Library spaces could meet

open student study and internal staff needs. The new Learning Spaces Policy gives priority to requests for courses/workshops involving research projects; academic skills development; sciences information/data literacy; STEM pedagogy innovation and development; and history of science materials. Special consideration is given to learning communities that lack official space support (e.g., extracurricular learning communities), like the LA program and PEERS.

In addition to an increase in space usage, the STEM CLC has increased the value and visibility of the Sciences Libraries with the Library Development office and library donors. The UCLA Library Director of Communications featured the STEM CLC in a donor newsletter; there has been donor interest in funding renovations to the entire Science and Engineering Library due to the excitement and interest in these new programs and partnerships and their demonstrated impact on student success.

Through this project, the UCLA Library has strengthened its position as an essential partner in instruction and undergraduate achievement. This project has also allowed library staff to have a close look at learning as it happens in the sciences. The space aligns with UCLA’s educational innovation strategic goal to reformat the footprint of active learning, as well as the UCLA Library’s strategic goals to provide exemplary spaces for our users and demonstrate the value of the library to the campus community.

Expansion of Services

Starting in Winter 2019 the STEM CLC expanded its service offerings to include the UCLA Undergraduate Writing Center (UWC). While the UWC serves a large number of STEM students, they previously did not offer a service point on the south side of the UCLA campus, which is the home to most of the STEM departments. The UWC provides one-on-one and drop-in appointments with a Peer Learning Facilitator (PLF), students trained to offer support at any point in the writing process. This model was a natural fit with the other peer-to-peer offerings in the STEM CLC. The service has proven to be very popular with students, with a 92% fill rate of appointments in the first two quarters of its implementation.

As of Winter 2020 the Library also offers an embedded research assistance service point in the STEM CLC. This service is staffed by Research Consultants, graduate students in the UCLA Information Studies program who are trained to provide basic research assistance across all science disciplines.

Conclusion

Overall, stakeholders agreed that the STEM-CLC pilot project was a resounding success, and Library leadership decided to continue the pilot as an ongoing service model. Several key take-aways from the project are guiding local planning efforts and can inform similar work at other institutions:

- **Focusing on a shared mission:** Initial territorial concerns gave way when the project team began to emphasize the shared mission of project partners to support student success. Framing the space as a Collaborative Learning Center with a mission to support multiple campus programs and groups helped shift the conversation from "who owns this space?" to "how can we work together to make this happen?"
- **Technology integration:** In a time when administrators have become intent on reinventing library spaces with expensive technology offerings, this case study supports previous research showing that students and faculty may still prefer and benefit from the basics.
- **DIY and low-budget approaches:** Do-it-yourself and low-budget projects leveraging existing furniture can still have a big impact, especially when they bring together campus partners and align with larger campus initiatives.
- **Library as space & space as service:** Metrics for library impact do not always adequately account for the importance of space and service model design.

New metrics that focus on strategic alignment and campus partnerships need to be created and incorporated into organizational impact evaluations

- **Extra-curricular learning:** Learning, collaboration, and community building happening outside of scheduled class time have a significant impact on student success, but spaces, services, and campus partnerships must be aligned to make this possible.

In an ever-changing academic landscape, campus partners need to connect in unique ways to foster student success, increase visibility, and create innovative programming and spaces. The more that libraries, academic support programs, student affairs departments, and campus communities collaborate, the more we realize how our missions coincide and how we can work together to achieve similar goals. Through this project, the STEM CLC has become both a shared physical space and a representation of a shared vision for teamwork and collaboration in support of inclusive academic success.

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