

SPOTLIGHT

Excluded Identity Retention in STEM: A Roadmap for Inclusive Undergraduate Research Symposia

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INTRODUCTION

Undergraduates make up a critical portion of STEM research workers at universities. However, undergraduate researchers coming from racial, cultural, socioeconomic, gender, or other groups that are historically underrepresented in STEM (i.e., excluded identity [EI]; Bhatti, 2021) often have difficulty accessing professional development opportunities that might encourage them to pursue a career in a STEM field (Barber et al., 2020). To support EI students and increase retention in STEM beyond the undergraduate level, opportunities to build scientific skills should have a low barrier to entry and provide ample training.

One essential skill for a successful career in STEM is the ability to communicate scientific knowledge and findings (Cirino et al., 2017; Easterly et al., 2017). Critical presentation skills (e.g., drafting an abstract, creating a poster, public speaking) are often introduced in undergraduate classrooms but not developed until the time comes to present at research conferences. To address the critical lack of scientific communication training opportunities for EIs, graduate students in the Ecology, Evolution and Marine Biology (EEMB) department at the University of California, Santa Barbara (UCSB), conceived, developed, and ran an on-campus departmental undergraduate research symposium that created an informal, small-scale conference atmosphere, allowing undergraduates to become familiar with traditional conference structure and hone skills in science communication, all at no cost to the attendees.

EVENT LOGISTICS

RECRUITMENT AND ADVERTISING

Stirring up interest within the department was spearheaded by the graduate students planning the event, and word-of-mouth was key in encouraging undergraduate researchers to apply. To advertise event registration to the larger community, emails were sent to listservs that were related to biological sciences. Participation was open to any undergraduate in biological sciences who wanted to present. Presenters were asked to submit an abstract upon registration; however, this was purely for planning purposes, and no student with a topic in ecology, evolution, or marine biology was denied the opportunity to present.

PRESENTATIONS

Student presenters were offered a range of options so they could choose which format fit the current state of their work and best matched their comfort and experience levels. We recommend offering poster presentations, five-minute lightning talks, and 10-minute talks with three minutes for questions. There was an increase in presenters during year 2, and to accommodate all who wished to participate in the day-long event, we shortened the time for presentations from 12 minutes and three questions to 10 minutes and two questions. Direct guidance for undergraduates who are developing

presentations is a critical component for a successful symposium. We expected that this would be most participants' first time presenting at a symposium, so we provided a list of resources on our event website that could guide them through the process of abstract writing and developing a poster or talk.

PRESENTATION FEEDBACK

All presentations were evaluated by graduate student and faculty volunteers, and feedback was returned to presenters after the event. All feedback was constructive and based on a rubric that emphasized guidelines useful for beginner presenters. To bolster presenters' resumes and celebrate exemplary work, we awarded printed certificates and gift cards for the highest scoring presentations.

VENUE AND FOOD

Early in our first year (2022), we sent out a department-wide survey to gauge interest in the symposium in order to estimate attendance and to select the appropriately sized on-campus auditorium and outside space for poster presentations, as well as to determine the length of our event (one day vs two). In our second year (2023), we used the previous year's attendance to choose an adequate venue. The venue should have ample seating, a projector, and a microphone, and be easy to access for students with limited transportation.

Symposia are mentally and socially intense events. Having snacks and coffee regularly available can help maintain the energy and attention of attendees as well as provide impromptu networking opportunities. Because our symposium lasted all day, we also provided breakfast and lunch for participants.

CREW

From the beginning, a core planning committee of five to eight graduate students was successful in planning and coordinating an efficient symposium. We staffed the event with 20 short-term volunteers by creating 30 ten-minute tasks for volunteers to choose from.

FUNDING

To eliminate financial barriers for participants, all costs associated with attending this symposium can be covered by community fundraising initiatives, grants administered through campus organizations, and intra- and inter-departmental support. We also budgeted for several poster printing scholarships for students who were unable to acquire funding from their labs.

UNIVERSITY SUPPORT

Campus entities such as Associated Students and the Graduate Student Association likely have larger grants (\$1,000+) to cover costs of catering (the largest budget item) and campus poster stand rentals. We found that our department was willing to cover the costs of smaller elements of the symposium, specifically, the rental of poster stands.



Students present their posters during the 2022 undergraduate research symposium poster session. Photo credit: Bridget Vincent

COMMUNITY SUPPORT

To encourage community support and awareness of the symposium, we created an outreach and fundraising event called “Science by the Pint” (SBTP). We partnered with a popular local brewery to offer weekly science outreach talks in exchange for a percentage of beer sales during the talks. SBTP ran from February to April, and our group was able to fundraise 17%–20% of our budget. SBTP also offered a platform to showcase UCSB research projects that undergraduates participate in, effectively reinforcing the importance of undergraduate involvement in research. Stickers with our event logo were sold for \$3 during SBTP.

RESULTS

To gauge the efficacy of our symposium, presenters were asked to take a post-event survey. Responses indicate that this event can be helpful in increasing a sense of belonging in STEM, as 33.3% more strongly agreed with the statement “I can envision a future career in science,” 60% no change, and 6.6% said their agreement went down by one point. Of the students who reported increased ability to see a future career in science, 33.3% of demographic selections were Asian, 50% White, and 16.6% selections were Hispanic or Latino, with one student selecting both White and Hispanic. These results hint at the potential to continue cultivating a sense of belonging and empowerment in STEM for EI students.

LESSONS LEARNED

- **It takes a village.** Cultivating and maintaining relationships within your community can greatly support your efforts to implement this event and ensure its longevity.
- **Provide resources to support students in developing their presentations.** The 2023 presenter surveys tell us that this is a majority of students’ first time presenting at a symposium. Providing presentation development resources is key, as students likely have little familiarity with conference etiquette and expectations.
- **Incorporate undergraduate input into the planning.** It is critical that this event provide opportunities and experiences that benefit undergraduates from the beginning.
- **Choose a venue easily accessible to students.** Second only to lack of opportunity, one of the most cited reasons for this being presenters’ first symposium was travel. Having the symposium in one of the many large lecture halls on campus minimizes the logistical challenge of travel.
- **Stay flexible.** Allow post-registration requests for changes in presentation format or timing of presentations to maximize participation, and tailor the event to students’ needs (e.g., requesting a morning talk slot because of a work shift in the afternoon, switching from a talk to a poster due to change in data resolution).

TAKEAWAYS

The goal of this event was to provide EI undergraduate researchers with a no-cost, easily accessible, and comfortable environment to deliver scientific presentations in the absence of a formal alternative and to gain a sense of belonging in STEM. Ultimately, we found that an annual departmental undergraduate symposium provides opportunities that can contribute to increased retention in STEM. It is important to note that our methodology is shaped by our community and adjusted to the barriers within our own institution, but we hope this roadmap may be of use for those at other universities who are looking to create a similar event that can support, celebrate, and empower undergraduate researchers from historically excluded backgrounds in STEM. For more resources on how to host this event at your own institution, including a detailed “How-To” handbook, please visit our GitHub repository (<https://github.com/madisonheard1/EEMBURS>).

REFERENCES

- Barber, P.H., T.B. Hayes, T.L. Johnson, L. Márquez-Magaña, and 10,234 Signatories. 2020. Systemic racism in higher education. *Science* 369(6510):1,440–1,441, <https://doi.org/10.1126/science.abd7140>.
- Bhatti, H.A. 2021. Toward “inclusifying” the underrepresented minority in STEM education research. *Journal of Microbiology & Biology Education* 22(3):e00202-21, <https://doi.org/10.1128/jmbe.00202-21>.
- Cirino, L.A., Z. Emberts, P.N. Joseph, P.E. Allen, D. Lopatto, and C.W. Miller. 2017. Broadening the voice of science: Promoting scientific communication in the undergraduate classroom. *Ecology and Evolution* 7(23):10,124–10,130, <https://doi.org/10.1002/ece3.3501>.
- Easterly, R.G., A.J. Warner, B.E. Myers, A.J. Lamm, and R.W. Telg. 2017. Skills students need in the real world: Competencies desired by agricultural and natural resources industry leaders. *Journal of Agricultural Education* 58(4):225–239, <https://doi.org/10.5032/jae.2017.04225>.

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