

Engineering Connection: Growing Sustainable Outreach for Graduate Students

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Introduction

Creating dynamic outreach opportunities outside of the traditional classroom space that appeal to science and engineering students can be an exercise in excitement or frustration, depending on many factors. Narrowing that focus to graduate student events adds an additional layer of considerations. As part of the Pennsylvania State University Libraries (PSUL) Science, Technology, Engineering, and Math (STEM) Libraries Outreach Team, engagement activities tend to focus on three goals that provide sustainable and impactful experiences. These goals are community-building (including friendship), library support, and partnerships. The overarching goal with this outreach work, however, is not academic. The PSUL STEM Libraries Outreach Team seeks to foster graduate students' feelings of belonging in the library by using signature events as the cornerstone to create a stable framework for additional outreach opportunities. This strategy allows for a dynamic and responsive approach to outreach, ensuring that the library remains a welcoming and supportive space for STEM and health graduate students throughout their academic journey. The creation of graduate-specific events and targeted efforts to share important support information is key to helping students balance their personal and academic wellbeing. Allowing students the opportunity to engage with their peers beyond the classroom while offering low-stress resources can increase their own academic belonging and identity.

Graduate students arrive on campus with a foundation of discipline-specific research knowledge but often lack familiarity with the resources available on their new campus. They also tend to lose their access to their previous campus's resources and support networks. These students need support for the new concentrated writing and research they are expected to undertake in their graduate programs. Further, not all graduate students complete one degree and immediately move to another degree. They often bring with them life experiences and obligations that can make out-of-class outreach participation difficult. This can lead to frustration on a librarian's part from the perceived lack of participation.

The PSU University Park campus had 3,864 STEM and health graduate students total in Fall 2024, with 1,726 in Engineering alone [1]. With so many students, it can be challenging to adequately meet the breadth of needs and wants across the student population. The authors balance this by taking a cost-benefit approach to assessment. Broadly, we consider an event successful not just based on attendance, for that can vary greatly between small and large events, but also time and cost for developing these events. For low-investment programs, single-digit attendance is celebrated, especially in first iterations of events. For high-investment programs, success is measured relative to the work and cost of the program.

The core mission of this work is to increase graduate students' sense of belonging as part of the vibrant, large campus experience. In order to make these events appealing and worthy of adding to graduate students' tight schedules, the authors focus on the unique needs of science and engineering students to make sure activities, information, and events are relevant. This paper highlights how these goals guide not only PSUL librarians but also inform librarians from other engineering libraries to consider using these goals to guide development of similar programs at their own institutions. Library outreach, particularly engineering and STEM library outreach, can propagate from a singular program into a garden of diverse experiences and activities to support STEM graduate student success.

Literature Review

Library Outreach to Graduate Students

Graduate students often begin their graduate academic journeys with different priorities than when they were undergraduates. Beyond traditional academic goals such as getting a good grade in a class, they often also have priorities like employment or family responsibilities. Such time constraints and multiple pressures make graduate students a unique target for library outreach [2]. Contrary to common assumptions, many graduate students enter their programs without a solid foundation in navigating university resources [2], [3], [4]. This includes how students approach library resources or engage with less-than-intuitive databases and search tools [5]. Research by Tieman and Black reveals a concerning trend, that the graduate learners are frequently hesitant to seek assistance with library and research tools. Such apprehension can significantly hinder their academic progress and research capabilities [2]. Making the effort to bridge a connection with graduate students is important especially since they may be lacking in the information literacy instruction and support that is prevalent among undergraduate students [6]. Graduate students are notoriously hard to connect with outside of the classroom space and they may not consider all the resources available to them through the library as they attempt to balance the many personal and academic responsibilities graduate students must prioritize [5]. To help make this connection, it is important to introduce the library and its resources early in their academic programs [5], [6], [7]. Librarians cannot ensure they will be involved in graduate classes, so outreach activities and events are imperative for connecting with graduate students.

Recognizing this gap, forward-thinking libraries and institutions are adopting a more nuanced approach to graduate student outreach by designing programs that build upon students' existing research experiences, building on prior knowledge in conjunction with the more sophisticated demands of graduate-level study [8]. This strategy not only acknowledges the diverse backgrounds of graduate students but also fosters a more inclusive and supportive learning environment. This approach enhances students' research skills and boosts their confidence in their own academic prowess. By recognizing and building from students' previous experiences,

libraries can be more effective in their outreach efforts [9]. PSUL's experience with research consultations reveals that graduate students typically have more complex and in-depth questions and needs. Some of these needs are broadly applicable, such as setting up citation managers or mastering advanced database search techniques, while others are highly specific, benefiting from one-on-one consultations. By framing outreach as an opportunity for both connection and out-of-classroom learning, PSUL's STEM librarians can provide opportunities to learn about commonly requested topics in some settings, while helping students connect with their liaison librarians and have the chance to ask more complex questions in others. This strategy not only enhances the graduate student experience, but also maximizes the library's role in supporting advanced academic research [10]. It bridges the gap through informal learning to help graduate students be better equipped to navigate the complex landscape of academic resources throughout their studies.

Library events can support informal learning about resources and support, particularly for STEM and health graduate students. These gatherings offer more than just information; they provide a welcoming environment where students can familiarize themselves with library spaces, meet library employees, and construct valuable connections. It is important for institutions to identify the unique needs of their graduate students across various subject areas to create events and initiatives that directly impact their success [4]. Success will look different at each institution, and adjustments will be ongoing as student needs shift. At University of California, Los Angeles, the library had shrinking opportunities to engage with students through institutional-wide orientation efforts. To address this gap, the librarians in their Science and Engineering Library created the New Sciences Graduate Student Resource Fair, which has grown into a lasting and impactful program [7]. At Virginia Commonwealth University, they ended their stand-alone workshops and focused their efforts in creating a more cohesive and programmatic workshop program that leverages librarian skills to address research skills that can benefit graduate students [11]. Additionally, marketing library resources and services through in-person orientations is preferred by graduate students, even as they appreciate online workshops that provide introductions to institution-specific resources [12], [13].

Community, Belonging, and Cognitive Load

A students' quest for community is a fundamental aspect of their journey through higher education, especially for graduate students [14]. While these scholars may find a sense of belonging within their specialized departments, this connection may not extend to the broader college or university ecosystem. The challenge lies in fostering a more comprehensive sense of inclusion where the library is integral to graduate students' sense of belonging [15]. There is no "holy grail" that can address the multifaceted needs of graduate students. However, institutions may make significant strides in nurturing a sense of belonging by offering a diverse array of events and opportunities tailored to unique graduate student demographics [16]. These initiatives

serve a dual purpose: they acknowledge the distinct presence of graduate students within the academic community and provide platforms for meaningful engagement. By recognizing graduate students as integral members of the institution, universities can cultivate an environment where these advanced learners feel truly seen and valued [17], [18]. This approach not only enhances their academic experience but also strengthens their connection to the larger institutional framework, creating a more cohesive and supportive academic community. Two of the authors have published an initial review of their work to reach graduate students in this realm [19]. These interactions may contribute to students' professional development, expanding their networks and exposing them to diverse perspectives within the STEM and health fields.

There are numerous other benefits to community support for learners. Cognitive load is the amount of information an individual is able to retain in their working memory at one time [20]. When a learner surpasses that limit, it can be more difficult to process, encode, and retain new information [21]. With the frequent demands on a student's attention, finding ways to address cognitive overload is beneficial in all settings, but especially in informal learning contexts. Social connections may offer cognitive benefits similar to those observed in older adults, potentially enhancing graduate students' mental acuity [22]. As learners collaborate, they can also benefit from reduced cognitive demands by drawing on shared knowledge, a collective working memory, and a lessened cognitive strain [23], [24].

Partnerships

A collaborative approach has proven invaluable in leveraging collective expertise and resources to craft successful outreach events at the PSUL STEM Libraries. These external collaborations allow a small team to deliver graduate student support while simultaneously strengthening cross-campus connections. Having a group of organizers with a broad set of skills can help streamline the complexities of organizing, like ordering food for diverse dietary needs and coordinating space use. Additionally, partnering with other departments on large events greatly reduces planning demands for organizers. For example, inviting a department like PSUL's Research Informatics and Publishing (RePub) to participate in an event means the organizers do not need to create information to advertise their services, while RePub gets a direct marketing opportunity with graduate students. The added benefit of partnerships is the spread of cognitive load demands on a larger group of organizers [23], [24], [25]. With more partners involved in organizing outreach, there are less demands on a single person.

Collaborative partnerships also increase the appeal of library workshops and events, especially for graduate students [26]. The serendipitous nature of visiting an outreach event for writing support and discovering other relevant campus opportunities could encourage students to attend future events or learn more about other departments on campus [27].

Assessment

When developing a library outreach program, there is often pressure to assess for viability and adaptability. On a foundational level, assessment can simply be counts of attendance and participation. Incorporating the cost for an event, both in time and money, can provide a more holistic understanding of an event, situating assessment as the return on investment (ROI). Since ROI is a performance matrix to assess profitability, an outreach program might assess the costs in relation to the number of students attending or benefitting from an activity or an event [28], [29]. However, comprehensive assessment strategies can go beyond these simple ROI calculations. These may include ethnographic observations, assessing partnerships and stakeholder values, and incorporating student reflections into a holistic approach to assessment [30], [31]. It can also be used to better situate the value of low-cost programs with low attendance. Academic libraries can make more informed decisions and continuous improvements to outreach for STEM and health graduate students by understanding the true impact of their programs.

Outreach Goals

The PSUL STEM Libraries Outreach Team has three overarching goals that shape outreach efforts to STEM and health graduate students. These goals are:

1. Introduce graduate students to library resources and support in an informal setting.
2. Provide structure to help graduate students make friends and build social and professional networks, especially outside their major field.
3. Partner with other library and campus organizations to showcase their missions and ensure our events keep a sustainable workload.

These goals combine to support the growth and direction of a strong outreach program. They come together in different ways for individual programs based on factors such as the type of activity or event and the timing during an academic semester.

A critical aspect of these outreach efforts is the strategic showcasing of the diverse PSUL spaces, with particular emphasis placed on three specialized STEM branch libraries. These STEM branch libraries are positioned in close proximity to their liaison departments and are invaluable resources that are often underutilized due to lack of awareness amongst graduate STEM and health students. Bridging this knowledge gap is a crucial consideration of outreach work. There are four STEM library spaces at PSU:

1. The Engineering Library.
2. The Fletcher L. Byrom Earth and Mineral Sciences (EMS) Library.

3. The Life Sciences Library, which is housed within Paterno Library. The Pattee-Paterno Library serves as the central hub of PSU's University Park campus.
4. The Physical and Mathematical Sciences (PAMS) Library

Highlighting these specialized spaces promotes a more distributed and discipline-specific approach to PSUL utilization. This strategy aligns with a broader goal of fostering a more integrated and effective use of library resources across the STEM and health disciplines.

In the first three years of planning these events, the goals discussed here were not explicitly articulated during the planning process. However, these themes were frequently discussed when reflecting on events and therefore the spirit of these goals were present from the beginning. The first iterations of PSUL's STEM Libraries graduate student outreach began with the Graduate Writing Retreat and the Graduate Mixer, two large-scale events. Reflecting on the success of these events helped the Team to define what STEM Libraries outreach looked like and then begin to develop smaller scale events to expand the impact of this work.

Graduate Mixer

Over the past three years, the PSUL STEM-Health Graduate Student Mixer has been held one evening in mid- to late-September at the PAMS Library. The event features several engagement stations where students can interact with employees from PSUL departments and the University more broadly. The space is designed for students to choose their interests: they can visit as many stations as interest them, get food from the buffet, or chat with other attendees in various seating areas. Many attendees are graduate students who are new to campus, so the primary goal of the Mixer is to introduce and encourage attendees to connect with their peers while also familiarizing themselves with library (and partner) spaces and services.

Location and timing are important considerations when developing a large-scale event like the Mixer. The PAMS Library is the most central library location on the University Park Campus. Engineering and other STEM departments are spread across the entirety of the 8,500 acre campus so a central location may help to increase attendance. The STEM Outreach Committee works with the PSUL marketing department to design flyers which are shared across the STEM Libraries department. Including "Health" in the title was intentional, after students in those fields reported they did not feel like they were part of the STEM Libraries events. The Mixer is then marketed directly to graduate students by liaison librarians to their departments in whatever way they see fit - often through newsletters, direct emails, or in classes and orientations. It is also advertised through flyers in STEM Libraries and on digital signage in both STEM departments and the library. The timing strikes an optimal balance—far enough into the Fall semester to have time to share marketing materials, yet close enough to the beginning to help new and returning students make connections and form friendships.

Students register for the event ahead of time, which helps with planning food and supplies. All registered attendees receive an email reminder approximately two days before the Mixer to help encourage attendance. With a nod to the famous axiom, “if you build it, they will come,” the planners have found for many outreach events “if you feed them, they will come”, so food is provided as a means to encourage graduate student attendance. The Fall 2024 Mixer included an assortment of subs, vegetarian sushi, and whoopie pies (a regional dessert from Pennsylvania), along with other party foods. Offering a wide assortment of food is expensive, but the event is popular and continues to grow, from 75 participants in 2022 to 90 in 2024. By focusing PSUL efforts on offering one signature, high expense event (like the Mixer or Writing Retreat) each semester, helps the STEM Libraries Outreach Team maximize the available outreach budget. These events plant the seeds that PSUL is a welcoming space for STEM and health graduate students.

Partnerships with both other library units and departments enhance the Mixer experience for attendees by providing opportunities for informal learning through engagement stations. It also helps to make the event more sustainable for the organizers - creating a space for partners allows them to showcase their expertise while reducing the planning burden because organizers do not need to create an activity or learning outcome for each station. Quite simply, this event would not be able to successfully offer the breadth of information without them. Table 1 describes the eight engagement stations from the 2024 Mixer. These engagement stations are staffed tables hosted by PSUL staff and campus partners to provide informal learning opportunities for attendees. Informal learning outside traditional classroom settings is often characterized by self-directed activities and social interactions. In figure 1, a student learns about the Dr. Keiko Miwa Ross Global News Center’s PressReader, a resource for students to keep up with news and events from around the globe. As shown in figure 2, the J. Jeffrey and Ann Marie Fox Graduate School’s Office of Theses and Dissertations showcases how they can help students stay on top of deadlines and find resources to support their academic timelines. Creating a space that allows students to independently explore library and University services encourages attendees to learn more about topics that interest them in a space with a lower barrier to asking questions. Engaging in cross-campus events, like the Mixer, exposes graduate students to a wider range of perspectives, methods, and approaches. This diversity can broaden their outlooks, enhance their learning experiences, and foster important skills such as critical thinking and communication [14].

Engagement Station Host	PSUL or Campus Partner	Activity	Giveaway
Dr. Keiko Miwa Ross	PSUL	Attendees marked	American Chemical

Global News Center		their hometown on a world map and learned about PressReader	Society graph paper lab notebook
STEM Libraries	PSUL	Learn about citation management	PSUL flash drive
STEM Libraries	PSUL	Meet your STEM-Health liaison	PSUL Sticky notepad
Patent & Trademark Resource Center	PSUL	Learn about intellectual property	PTRC lightbulb-shaped stress ball
Research Informatics & Publishing	PSUL	Learn about open access, GIS events, and data support	Stickers and data related swag
Office of Scholarly Communications and Copyright	PSUL	Learn about open access and copyright	Stickers
J. Jeffrey and Ann Marie Fox Graduate School's Office of Theses and Dissertations	Campus Partner	Learn about theses and dissertation deadlines and resources	Graduate school swag, including notepads and water bottles
Student Affairs' Health, Promotion, and Wellness	Campus Partner	Learn about resources to support well-being and manage stress	Stickers

Table 1: Descriptions of the PSUL STEM-Health Graduate Student & Postdoc Mixer's eight engagement stations



Figure 1: A library employee interacts with a graduate student during the Mixer to introduce PressReader and the Dr. Keiko Miwa Ross Global News Center, which allows students to access current edition newspapers and magazines from around the world.



Figure 2: The J. Jeffrey and Ann Marie Fox Graduate School's Office of Theses and Dissertations employees are ready to support STEM and health graduate student completion with information on deadlines and Graduate School swag.

Making friends and forming connections increases the sense of belonging for STEM and health graduate students, which in turn supports their academic and professional development [32]. The Mixer supports this by intentionally creating a space with a relaxed atmosphere. It is an interdisciplinary social event, so it has the added benefit of creating opportunities for graduate students to connect with people in different disciplines.

An important piece of the social aspect centers around a human bingo game. When students sign-in, they receive a bingo card with spaces like “plays soccer” or “likes anchovies.” Participants mark off a space when they talk to someone who meets the criteria for that space. They receive a prize for completing any type of bingo. If they completed blackout bingo, which means every space on the card is marked, they received a second prize from a mystery box. The prizes in the mystery box were gathered during conferences or from publishers throughout the year. Most students at the 2024 Mixer completed blackout bingo, as the allure of a mystery box prize seemed to be strong. Gamifying social interaction has worked well for this event - many attendees are excited to participate in bingo and participants often continue talking to each other, even after they have filled a bingo space. One first-semester graduate student informally shared that they found friends because they attended the 2024 Mixer.

Compelling anecdotal evidence underscores the significance of the Mixer. In both 2023 and 2024, the majority of graduate students continued chatting with friends in the library after the end of the event. The 2023 event's citation management station proved particularly impactful, sparking numerous consultations on Mendeley and Zotero. The Mixer's influence extends beyond its immediate timeframe. Since its inception in 2022, there has been a notable increase in requests from STEM and health graduate students for similar events, highlighting its value and relevance. Furthermore, the partnerships forged through this initiative have shown remarkable longevity, evolving into a cornerstone of support for this and other PSUL events. This sustained engagement and growing demand serve as strong indicators of the Mixer's positive impact on the graduate student community and PSUL's space in supporting these needs.

Writing Retreat

Each spring semester, PSUL's STEM Libraries hold a multi-day writing retreat over the week of spring break. The STEM-H Graduate Student Writing Retreat began as an event just for students in the fields of Earth and Mineral Sciences. Following a hiatus during the COVID-19 pandemic from 2020 to 2022, the event was revitalized in 2023 to target all STEM and health graduate students. The event has been held in both the EMS Library and in the Pattee Library. Both locations offered spaces for food, workshops, and a large number of seating options for participants.

While there have been a few iterations which had different times and dates, graduate student feedback also helped narrow the timing of the event on the first three days of Spring Break from 10 a.m. to 3 p.m. The 2023 event, held in Pattee Library, had 92 unique attendees, with 63, 50, and 39 attendees on Monday, Tuesday, and Wednesday respectively. The 2024 event had 76 unique attendees, with 60, 37, and 38 attendees on Monday, Tuesday, and Wednesday respectively. The 2024 event was held in the EMS Library, a space further from central campus, which may have resulted in the lower turnout of unique individuals, despite maintaining similar daily attendance levels. Typically, the highest attendance is the first two days, with a smaller turnout on the final day. While not discussed below, the 2025 event was expanded to include all graduate students and was again held in Pattee Library. This event was highly successful, with 135 unique attendees: more than half from STEM disciplines.

The main goal of the Writing Retreat is to provide space and time for graduate students to work on writing projects, such as theses, dissertations, academic projects, or research outputs. As seen in figure 3, participants could share their writing goals on a whiteboard, adding a degree of accountability that some participants reported they appreciated. Secondary goals include providing low-stakes social interaction for students while supporting their cognitive load by reducing distractions and providing basic needs like food (and caffeine) while they write. The event planners create and distribute study packs for attendees that feature PSUL items and collected STEM vendor swag. Over the years, these study packs have featured reusable water bottles, sticky notes, pens, and flash drives, all of which support writers during and after the Retreat. Each day, the planning team and partners present an option to attend short lunchtime workshops on relevant topics for graduate students. As shown in figure 4, the 2024 STEM-H Graduate Student Writing Retreat was expanded and renamed as the STEM-H Graduate Student and Postdoc Writing Retreat. The goals were similar for STEM postdoctoral scholars (postdocs). Unfortunately, no postdocs attended the Writing Retreat and post-retreat feedback from postdocs was that they did not feel like they had the same needs as graduate students. Since then, most postdoc messaging has been removed from the marketing materials, but postdocs are still welcome to attend.

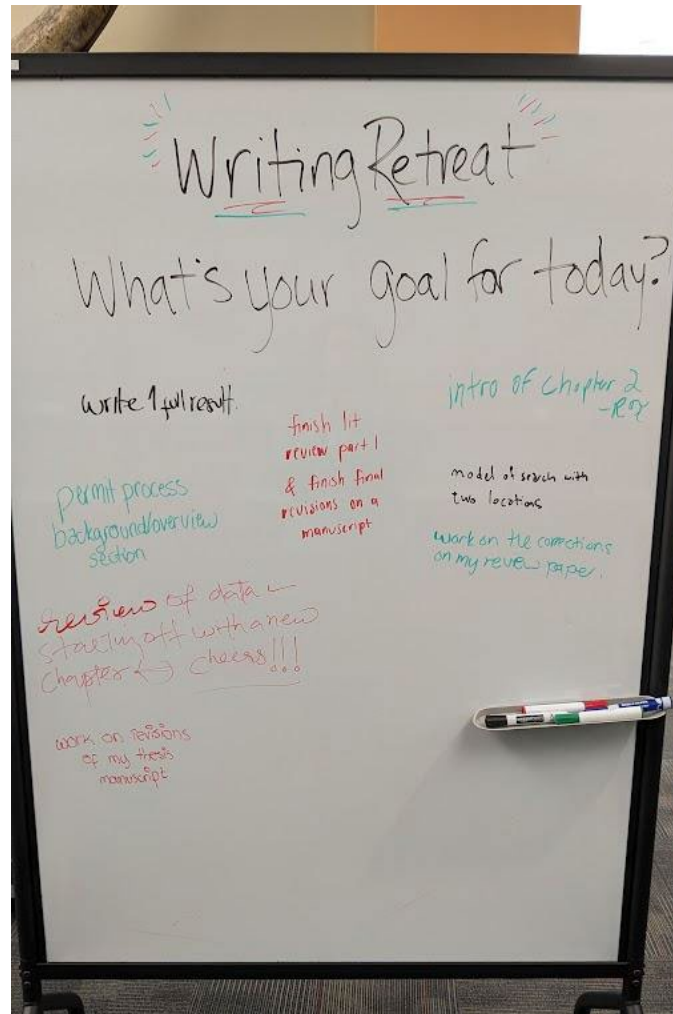


Figure 3: Attendees were able to share writing goals on a whiteboard at the beginning of each day of the Retreat.



Figure 4: Welcome board for 2024 STEM-H Graduate Student Writing Retreat. It was updated each day with daily workshop information, times for consultations, and other relevant information.

These lunchtime workshops present valuable opportunities for graduate students to learn outside the classroom through informal learning. In 2023, the PSUL STEM Outreach Team partnered with both the J. Jeffrey and Ann Marie Fox Graduate School and PSU's Student Affairs' Health, Promotion, and Wellness. That year, the partners offered workshops which focused on stress reduction and mindfulness practices. Guided by feedback, in 2024 the planning team shifted the workshops to focus more on research topics, while continuing to offer information about wellness and stress reduction in the swag bags. In 2024, the Monday workshop was provided by RePub. Both the Tuesday and Wednesday workshops were offered by STEM librarians, who shared information on citation managers and setting up database alerts. All of these workshops presented information at a relatively high level with encouragement for students to visit their librarians for individualized support.

The Writing Retreat's structure has been carefully designed to maximize its effectiveness for graduate students. Library experts are available throughout the Retreat for drop-in consultations for research related topics such as data management and citation managers. The point-of-need

help model has resonated strongly with graduate students. Experience has shown that students often hesitate to seek assistance unless they have a clear understanding of their specific needs [33]. Embedding personalized assistance within the context of dedicated writing time has yielded exceptional results. By offering support at the moment it is most relevant and applicable, the planning team observed increased engagement and a greater willingness among students to seek assistance during the event than with students simply using library spaces. This approach not only enhances the immediate productivity of the Writing Retreat but also can foster longer-term comfort with utilizing library resources.

While social interaction played a less central role in the planning goals for the Writing Retreat than it did for the Mixer, the event still serves to bring together STEM and health graduate students across disciplines and gives them the opportunity to make friends and strengthen professional connections. As shown in figure 5, some students arrived in groups and worked in the same space and others met each other during lunch or trips to the coffeemaker and then chose to sit together to write in the afternoons. Others connected with librarians, including a student who chatted with the planning team while getting coffee and returned later to share the exciting news that she had received her first job offer.



Figure 5: Graduate students working in small groups during the Writing Retreat.

Like the Mixer, a large event like the Writing Retreat could not be as successful without partnerships. In 2023, the PSUL STEM Outreach Team partnered with both the J. Jeffrey and Ann Marie Fox Graduate School and PSU's Student Affairs' Health, Promotion, and Wellness to offer information and resources for students. Based on feedback, workshop topics and partnerships shifted to better meet the graduate student needs. Following a successful partnership for the Fall 2023 Mixer, the planning team worked with the Graduate Writing Center to offer drop-in hours with them during the 2024 Writing Retreat. As mentioned previously, a librarian

from RePub offered both a workshop and drop-in data help hours for graduate students. These services would not have been possible or as effective with only the expertise of the STEM librarians.

In addition to creating a space to help STEM and health graduate students, the Writing Retreat is the event used to capture the most in-depth formal assessment in the form of a nine-question survey. For the 2024 survey, the planning team had a 43% response rate. Graduate students provided very detailed feedback, sharing that the event was well organized and thoughtful and that they particularly appreciated not having to worry about food. Reducing outside worries can reduce overall cognitive load, making academic work slightly easier for graduate students [22]. While the PSUL STEM Outreach Team uses some questions to assess the event, other questions allow graduate students to share other learning and or social opportunities they are interested in attending. Many of the graduate students asked for more events like the Writing Retreat.

STEM Outreach Program Growth

With the continued success of a large, signature event each semester, the PSUL STEM Outreach Team has enjoyed some flexibility in developing and piloting smaller events throughout the semester. Many of these events were developed based on feedback received during the Writing Retreat and the Mixer. The Team focused on two key programs implemented in the 2024-2025 academic year: a series of informational workshops and the introduction of Finish it Fridays. These programs were designed in response to feedback from previous events and aim to address the specific needs of STEM and health graduate students by providing introductions to topics of interest through the workshops and a dedicated space and time to write at Finish it Fridays.

The Fall 2024 workshop series covered a broad range of relevant topics and issues, and were presented by STEM librarians with expertise in each topic, which included:

1. Using citation managers (Zotero and Mendelay)
2. How to read a scientific article
3. Highlighting free health information resources
4. Building and managing your scholarly presence
5. Systematic reviews/evidence synthesis
6. Setting database alerts
7. Predatory publishing
8. Finding and requesting standards

STEM librarians chose to present from a list of suggested topics, or they proposed their own topic. The goal was to offer a wide variety of topics that graduate students had previously requested and to use the first semester of workshops as a test to see what students were actually

interested in. All of the sessions were offered synchronously in-person and over Zoom from the Engineering Library. As the Engineering Library had just moved to a new space, these workshops presented an opportunity to introduce the new location to STEM and health graduate students and STEM librarian presenters. The hybrid format was chosen to ensure broad accessibility to the sessions, which were all hosted on Wednesdays from 5 p.m. - 6 p.m.

The purpose of these workshops was to provide ancillary support to the research activities students were already (or may soon be) engaging with in their specific fields. Many of these sessions also covered topics that may not be covered in their general course work but will still be helpful in their academic futures (e.g. predatory publishing and managing scholarly presence). Graduate and undergraduate students were encouraged to attend any workshops with topics that interested them. The PSUL STEM Outreach Team was able to bring together eight different librarian presenters for the workshops and each presentation focused on a topic of interest or expertise for that librarian. While at least one member of the STEM Outreach Team was present for all of the workshops, members did not need to develop and present each workshop on their own. Since there were typically a minimum of two librarians available, this was also considered an opportunity for informal library and research support if an attendee had a question beyond a presented topic.

After the completion of the workshops at the end of the semester, a survey was sent out to everyone that registered for reminders to these events. Not everyone that signed up attended, but the Team felt that graduate student feedback would provide valuable input as to why interested students were unable to attend. The Team also hoped to build a list of other topics that students may be interested in seeing in future workshops. Unfortunately, there were only two responses shared, both from students that attended. These students indicated which workshop they attended, what they learned, and changes they hope to see in the future. Students confirmed that providing a Zoom option for each workshop and having workshops in the evening were very convenient. For future workshops, one respondent indicated an interest in seeing a session on AI ethics in research. This suggested workshop topic is being addressed in Spring 2025.

While workshop attendees shared positive feedback from their experience, attendance numbers were relatively low, with an average of two attendees per session. For Spring 2025, the team pivoted by reducing the number of workshops and limiting the topics to just citation managers, searching on PubMed, and using generative AI for research. The workshops are offered only online on different days of the week and at different times of day. Reducing both the time cost by offering fewer workshops and fewer topics, as well as lowering the staffing need by only having members of the Outreach Team present allows the Team the space to better understand the best time and topics for workshops.

In addition to the workshops, the Team also explored expanding part of the mission of the Writing Retreat. Participants asked for a dedicated, quiet space and time for writing. The Team launched Finish it Fridays in Fall 2024, which took place on three Friday mornings during the semester. The event was held in a multi-purpose classroom in the Life Sciences Library in Paterno Library and offered attendees a quiet writing space in a central campus location. Finish it Fridays was marketed specifically to graduate STEM and health students, providing them two uninterrupted hours three times per semester in a reserved study space with plenty of tables, chairs, and complimentary hot beverages. Three to four STEM librarians were typically available in the vicinity of the space for any questions, but students generally kept to themselves as they focused on completing their writing projects. An average of 3 students arrived for each session, with the final November date having the most students with 5 attendees.

Feedback for the Finish it Fridays events was more informal. Participants remarked to the PSUL STEM Outreach Team that they were glad for the dedicated space and time. Often, graduate students continued working in the provided space past the scheduled end of the event. A powerful moment of validation emerged when a participant sought out a Life Sciences staff member after the event. Through this informal conversation, the staff member relayed enthusiastic feedback that encapsulated the core purpose of this initiative. The staff member shared that, “The patron LOVED the event and said she is looking forward to it again. She said it was great to have a space to just focus!” This spontaneous, unsolicited feedback serves as a meaningful affirmation of the Team’s outreach goals. It demonstrates that by creating purposeful spaces and opportunities, libraries can directly support graduate students' academic and professional development. More importantly, it underscores the significance of listening to and responding to students' unmet needs. Finally, while attendance was low, the financial and work costs were also low. The Team budgeted \$50 for beverages for the 6 events across two semesters and ended up spending only \$30. The room reservation is straightforward, and gathering the STEM Outreach Team to be available for setup and questions during the event has also provided us with time to meet, plan for upcoming events, or even complete our own writing. The success of the larger events coupled with the low cost of the smaller events has helped the Team to justify the budget and work time to try new things.

Recommendations

To foster the sustainable growth of a robust outreach program, it's essential to nurture its roots with care and attention. While the preparation for these events demands significant time and resources, the multifaceted benefits they yield for graduate students, librarians, and campus partners justify the investment.

The PSUL STEM Outreach Team initiates its planning and organizational efforts during the summer months, providing ample time to:

1. Establish clear, measurable goals.
2. Secure optimal event locations.
3. Forge strategic partnerships both within the library and across campus.
4. Develop efficient registration systems.
5. Address logistical considerations, including food.

This proactive approach allows the creation of a solid framework for events, ensuring that every aspect is thoughtfully considered and efficiently executed. By laying this groundwork, the quality of individual events is enhanced for an overall strong and resilient outreach program. The time invested in this early phase leads to well-organized events that can effectively meet the needs of the STEM and health graduate student community.

Partnering with the PSUL Public Relations and Marketing Office is essential to successful outreach and is a significant portion of the preparatory work. This process involves collaborating with a designer to create a suite of promotional materials, including eye-catching posters, dynamic digital signage, and other tailored content. To work effectively with this department, ample time is necessary to create materials and put advertisements in place; in the case of the STEM Outreach Team, these requests are submitted at least two months prior to the event. Submitting materials to the department ensures that despite expected delays, outreach posters and other items can be shared in a timely manner. Planning ahead also gives possible partners time to respond in a time that works best for them.

Documentation is another key recommendation for all outreach and informal learning efforts. The PSUL Outreach Team regularly references marketing materials, feedback, and logistical notes from previous years to help us determine the costs and resources needed when requesting funding. It is recommended for librarians involved in outreach work to consider the following best practices for a successful event.

1. Keep notes regarding:
 - a. Planning timelines.
 - b. Partner collaboration messaging.
 - c. Liaison departmental email messaging.
 - d. Internal library messaging.
2. Establish roles during the event itself
 - a. Consider how event attendance is collected. Recommendations include the use of a sign-in sheet to gather additional information or a clicker for collecting the number of attendees.
 - b. Discuss who is coordinating with partners during the event for set-up and questions.

- c. Assign someone to take pictures during the event.
 - d. If there is food, ensure someone is in charge of refreshing food trays and making sure the space is tidy during the event and at the conclusion.
- 3. After the event has concluded
 - a. Within a few days, while the details and anecdotes are fresh, create a summary that includes details about partnerships, participants, logistics, and any relevant feedback.
 - b. Acknowledge partners and anyone supporting the event through thank-you notes/emails/internal kudos.
 - c. Ensure all planning documents are gathered and updated for the next year.

All together, these practices help to create subsequent marketing or assessment reports to show impact. With the documentation and practices in place, it helps an outreach librarian or team then continue to grow their own outreach to build new events.

Conclusion

Developing an outreach program, especially for STEM and health graduate students, can be both challenging and rewarding. Developing goals that align with individual capacity, available resources, and specific audience needs is a key to success. This strategic alignment is crucial for librarians looking to cultivate popular yet sustainable programming. Implementing a few large-scale signature events can help you build momentum and gather a large enough group of participants to collect feedback that will inform the direction of other programs. These events provide valuable opportunities for comprehensive feedback, which can then in turn inform future refinement. An iterative approach allows for adaptation to evolving STEM and health graduate student needs.

It is important to acknowledge that the path to a successful program may often involve trial and error. Not every outreach event will be successful, but they will still give you insight into what people are or are not interested in. Being flexible, nimble, and open to feedback will let you grow a holistic program that supports the needs of science and engineering graduate students.

Regarding IRB and Participant Feedback

For this specific project, we contacted Penn State's Institutional Review Board on 6 March 2025 and they responded that an IRB review was not required to publish about the participant feedback that has informed our library's approach.

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