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Meeting Mentoring Needs in Physical Oceanography

AN EVALUATION OF THE IMPACT OF MPOWIR

By Colleen B. Mouw, Sarah Clem, Sonya Legg, and Jean Stockard

ABSTRACT. After a decade of program offerings, the Mentoring Physical Oceanography Women to Increase Retention (MPOWIR) program initiated a community-wide survey to (1) assess the impact MPOWIR has had on retention of women in the field of physical oceanography, and (2) gauge where needs are being met and where gaps still exist. To investigate the impact of MPOWIR, we compare MPOWIR participants with male and female cohorts that did not participate in MPOWIR but were at a similar career stage. The survey results indicate MPOWIR has had a substantial impact by aiding individuals in finding and developing mentoring relationships. MPOWIR women are far more likely to have a mentor, and they report having mentors in addition to their advisors, indicating proactive seeking of mentoring relationships. Survey results identify many unmet mentoring needs for both men and women, but MPOWIR participants appear to be receiving more from their mentoring relationships than their non-MPOWIR cohorts. The majority of survey respondents reported there were challenges to achieving career goals, but MPOWIR participants were significantly more likely to have attained their career goals, even though they had received their PhDs more recently. Eighty-eight percent of survey respondents with PhDs were employed in oceanography, irrespective of participation in MPOWIR. MPOWIR women indicate the program has had a large impact on their lives, with the greatest effect being expansion of professional networks and exposure to professional development skills. Senior participants in the program (who serve as mentors to junior scientists) also reported significant professional and personal growth from being involved. Data obtained independently of the survey show that, of the 173 women who have participated in MPOWIR, the recent PhDs are predominantly in postdoctoral positions as expected, but for participants receiving their PhDs prior to 2012, an impressive 80% are in faculty or university/government/nonprofit research positions. Thus, MPOWIR appears to have had an important impact on retention and career satisfaction of its participants.

INTRODUCTION

Many ocean scientists have been fortunate at various stages of their lives to benefit from mentors who have lent encouragement and opened doors of opportunity. Receiving effective mentoring can increase performance, enhance motivation, build self-confidence, improve career success, promote career satisfaction and growth, and improve retention in the field (Eby et al., 2013). Research suggests that mentors are particularly important for the retention of women in science, technology, engineering, and math (STEM): women are much more likely to leave their fields of study if they have not developed meaningful mentoring relationships that help provide a sense of belonging (Dennehy and Dasgupta, 2017). With this understanding of the importance of mentoring, we seek to determine how well mentoring needs are being met within the field of physical oceanography. The Mentoring Physical Oceanography Women to Increase Retention (MPOWIR, http://mpowir.org/) program was developed 13 years ago in response to stark gender differences in physical oceanography, both in mentoring needs and representation in academic careers.

MPOWIR began with a workshop in October 2005 in Warrenton, Virginia, at which 29 physical oceanographers (men and women) developed the outline of a mentoring program for early career women, focusing on needs that were not currently filled by institutional mentoring or other peer mentoring programs (Lozier, 2005, 2006). Prior to the workshop, a survey of physical oceanographic colleagues and students at institutions and universities around the country was conducted to collect information on the demographic make-up of the physical oceanography community and its mentoring needs (herein referred to as the initial community demographic survey). At that time, half of the graduate students at the respondents' institutions were women, but only 20% of the scientists with principal investigator status were women, and only 14% of those in tenure track positions were women. A complementary study indicated the percentage of women who obtained a tenured or tenure-track position dropped from 23% for those earning PhDs between 1980 and 1995, to 8% for those earning PhDs between 1996 and 2009 (Thompson et al., 2011). The initial community demographic survey also showed important differences in mentoring experiences between men and women. Whereas 24% of women said that the gender of the mentor was important to them, only 12% of women had female mentors. By contrast, all of the male respondents had male mentors, yet the gender of the mentor was not important to the male respondents. Women were also less likely than men to have a mentor during their postdoctoral years, whereas in graduate school men and women were equally likely to have a mentor (Lozier et al., 2006). Based on the survey results and input from the workshop, the MPOWIR program was developed with the following guiding principles (Lozier et al., 2006):

The community should take collective responsibility for the mentoring of junior women. MPOWIR focuses on the collective community responsibility for mentoring, providing each junior scientist with a network of mentors, to better fulfill their needs for different stages of an evolving career.

The mentoring program should be designed for and by the physical oceanography community. Oceanography careers have several unique characteristics: sea time, relatively few industry jobs (although growing in number), a limited number of geographical locations where jobs are available, a relatively large proportion of research positions versus academic positions, and a relatively small discipline. Senior members of the physical oceanography community who understand the culture of the discipline are best positioned to provide mentoring to junior scientists of the same community.

The lack of retention of junior women is a community issue, not a women's issue. High attrition of junior women after completing their PhDs creates a substantial loss of intellectual and financial capital that impacts the entire community of physical oceanography. Capitalizing on the investment the funding agencies and universities have made in the education of women students, and ensuring a diverse workforce, requires a community effort, involving both male and female physical oceanographers.

Mentoring resources are best expended during the transitional years for a junior woman. The community-wide survey conducted prior to the design of MPOWIR revealed that transitions from PhD to postdoc and then from postdoc to entry-level position, periods when institutional mentoring programs are typically least available, were the most vulnerable times for junior women. Obstacles include exclusion, lack of collaborators, lack of senior women role models, lack of exposure to career development resources, and challenges balancing work and family. The survey showed that only 30% of the females formed an important mentoring relationship during their postdoctoral years. Thus, MPOWIR was designed to provide continuity of mentoring through the early stages of a woman's career, from the final years of graduate school through postdoctoral years and on to a permanent job.

Effective mentoring needs many different touch points. To accommodate the many needs of junior women in a wide variety of positions at different types of workplaces (e.g., research institutions, government labs, universities, industry, and nonprofit organizations) and at different stages in their careers, mentoring should be offered in various formats, as described in the following section.

The MPOWIR program consists of the following elements:

1. **Pattullo Conference.** This biannual conference, named after June Pattullo (http://mpowir.org/resources/career-profiles/june-pattullo/), the first woman to receive a PhD in physical oceanography, brings ~25 junior women physical oceanographers together with 12 senior physical oceanographers for a 2.5-day meeting focused on discipline-based mentoring and professional development. The senior mentors are balanced between men and women.

2. **Mentoring Groups.** Groups of approximately six junior women and two senior women physical oceanographers meet for a monthly teleconference for the purpose of confidential, small-group mentoring, where each participant can receive individualized feedback. The junior women self-select into the mentoring program through open registration. The senior mentors are recruited from names suggested by previous program participants and the steering committee. In assigning groups, time zone is considered, and care is taken to ensure junior and senior participants are not from the same institution.

3. **NASA Speaker Series.** Each year, two junior women scientists are chosen to give seminars at a NASA lab, one at the Jet Propulsion Laboratory and one at Goddard Space Flight Center, to familiarize junior physical oceanographers with the research conducted at the NASA labs and to expose NASA scientists to junior scientists in the university community.

4. **Databases and Surveys.** Regular surveys are conducted to assess the effectiveness of MPOWIR activities, determine community mentoring needs, and evaluate progress in retention. Results of previous surveys can be found in Clem et al. (2014) and Lozier and Clem (2015).

5. **MPOWIR Website.** The website (http://mpowir.org/) serves as a repository of resources for mentoring and physical oceanography careers.

6. **MPOWIR Webinars.** Semi-annual webinars focus on topics of particular interest to those in the early stages of independent positions, provide continued support for previous participants, expand gender neutral participation, and reach out to a broader scientific community.

7. **Townhall Meetings.** Townhall meetings at large conferences such as Ocean Sciences provide a forum for communication and engagement with the whole oceanographic community.

These opportunities are announced through email outreach, community listservs, and social media. An in-depth overview of these program elements can be found in Lozier and Clem (2015). Of the opportunities listed above, the first three program elements are open to female physical oceanographers, while the remaining elements are resources available to all fields of study, genders, and career stages. In 2008, the first cohort of MPOWIR women attended a Pattullo Conference (Lozier, 2009; Martini et al., 2009), followed by the initiation of mentoring groups. After 10 years of providing discipline-specific mentoring, MPOWIR conducted a community-wide survey to assess the impact to date on retention of women in the field of physical oceanography and to gauge where mentoring needs are being met and where gaps still exist.

SURVEY OVERVIEW

To assess MPOWIR's overall impact, and mentoring needs of the community, an Internet-based survey was open for 110 days between February 25 and June 14, 2016. Input was solicited through email outreach, community listservs, and social media. Initial email outreach distributed the survey to approximately 85 senior oceanographers, both male and female, and ~245 junior women who had participated in MPOWIR in some capacity. Recipients were explicitly asked to share the survey with other students and colleagues. Community listservs, such as ESWN (Earth Sciences Women's Network), FAMOS (Forum for Arctic Modeling and Observational Synthesis), and the Ocean Model Working Group, also served as avenues for dissemination. Finally, social media, in particular Twitter, aided in sharing the survey with a wider audience. The major focus of this report is comparing the experiences and views of participants in MPOWIR and non-participants of similar age and career stage. The analysis was limited to people born after 1972, the birth year of the oldest MPOWIR participants. The sample included 79 women who had participated in MPOWIR and 134 non-participants, 35 of whom identified as male. All survey respondents provided input voluntarily following receipt of the request for participation through one of the many dissemination channels. Results of our analysis are summarized below. Where we found significant differences, we report results of tests of statistical significance as well as effect sizes (Cohen's d), a descriptive statistic often used by social scientists to describe the magnitude of a difference between two groups. Traditionally, psychologists have interpreted effect sizes of 0.20 as small, 0.50 as medium, and 0.80 as large (Cohen, 1988). Details of our analysis can be found in the online supplementary materials.

Preliminary analyses indicated that the participants and non-participants were similar on important variables. There were no significant differences between the groups in age or marital status (Tables S1 and S2 in the supplementary materials). They also reported similar views regarding professional demands of a career in oceanography and similar family-related constraints on career choices (Tables S3 and S4). The MPOWIR participants were more likely than other respondents to have finished their graduate work (chi-square = 11.63, $p = 0.001$). Among those who were still in graduate school, participants and non-participants were at similar stages in their schooling. But, among those who had attained their PhDs, the MPOWIR participants had finished their degrees more recently ($t = 3.10$, $p = 0.002$, Cohen's $d = 52$; Table S2). In general, these similarities between participants and non-participants enhanced confidence that our targeted sampling approach produced groups that could provide valid comparisons. But to ensure that the differences in degree completion did not affect our findings, and because students and non-students often have different mentoring needs, we examined results separately for these two groups.

HAVING A MENTOR

MPOWIR participants were more likely than the other respondents to report that they currently had mentors ($t = 4.11$, $p = 0.0001$, $d = 1.06$ for students, and $t = 2.07$, $p = 0.02$, $d = 0.36$ for non-students). Women graduate students who did not participate in MPOWIR reported especially low rates of mentorship: 37% compared to 94% for their peers who had participated in the program (Figure 1, Tables S5 and S6). Analyses reported below focus only on respondents who had mentors (15 participants and 22 non-participants in the group of students and 28 participants and 26 non-participants among non-students).

MENTORING RELATIONSHIPS

MPOWIR participants were more likely than their non-participating peers to report that they had multiple people they could turn to for assistance, a difference that was statistically significant for graduate students (t = 1.80, p = 0.04, d = 0.61; see Figure 2, Tables S7 and S8). In addition, participants less often reported that their mentors were also their advisors, suggesting that their support networks extended beyond formal relationships established through their schooling. This difference was statistically significant for both the student and the non-student groups (t = 1.90, p = 0.03, d = 0.30 for students, and t = 2.12, p = 0.02, d = 0.52 for non-students; see Figure 2, also Table S9).

Not surprisingly, given the gender composition of the field, men were far more likely to have the same gender as their mentor (71%), while MPOWIR women (48%) and non-MPOWIR women (43%) were equally as likely to have a mentor the same gender as themselves (see Table S10). In other words, there was a substantial gender difference in the probability that respondents would have a mentor of the same gender (t = 1.79, df = 93, prob. = 0.04; d = 0.52), suggesting that women tend to gravitate toward women mentors. This phenomenon had been noted in the initial community demographic survey and by other studies that suggest the gender of the instructor or mentor does not matter for males but that having instructors/mentors of the same gender significantly impacts the engagement of females (Carrell et al., 2010). This preference for a mentor of the same gender might also help account for the extraordinarily low rate of mentorship for graduate student women who did not participate in MPOWIR.

INTERACTIONS WITH MENTORS

The survey also queried the nature of interactions between mentees and mentors. As would be expected, graduate students more often discussed classwork and navigating graduate school, while those who had completed their schooling more often talked about career issues. There were no differences between MPOWIR participants and others in the topics that they discussed with their mentors. The most common topics discussed were research, job applications, and long-term career and family/personal issues (see Table S11).

In addition, a series of 19 questions asked respondents about the types of support they received and wanted from their mentors. Using standard scaling techniques, these responses were combined into three composite variables related to the provision of (1) personal support, such as listening, building confidence, teaching by example, offering encouragement, offering tools, motivating, giving emotional support, and providing information about career paths; (2) assistance with career advancement, such as coaching, providing "wise counsel," role modeling, encouraging, developing professional relationships, and advocating; and (3) motivation, including items such as challenging them, assisting with keeping on schedule, helping to secure funding, assisting with writing, and soliciting input to mentors' work (see Tables S12 and S13). The MPOWIR participants had significantly lower scores on the scale regarding motivation and encouragement. Perhaps this is partially related to the self-selection into the program by individuals already highly self-motivated who are seeking out further professional assistance from the MPOWIR program. Yet, these differences largely reflected the fact that the other respondents more often had mentors who were also their advisors and disappeared when this variable was controlled (see Tables S14–S16).

Both MPOWIR and non-MPOWIR respondents reported that they wanted more support in each area than they received from their mentors. This pattern appeared with all three areas examined (Figure 3). It was somewhat smaller for the MPOWIR participants, but the differences from other groups were statistically significant with only one comparison: that for the area of personal support. Male respondents reported that

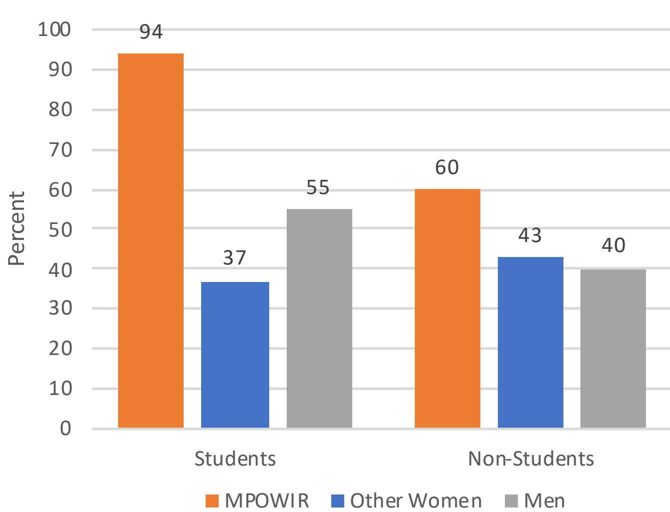

FIGURE 1. Percentage of respondents who currently have a mentor by group and student status.

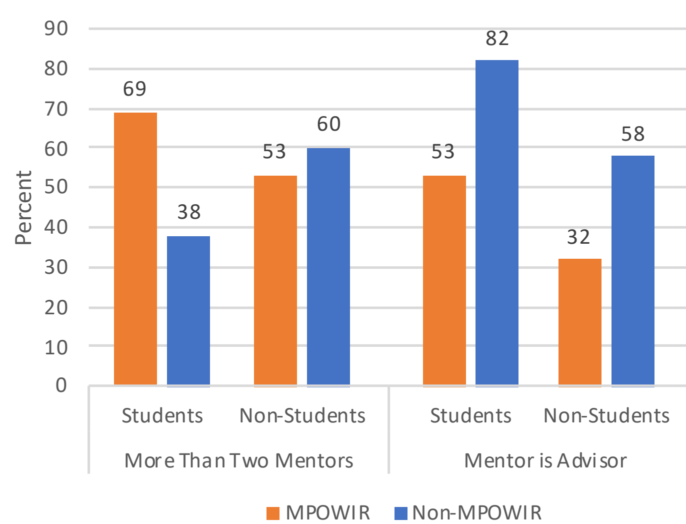

FIGURE 2. Percent of respondents who have more than two mentors and whose mentors are their advisors by group and student status.

they wanted more personal support than the women but received less, resulting in a gap that was more than twice that of either the MPOWIR women or the other women (Figure 3 and Table S15).

PROGRESS AND CHALLENGES IN REACHING CAREER GOALS

The vast majority (88%) of respondents who had finished their PhDs were employed in oceanography, and there were no significant differences in employment in the field between participants and non-participants. However, this analysis just considered if respondents were employed in the field of oceanography and did not assess whether they were employed in their target types of positions for their career stages. This lack of statistical significance should be interpreted cautiously due to challenges in getting the survey to participants, and to non-participants no longer employed in the field. This issue is further addressed in the section titled "Other Assessment of MPOWIR's Impact," which, we believe, provides a more accurate view of MPOWIR's impact on employment in the field.

About two-thirds of the respondents reported that they had met obstacles as they worked toward their career goals, and there were no significant differences in these reports between participants and non-participants. However, the MPOWIR participants were significantly more likely than non-participants to indicate that they had met their career goals ($t = 2.15$, $p = 0.02$, $d = 0.25$). This may be in part be due to MPOWIR women setting more realistic and achievable goals than their peers. The difference between women who had and had not participated in MPOWIR was especially notable, with almost half of the MPOWIR women, but only about a tenth of the other women, indicating they had met this goal (see Figure 4 and Tables S17 and S18).

Survey respondents were also asked to rank their impressions of various career challenges. Even though the various cohorts reported similar rates of obstacles in pursuing their careers, the MPOWIR women appear to have been more successful in overcoming these roadblocks. The success of the MPOWIR women is striking given that they had finished their graduate work more recently than the non-participants and it could be expected that they would thus be further behind in their career progression.

MPOWIR'S IMPACT

Survey respondents who participated in MPOWIR were asked to rate the impact of MPOWIR in various career-related areas. Overall, MPOWIR women indicated the program had a very large impact on their lives. More than four-fifths indicated that they had been well mentored via their MPOWIR connections. Similarly, high percentages indicated that MPOWIR had positively impacted (to a great extent or somewhat) their professional development skills, professional networks, and ability to perform well in their current position. Half or more of the participants indicated that the program had helped them balance work and family, while fewer, especially among the graduate students, indicated the program had helped them obtain their current positions (Figure 5 and Table S20).

Perhaps the most valuable assessment of the impact of MPOWIR can be found in testimonies of those that have participated. A total of 35 comments were submitted by MPOWIR participants in response to the 2016 community survey, and of these 34 were positive. A selection is shared here:

MPOWIR has been very important for creation of peer-to-peer mentoring network, and for understanding the roots of gender bias and its manifestations in ourselves and in others and providing practical skills to gently combat bias in the workplace. Truly empowering!

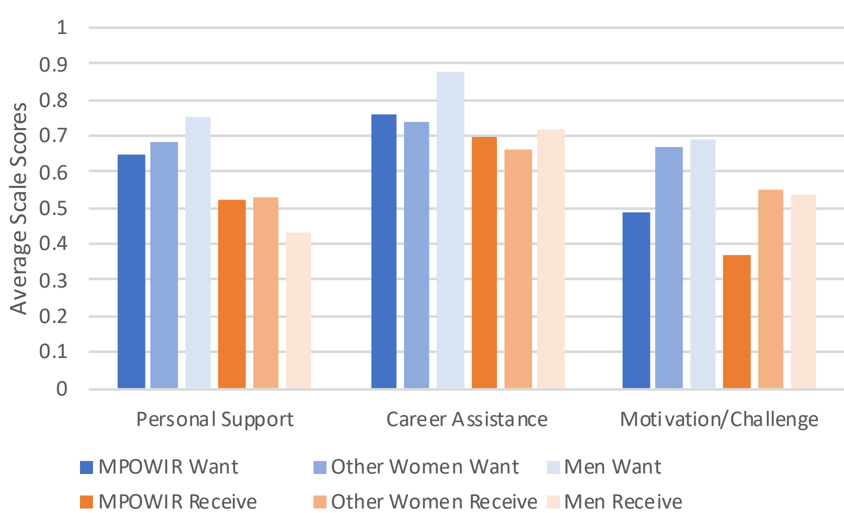

FIGURE 3. Mentoring want and receive factors by cohort.

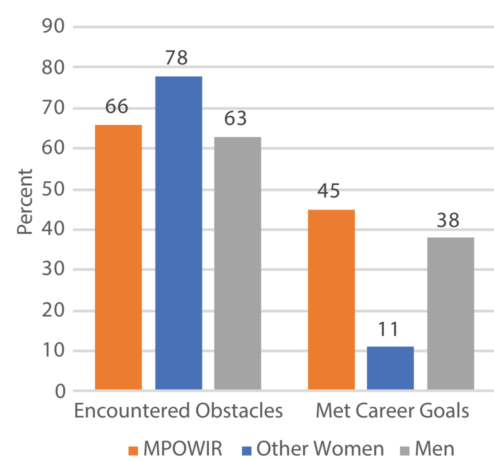

FIGURE 4. Encountering obstacles and reaching career goals by cohort.

The Pattullo conference was a really fantastic experience for me as an early-career scientist. It felt so valuable because it was the first time I felt that non-judgmental attention was focused on me. This was a great inspiration and confidence builder. Thank you!!

The MPOWIR program has been one of the few resources that helped me feel connected and integrated with oceanography even when the cultural conditions of my institution were not inviting. MPOWIR has also helped provide a network of women advocates who continue to help support me. I am incredibly grateful for this resource.

I really appreciate the continuity that MPOWIR provides. Though some other programs exist where mentoring sessions are provided for a day to two, what stands out about MPOWIR is how it actively accompanies us through the process of being an early career scientist and graduating to the next step, dynamically providing tools and helping to solve issues/challenges as they arise.

The greatest benefit for me with MPOWIR has been the realization that the struggles I was having were ubiquitous and experienced by very senior, well respected women in my field. That, plus the networking and support have been invaluable to keep me going and not give up.

While the majority of our focus has been on the impact MPOWIR has had on the mentees, information was also available from 17 senior-level women who had served as mentors. They also reported significant growth from their involvement. At least half indicated that MPOWIR had helped them in all areas shown in Figure 4 except obtaining their current positions (Table S21). Given that the mentors were primarily well established in their careers before participating in the program, this result would be expected.

SUMMARY OF SURVEY RESULTS

The results of the survey indicate that MPOWIR has been effective at retaining women in the field of physical oceanography. MPOWIR participants were significantly more likely than non-participants at similar career stages to have had mentors. They were also more likely to have multiple people that they consider mentors and to have mentors other than their graduate school or postdoctoral advisors. MPOWIR participants have the opportunity to engage with many mentors through various program elements, and they are encouraged to proactively seek mentors within their home institutions and other communities with whom they interact. Although the MPOWIR participants were similar to non-participants in the topics they discuss with mentors and in reports of obstacles faced in their careers, the participants were significantly more likely to have met their career goals. The vast majority of participants indicated that they had been well mentored through the program and that it had helped them develop useful professional skills and networks. In addition, those who had served as mentors reported overwhelmingly positive impacts on their own careers from their participation.

OTHER ASSESSMENTS OF MPOWIR'S IMPACT

In addition to the community survey reported above, another method of evaluating the impact of MPOWIR on retention and career progression is to track the careers of individual MPOWIR participants. To avoid the complications of response rate and self-reporting biases associated with surveys, we have sought to determine the current career status of all past MPOWIR participants using web search tools, combined with our information on the last verified email address of the participant. We were able to determine the current career status of all but nine of our 173 MPOWIR participants as of May 2017. Of those 173 participants, 154 have completed their PhDs, with the remaining 11% either currently enrolled as students or unknown. (Note that the different ratio of students to non-students compared to the survey reflects the fact that here we are attempting to track all participants from the decade-long program, whereas survey respondents may be biased toward those with more recent involvement, and the survey was completed before the tracking of participants was completed.) Career status is shown as a function of date of PhD in Figure 6. Recent PhDs are predominantly in postdoc positions, as expected, but for participants receiving their PhDs prior to 2012, an impressive 80% are in faculty or university/government/nonprofit research positions. In particular, we highlight that for those receiving PhDs between 2006 and 2011, 34% are in faculty or instructor academic positions. Approximately

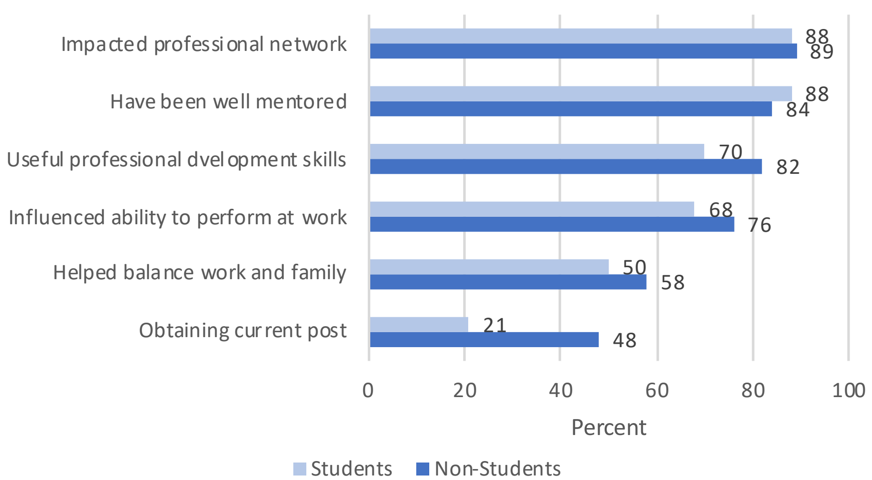

FIGURE 5. Percentage of participants indicating that MPOWIR had helped them somewhat or a great deal by area and student status.

15% are in commercial sector positions, including for-profit oceanography/climate companies (e.g., Sea-bird Scientific, the Climate Corporation), or technical jobs at companies such as Facebook and Bank of America. On average, 5% are unknown, suggesting they have left the field. Compared to average loss rates of ~30% of women who have earned PhDs in STEM fields (Shen, 2013), these statistics indicate that MPOWIR is successfully reducing the loss of physical oceanographers from the field, as well as helping to enable participants to obtain prominent academic and research positions.

Another quantitative method for assessing MPOWIR's impact is examining the demographics of physical oceanographers in permanent positions at US institutions. Prior to initiation of MPOWIR in 2007, the initial community demographic survey assessed the number of male and female faculty in academic and research positions at various career levels in oceanography departments in 13 universities and government labs across the United States. This survey highlighted the need to improve the retention of women, with less than 18% of faculty being female, far fewer than the percentage of PhDs awarded to women in physical oceanography (Table 1). Ten years later, MPOWIR revisited this assessment to see if overall improvement had occurred with the existence of a community mentoring program. In 2017, in the same 13 universities and laboratories, 26% of the physical oceanography faculty are female. Even greater improvements are seen in the percentages of women in associate and full professor positions as compared to 2007 (Table 1). This increase in the percentage of women is encouraging, but improvement has not been uniform across institutions.

There is a stark difference between physical oceanography and chemical oceanography in the occupation of women in assistant and associate ranks. In physical oceanography, there is nearly equal occupation of women at the assistant and associate ranks. However, in chemical oceanography, the percentage of women at the assistant level is nearly equal to that of physical oceanography, but is about half at the associate level. This comparison makes it clear that MPOWIR has improved retention for its target community of physical oceanographers. While MPOWIR's target is women in the last two years of graduate school through the attainment of the first permanent position, it seems that the culture of proactive mentoring that MPOWIR promotes is continued with these women into their permanent jobs. The women who had participated in MPOWIR's programs but had progressed in their careers beyond the stages targeted by MPOWIR voiced an interest in and need for some level of continued mentoring. In response, MPOWIR added the webinar series (see the introduction) to its programming in 2017. The webinars are open to any field, career stage, and gender.

OUTLOOK

Since 2009, women have surpassed men in the number of PhDs earned in ocean sciences (Bernard and Cooperdock, 2018). Within physical oceanography, between 2001 and 2012, 35% of PhDs in were earned by women, and as of 2017, 26% of faculty positions in physical oceanography were filled by women, up from 18% a decade earlier. Similar improvements are seen across all of geoscience with an increase in female geoscience faculty from 16% in 2006 to 23% in 2016 (Wilson, 2017). With the improvement in

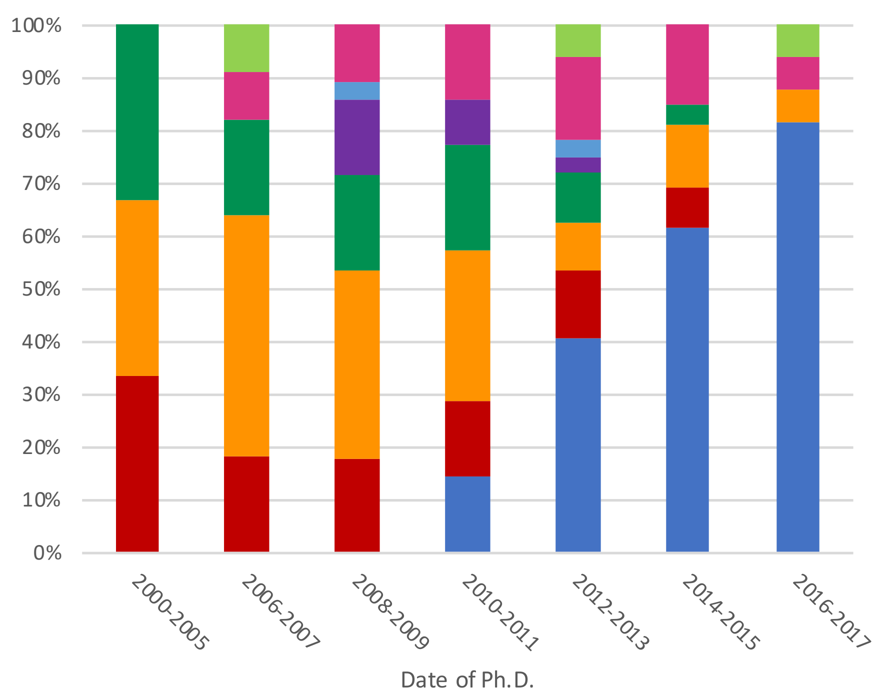

FIGURE 6. The current employment of past MPOWIR participants, shown as a function of date of PhD, and as a percentage of the total PhDs by date.

TABLE 1. Percentage of women at each faculty level as compared with total of males and females in each sub-category. Chemical oceanography is used as a control as no similar mentoring program exists for that community.

	2007 Physical Oceanography	2017 Physical Oceanography	2017 Chemical Oceanography
Assistant	36%	39%	43%
Associate	19%	35%	26%
Full	10%	19%	21%
Total Female	**18%**	**26%**	**26%**

gender ratios at academic and research institutions, combined with the impressive 80% of the MPOWIR participants who received PhDs prior to 2012 now holding permanent positions in the field, the evidence suggests that MPOWIR is improving the climate and retention rate for women beyond those women directly participating in MPOWIR. MPOWIR is uniquely situated to offer within-discipline networking and confidential mentoring, independent of academic institution, that supports junior women physical oceanographers through career transitions from PhD study through postdocs to permanent positions, advantages that are not duplicated by institutionally based programs or large open peer networks.

Even with the success reported here, progress is far from complete. The gender ratio in faculty level positions is still not equal to that of students studying physical oceanography. Gender bias in hiring and mentoring in academia still exists, as shown by numerous recent social science experiments (Moss-Racusin et al., 2012; Sheltzer and Smith, 2014). Women continue to be overlooked as reviewers (Lerback and Hanson, 2017), invited speakers (Casadevall and Handelsman, 2014), and award recipients (Mervis, 2017). The increasing discussions about sexual harassment and bullying in science (Hollis, 2012; Feder, 2016) demonstrate the need for confidential discussion spaces (such as provided by the MPOWIR mentoring groups) for early career women scientists. MPOWIR cannot, by itself, change the culture of science, but we provide the support needed to help overcome these obstacles and raise awareness of these issues among senior scientists participating in our programs. Relationships built through MPOWIR foster an increased sense of belonging in the oceanographic community that, in turn, encourages participants to continue with oceanographic careers. The ever-increasing demand for mentor groups and the Pattullo Conference provide evidence of MPOWIR's value to the community.

While these results are encouraging, we emphasize that we have only highlighted the significant results from the survey. Although there was no indication of negative results related to MPOWIR, many of the comparisons did not lead to significant findings, which may be due to the small sample sizes. We also recognize that the self-selection of MPOWIR participants may bias the participants toward those who are more motivated to succeed. Regular thorough examination of gender equity would help to provide more reliable insights. Further documenting institutions that are excelling and struggling in equity and investigating the reasons for success could help develop policies and rewards to promote equity.

MPOWIR is far from the only program aimed at increasing retention of women in STEM careers. Other programs include the NSF-funded ADVANCE program (Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers), which aims to improve gender equity in STEM academic positions through institutional transformation; the Earth Science Women's Network (ESWN, https://eswnonline.org/), which provides peer-mentoring and career development support to more than 3,000 women in geosciences worldwide; the Society for Women in Marine Science (SWMS, http://swmsmarinescience.com/), which brings together marine scientists of all career levels to celebrate and promote the research done by women in marine science; and mentoring programs in individual academic institutions and departments. These programs are all complementary, using different approaches and tackling different aspects of the challenge of increasing gender parity in science.

We have been able to demonstrate MPOWIR's impact on the demographic it targets. However, through comments at our town hall events, personal conversations, and evidence from this survey, it is clear that there are significant unmet needs for thoughtful, persistent mentoring across many disciplines, genders, identities, and career stages. Previous research has indicated that conceptualizations of the ideal mentor vary by age, gender, and citizenship, but not by academic discipline or stage of persistence (Rose et al., 2005). Thus, while MPOWIR's focus is on women in physical oceanography, we hope that MPOWIR's impact has been broader than just its target demographic through our program elements that are open to everyone (town halls, webinars, online resources; http://mpowir.org/), and we encourage those outside our target audience to participate. We hope the success that MPOWIR has demonstrated aids other groups and disciplines to develop targeted mentoring programs for their communities. To assist with translating MPOWIR's program elements to other communities, a handbook has been developed that outlines programmatic and logistical considerations for all of MPOWIR's program elements (Clem et al., 2016).

The need for mentoring goes beyond women. Our survey results also indicated many unmet mentoring needs for men at the same career stages as the women who have participated in MPOWIR. The community as a whole could benefit from mentoring training with sensitivity toward all identities and regular surveys of the state of the profession with regards to a variety of equity issues. We therefore encourage all members of the oceanographic community to appreciate the importance of mentoring for all their colleagues. All institutions should encourage and reward good mentoring in addition to research achievement in their hiring and promotion practices.

SUPPLEMENTARY MATERIALS

Supplementary materials are available online at https://doi.org/10.5670/oceanog.2018.405.

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AUTHORS

Colleen B. Mouw (cmouw@uri.edu) is Assistant Professor, and **Sarah Clem** is Marine Research Specialist, both at the University of Rhode Island, Graduate School of Oceanography, Narragansett, RI, USA. **Sonya Legg** is Research Oceanographer, Princeton University, Princeton, NJ, USA. **Jean Stockard** is Professor Emerita, University of Oregon, Eugene, OR, USA.

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