RESEARCH ARTICLE | NOVEMBER 17 2023

Key features of a long-standing student-led women in physics mentoring program

Mary K. Chessey ✉; Sara D. Negussie; Megan D. Marshall Smith; Mika A. Chmielewski; Kristen M. Burson; Alison E. Duck; Kathleen A. Hamilton-Campos; Amitava Banerjee

AIP Conf. Proc. 3040, 060008 (2023)
https://doi.org/10.1063/5.0176033

Key Features of a Long-Standing Student-Led Women in Physics Mentoring Program

Mary K. Chessey[1, a)], Sara D. Negussie[2], Megan D. Marshall Smith[3], Mika A. Chmielewski[4], Kristen M. Burson[5], Alison E. Duck[6], Kathleen A. Hamilton-Campos[7] and Amitava Banerjee[8]

[1]*Barcelona Supercomputing Center, C/ Jordi Girona 31, 08034 Barcelona, Spain*
[2]*Wesleyan University, 45 Wyllys Ave, Middletown, Connecticut 06459, USA*
[3]*Hamilton College, 198 College Hill Rd, Clinton, New York 13323, USA*
[4]*Duke University, 120 Science Dr, Durham, North Carolina 27708, USA*
[5]*Grinnell College, 1115 8th Ave, Grinnell, Iowa 50112, USA*
[6]*The Ohio State University, 281 W Lane Ave, Columbus, Ohio 43210, USA*
[7]*Johns Hopkins University, 3400 N. Charles St, Baltimore, Maryland 21218, USA*
[8]*University of Maryland College Park, 4254 Stadium Dr, College Park, Maryland 20742, USA*

[a)]Corresponding author: mkchessey@gmail.com

Abstract. As members of the student-initiated and student-led Women in Physics (WiP) organization (now called "Physicists of Underrepresented Genders") in the Department of Physics at the University of Maryland College Park, we describe a mentoring program that started in 2012. The WiP group prioritizes creating a welcoming social environment for women and gender-diverse members of the physics community, as well as opportunities to network and learn about academic and career development. Each year, the long-standing mentoring program pairs interested undergraduates with graduate student or postdoc volunteers. Mentor-mentee matches commit to meeting for the academic year, but pairs often continue in following years and even after leaving the university. The WiP student organization leaders encourage pairs to meet at least three times during a 12-week semester, and group activities are organized to support this goal. Brief surveys completed by participants over the years have enabled the WiP leadership to assess and improve the program iteratively. In-depth reflections from one recent mentor-mentee pair provide insight on key elements that may have been the most beneficial to participants. Mentor-mentee interactions shifted to a virtual, long-distance environment during the COVID-19 pandemic. Implications for starting or maintaining mentoring programs for women in physics are discussed.

CONTEXT AND DESCRIPTION OF THE MENTORING PROGRAM

The University of Maryland College Park (UMD) is located on the ancestral lands of the Piscataway People, who were among the first in the Western Hemisphere [1]. The UMD Department of Physics is one of the largest in the United States, with over 200 faculty, staff and lecturers; nearly 700 undergraduate and graduate students; and over 100 postdocs. Between 2017 and 2019, UMD Physics awarded 72 bachelor's and 26 doctoral degrees each year on average, predominantly to male graduates [2]. The mismatch of sex and racial demographics of physics graduates with state and national populations is influenced by sexism and racism [3–5].

The Women in Physics (WiP) student organization (now called "Physicists of Underrepresented Genders") was founded in 2008 and is led by seven student officers. Early WiP leaders among the authors report guiding influences to the development and evolution of WiP from established physics student community groups as part of the Access Network in the USA, including the Sundial Project at Arizona State University, the Compass Project at the University of California Berkeley, and the Equity Constellation at UMD. WiP aims to provide a welcoming and supportive environment for women and gender-diverse members of the physics community at UMD and to create networking and career development opportunities [6]. WiP is open to everyone—undergraduates, graduate students, postdocs,

Women in Physics
AIP Conf. Proc. 3040, 060008-1–060008-5; https://doi.org/10.1063/5.0176033
Published by AIP Publishing. 978-0-7354-4718-9/$30.00

faculty and staff and people of all genders. Besides hosting professional development sessions and a mentoring program, WiP also organizes many fun social events for everyone to come together and connect over physics. WiP activities are funded in part by an endowment. WiP activities include an annual meeting that serves as the start of the mentoring program, mentor training and a weekly coffee and study hour.

Launched in 2012, WiP runs a yearly mentoring program that pairs undergraduates with mentors who are usually graduate students or postdocs. The goal of the program is to foster a supportive community for undergraduate women interested in physics or adjacent fields. Individual mentoring pairs are tailored to the goals of the student and what they are looking for in a mentor, including research or academic advice. Near the start of each academic year, WiP sends out an email invitation and sign-up form for the mentoring program with questions about applicants' role at the university and research area. People who sign up then receive information about a speed matching event where mentors and mentees can meet each other, but attendance at the event is not required. Mentors then also receive information about an optional mentor training session. Finally, WiP puts matched groups (either pairs or small groups of three or four people) in email contact, encourages monthly meetings, organizes occasional social gatherings to facilitate meetings and requests regular updates in the form of brief surveys. The survey invites participants to report on topics of discussion (coursework, research, employment, personal, social or cultural issues, etc.), how partners are doing and getting along and any concerns. Surveys were collected for program evaluation, not formal research, but a brief quantitative summary of responses from 2013 to 2019 with an average response rate of 53% or 13 participants each of the 11 semesters suggests that most mentees got along well or very well with their mentors (83% of mentees on average each semester) and reported that they benefitted from the mentoring program (67% on average). Deeper analysis of responses from the second semester of the 2018–2019 academic year revealed that most mentees benefited from their relationship with their mentor academically (11 out of 14 responses), with an increased sense of belonging (9/14), with a stronger support network (10/14) and overall (9/14).

Slightly over 10% of mentoring groups (of two to four people) between 2013 and 2019 were partnered through the program for multiple years, and some of those remained in contact even after leaving the university (including authors MKC and SDN). Authors who participated in the WiP mentoring program reflected that some aspects of these long-term partnerships that may have contributed to their longevity include prioritizing regularly scheduled meetings; having occasional privacy for personal conversations; encountering each other frequently, such as in the hallways, shared office or lounge, or at research group meetings and meeting socially.

NINE-YEAR HISTORY OF THE STUDENT-LED MENTORING PROGRAM

After nine years, the WiP mentoring program has persisted beyond its student founders' time at UMD. Figure 1 illustrates participation in the mentoring program each year. Several factors may have contributed to the increased participation between 2017 and 2019. Authors who are former WiP leaders reflected that likely causes for the increase may have included advertising at the university's student group fair, word of mouth advertising, individual personal invitations, the implementation of mentor training sessions and a brief partnership with an organization of astronomy students. Participation decreased in the 2019-2020 academic year for many likely reasons, including a significant turnover in WiP student leadership due to graduation of previous officers, a return to independence from the organization for astronomy students and the COVID-19 pandemic during the second semester.

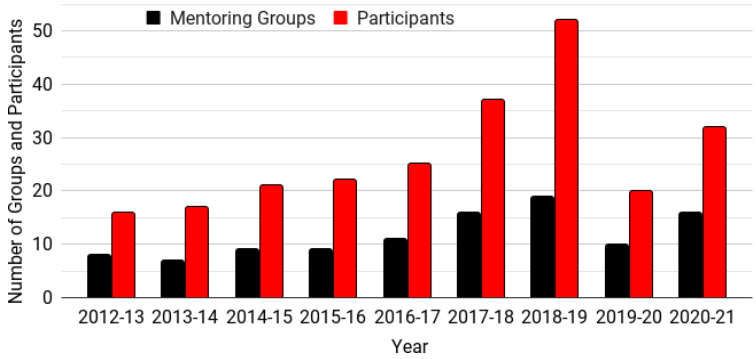

FIGURE 1. Participation each year since the launch of the WiP mentoring program. Each academic year is labeled by two calendar years because the academic year begins in August and ends in May of the following calendar year.

In January 2012, the American Physical Society (APS) Conference of Undergraduate Women in Physics (CUWiP) took place at six sites simultaneously across the USA. Physics majors from UMD attended the conference at their regional site. The conference experience invigorated participants and inspired them to create the mentoring program. These student leaders also collaborated with faculty and staff to host the 2014 CUWiP at UMD. In 2015, the blossoming WiP organization was awarded an APS Committee on the Status of Women in Physics (CSWP) grant. APS CSWP grant awardees receive a total of up to 1,000 USD to improve sustainability of a group by funding activities such as networking events, mentoring meetups, career workshops, lab tours, and field trips.

Student leaders continuously solicited and analyzed feedback from participants in the mentoring program. In 2016, WiP officers observed that undergraduate students could benefit from advice and mentorship from other more senior undergraduate students (e.g., which classes to take, professors to talk to, dormitories to choose). Creating mentoring *groups* of three or four people instead of strictly pairs allowed more flexibility in matching and blurred the lines between mentor and mentee, enabling intermediate-level participants to practice mentorship skills under the guidance of a mentor. In 2018, WiP formed a brief partnership with Astronomy Gentleladies' Network (now Astronomy Community Engagement [ACE]) to bring together women in physics, astronomy and astrophysics for greater community. ACE has since shifted the focus of its work, but the WiP mentoring program continues to welcome astronomy and astrophysics students. Also in 2018, WiP developed mentor training sessions, designed to help mentors, especially first-time mentors, understand their role and the many ways they can be an effective mentor. Training sessions are a casual way for experienced mentors to pass down suggestions and for connecting mentors with UMD-specific resources. In January 2020, UMD hosted roughly 150 attendees at its second APS CUWiP, thanks in large part to the active leadership and organizing work of WiP members.

MENTORING ACTIVITIES

Some typical mentoring activities reported by authors and in surveys include eating together, playing games and meeting regularly (at least once per month for an hour) to check-in. Privacy at some check-in meetings allows for discussion of personal matters such as academic transcripts or home and health issues. In the experience of authors who participated in the program, some mentoring activities may have special benefit to women in physics, such as responding to instances of perceived discrimination in the department. Authors also reflected that mentoring program participants may learn from each other in a safer, informal environment about shared experiences of microaggressions or structural barriers and may identify patterns of behavior of their colleagues. Some participants reported working together to draft professional correspondence (e.g., write an email to a professor to ask about joining their research group), plan academic and career goals, revise professional profiles and CVs, and practice research talks. Others met purely socially over lunches on campus. Doing these tasks together may help participants cope with a sexist environment by providing reassurance that improves their sense of belonging in physics [7, 8].

In the following two sections, detailed reflections of two authors are shared to give a more personal perspective into participation in the WiP mentoring program. These descriptions do not represent the collective community experience. Instead, they illustrate some of the considerations, motivations and strategies of one mentee and one mentor who developed a long-term friendship in direct consequence of the WiP mentoring program.

Advice for Mentees from a Mentee

Author SDN succeeded in completing her physics bachelor's degree while participating as a mentee in the UMD WiP Mentoring Program. SDN's success likely relied on many of her active strategies in seeking out support from multiple different sources, not only the mentoring program. For example, SDN also started regularly attending office hours for all her physics courses, finding and meeting with physics graduate student mentors who shared her research interests or similar background experiences, prioritizing her mental and physical health and engaging in fulfilling community-oriented activities. The one or two hours per week (more frequent than the minimum recommendation of once per month) spent meeting with her mentor MKC was only a small influence on the outcome of her senior year. SDN demonstrated that mentees play an active and demanding role in their own mentorship experience. As such, SDN compiled the following advice for mentees:

- **It is common and acceptable to switch mentors or have more than one.** It has to be a mutually beneficial relationship. Don't get discouraged if your first few do not click. Try to be open, honest and

upfront about your needs. If one or both of you don't think the partnership is a good match, it is better to find someone else.

- **Relationships take time to develop.** It is okay if you need a few meetings before you are comfortable to share your goals for school, internship applications, transcript, career aspirations, and so on. Remember, your mentor signed up for this position to help you, not to judge you.
- **Understand what you want from this relationship and these meetings.** Think about why you signed up for mentoring. What tools and resources do you think a mentor can provide (e.g., personal experience, networking skills)? If there is a goal you have, how can your mentor help you? How can the meetings run effectively so you can work towards your goals?
- **Work with your mentor's strengths and past experiences to see how they can help with your goals.** For example, if your mentor has already applied to graduate school, and you want to as well, they can give you advice on timelines, asking for letters of recommendation, and choosing universities.

Mutually Beneficial Mentoring

For MKC, meeting with her partner SDN was an enormous source of energy and hope, and it connected her to the department outside her subfield, combatting a feeling of isolation often experienced by postdocs. MKC describes mentoring as engaging with one's own community of scientists and having a stake in present and future scientific endeavors. Participating in the mentoring program is an invigorating experience. Interacting with mentees is engaging and stimulating, causes reflection, uses problem-solving skills, gives new perspectives and information that mentors otherwise might not have, supports mentors in learning their own weaknesses, and refines how mentors work day-to-day to become the models they want to be for their mentees. The mentor-mentee designation is slightly arbitrary (SDN is MKC's mentor in many areas) but useful to spark the relationship with some built-in structure, which can be adjusted over time. As a result of the fulfilling friendship formed by participating in the mentoring program, MKC feels a positive influence in attitudes about work and hobbies, and will always be alert for more mentoring opportunities. SDN stated this clearly in her advice to mentees: Seek mutually beneficial relationships.

Mentoring during the COVID-19 Pandemic

Owing to COVID-19 restrictions, mentoring pairs met through online platforms or outside with social distancing during the 2020–2021 and 2021–2022 academic years. WiP suspended large in-person gatherings but started bringing back small in-person events when it became safe to do so. The annual matching events and mentor training took place online. Groups tended to meet at least once per month as usual, mostly online. Feedback from surveys about participants' experiences was overwhelmingly positive. MKC and SDN kept weekly meetings but used text messages more frequently to substitute campus encounters. Co-working in shared online documents allowed for easy collaboration. Online games replaced in-person socials. WiP moved apart but stayed connected. Moving into the future, the demonstrated ability to host hybrid WiP events and remote mentoring activities has the potential to increase accessibility of the mentoring program long-term, and has already proven to support participation in the mentoring program of individuals who have left the university.

CONCLUSION

By sharing this report of the context, history, and activities of the WiP mentoring program at the University of Maryland College Park, we hope to provide useful insights to others who may be considering participating in or creating a mentoring program of their own. The authors' own participation in the mentoring program provided key insight about the probable most important aspects that contributed to successful mentoring experiences. Notable strategies for readers hoping to create or grow their own mentoring program were for WiP to reach outside their home department (by attending a regional conference for undergraduate women in physics) for a wider population of women in science, technology, engineering and mathematics to meet, which provided the spark to organize back at UMD, and to advertise both broadly and personally. Advertising, implementing mentor training sessions, and joining together physics and astronomy students were all factors associated with the highest number of participants in a single academic year. The core of these strategies (inform, invite, and support participants) are not unique to the environment at UMD, and therefore have the potential to be adapted to a variety of different contexts.

REFERENCES

1. Office of Diversity & Inclusion, "Land Acknowledgment," University of Maryland, n.d., https://diversity.umd.edu/resources/land-acknowledgment.
2. American Physical Society, "How Does Your Institution Compare?" n.d., https://www.aps.org/programs/education/statistics/compare.cfm.
3. M. James, E. Bertschinger, B. Beckford, T. Dobbins, S. Fries-Britt, S. J. Gates *et al.*, *The Time is Now: Systemic Changes to Increase African Americans with Bachelor's Degrees in Physics and Astronomy* (American Institute of Physics, College Park, MD, 2020), https://www.aip.org/diversity-initiatives/team-up-task-force.
4. R. S. Barthelemy, M. McCormick, and C. Henderson, "Gender discrimination in physics and astronomy: Graduate student experiences of sexism and gender microaggressions," Phys. Rev. Phys. Ed. Res. **12**, 020119 (2016).
5. T. J. Atherton, R. S. Barthelemy, W. Deconinck, M. L. Falk, S. Garmon, E. Long *et al.*, *LGBT Climate in Physics: Building an Inclusive Community* (American Physical Society, College Park, MD, 2016) https://www.aps.org/programs/lgbt/upload/LGBTClimateinPhysicsReport.pdf.
6. Physicists of Underrepresented Genders, http://wip.umd.edu/.
7. L. M. Aycock, Z. Hazari, E. Brewe, K. B. H. Clancy, T. Hodapp, and R. M. Goertzen, "Sexual harassment reported by undergraduate female physicists," Phys. Rev. Phys. Ed. Res. **15**, 010121 (2019).
8. D. Herber, "UMD Women in Physics provides community, mentorship," *The Diamondback* (September 22, 2021), https://dbknews.com/2021/09/22/women-in-physics-mentorship/.