

The “Why” behind PROGRESS Activities

The Problem

- The geosciences represent the lowest diversity of all STEM fields at all levels of higher education. ([NSF, 2021](#))
- The Geosciences are unique among STEM fields in our lack of improvement. (e.g. [Bernard and Cooperdock, 2018](#))
- Gender diverse teams produce better science. ([Bear and Woolley, 2013](#); [Campbell et al., 2013](#); [Yang et al., 2022](#))
- Unlike other geoscience fields, atmospheric science has not closed the gender gap. (e.g. [Bernard and Cooperdock, 2018](#))

PROGRESS Workshop Agenda

- Workshops have a strong social science foundation.
- They are designed to introduce, inspire, and inoculate.

Time	Activity
10:00 AM - 10:20 AM	Welcome, Process Overview, and Community Connections
10:20 AM - 10:30 AM	Introduction to the Earth and Environmental Sciences
10:30 AM - 11:30 AM	Panel Discussion: Pathways to the Earth and Environmental Sciences
11:30 AM - 11:45 AM	Break
11:45 AM - 12:45 PM	Support Map Exercise
12:45 PM - 1:55 PM	Working Lunch and Outdoor Break
1:55 PM - 2:00 PM	Lunch Recap and Regroup
2:00 PM - 3:00 PM	Panel Discussion: What Mentoring Means to Me
3:00 PM - 3:05 PM	Break
3:55 PM - 3:40 PM	Growing Equitable Inclusion
3:40 PM - 4:10 PM	Communication and Connecting Toolkit
4:10 PM - 4:30 PM	Concluding Remarks, Resources, Evaluation, Mentee-Mentor Connections

Welcome, Process Overview, and Community Connections

- **Goals:**
 - Cover workshop logistics - help students understand what to expect

- Promote norms of engagement with the workshop content, speakers/panelists, and one another
- Convey norms/expectations of diverse voices and experiences, kindness and respect for one another, commitment to confidentiality (stories stay in this space, lessons leave with you)

Introduction to the Earth and Environmental Sciences

- **Goals:**
 - Highlight Societal Relevance of the Earth/Environmental Sciences
 - Introduce diverse range of careers and work that fall within Earth and Environmental Sciences
- Societal Relevance:
 - Present connections between Earth/Environmental Sciences and communal problems/challenges (clean water, climate change).
 - Highlight how the work **improves lives, serves communities, helps others** (i.e., communal goals).
 - Present perceptions that STEM careers afford/support communal goals linked to motivation and persistence in STEM careers for women and persons from historically underrepresented racial/ethnic groups in STEM.
 - [Diekman, A. B., Brown, E. R., Johnston, A. M., & Clark, E. K. \(2010\). Seeking congruity between goals and roles: A new look at why women opt out of science, technology, engineering, and mathematics careers. Psychological Science, 21\(8\), 1051-1057. https://](#)
 - [Diekman, A. B., Weisgram, E. S., & Belanger, A. L. \(2015\). New routes to recruiting and retaining women in STEM: Policy implications of a communal goal congruity perspective. Social Issues and Policy Review, 9\(1\), 52-88. https://doi.org/DOI 10.1111/sipr.1](#)
 - [Brown, E. R., Smith, J. L., Thoman, D. B., Allen, J. M., & Muragishi, G. \(2015\). From bench to bedside: A communal utility value intervention to enhance students' biomedical science motivation. Journal of Educational Psychology. https://doi.org/10.1037/ed](#)
- Develop broad and inclusive expectations/norms of the **people**, the **work**, and the **values** in Earth/Environmental Sciences.
 - Broader and more inclusive expectations of STEM careers are linked to lower stereotypes, higher sense of belonging in STEM, higher motivation, and as a result - persistence in STEM career pathways.
 - [Cheryan, S., Master, A., & Meltzoff, A. N. \(2015\). Cultural stereotypes as gatekeepers: Increasing girls interest in computer science and engineering by diversifying stereotypes. Frontiers in Psychology, 6.](#)

Panel Discussion: Pathways to the Earth and Environmental Sciences

- **Goals:**
 - **Inspiration** from successful and relevant career role models.
 - **Inoculation** to the stresses, uncertainties, and challenges of navigating geoscience careers.
 - Expose students to **diverse people who identify as women** (i.e., demographically, career stage) who work in **diverse career fields** in the Earth/Environmental Sciences and have **overcome a variety of challenges** to achieve success.

- Panelists share personal stories of their career pathway that highlight:
 - **Relevance** and similarities of their personal journey and the student/participant's academic journey;
 - Successful attainment of degree/career in Earth/Environmental Sciences;
 - Norms, attitudes, and behaviors that led to success;
 - Normalize challenges/struggles on the journey;
 - **Attainability** of success in Earth/Environmental Sciences.
- Role models are most likely to be inspirational when they are relevant, highly competent/successful, convey that success is attainable by describing a pathway to achieve success, and normalize challenge/struggle - as well as strategies to overcome struggle.
 - [Lockwood, P., & Kunda, Z. \(1997\). Superstars and me: Predicting the impact of role models on the self. *Journal of Personality and Social Psychology*, 73\(1\), 91-103. https://doi.org/10.1037/0022-3514.73.1.91](https://doi.org/10.1037/0022-3514.73.1.91)
 - [Lockwood, P. \(2006\). "Someone like me can be successful": Do college students need same-sex gender role models?. *Psychology of Women Quarterly*, 30\(1\), 36-46. https://doi.org/10.1111/j.1471-6402.2006.00260.x](https://doi.org/10.1111/j.1471-6402.2006.00260.x)
 - [Marx, D. M., & Roman, J. S. \(2002\). Female role models: Protecting women's math test performance. *Personality and Social Psychology Bulletin*, 28\(9\), 1183-1193.](https://doi.org/10.1111/j.1471-6402.2006.00260.x)
- Develop broad and inclusive expectations/norms of the people, the work, and the values in Earth/Environmental Sciences.
 - The message that overcoming challenges through growth (i.e., effort leading to learning) protects women from stereotype threat, increases belonging, and promotes persistence intentions.
 - Broader and more inclusive expectations of STEM careers are linked to lower stereotypes, higher sense of belonging, higher motivation and persistence in STEM career pathways.
 - [Cheryan, et al., \(2015\).](#)
 - [Dasgupta, N. \(2011\). Ingroup experts and peers as social vaccines who inoculate the self-concept: The stereotype inoculation model. *Psychological Inquiry*, 22\(4\), 231-246. https://doi.org/10.1080/1047840X.2011.607313](https://doi.org/10.1080/1047840X.2011.607313)
 - [Good, C., Rattan, A., & Dweck, C. S. \(2012\). Why do women opt out? Sense of belonging and women's representation in mathematics. *Journal of Personality and Social Psychology*, 102\(4\), 700-717. https://doi.org/10.1037/A0026659](https://doi.org/10.1037/A0026659)
 - [Herrmann, S. D., Adelman, R. M., Bodford, J. E., Graudejus, O., Okun, M. A., & Kwan, V. S. Y. \(2016\). The effects of a female role model on academic performance and persistence of women in STEM courses. *Basic and Applied Social Psychology*, 38\(5\), 258-268.](https://doi.org/10.1037/A0026659)
 - [Dennehy, T. C., & Dasgupta, N. \(2017\). Female peer mentors early in college increase women's positive academic experiences and retention in engineering. *Proceedings of the National Academy of Sciences*, 114\(23\), 5964-5969. https://doi.org/10.1073/pnas.1613](https://doi.org/10.1073/pnas.1613)

Support Map Exercise

- **Goal:**
 - Clarify current mentorship support structure/resources, gaps in support, and develop a strategy for growing support.
- Transforming the perspective of “mentoring” from a person to a network of support that can be filled by many individuals helps students broaden their perceptions of support (and gaps in support).
- Strategic planning to fill “gaps” in support can help students develop stronger and more diverse networks of support.

- [Higgins, M. C., & Kram, K. E. \(2001\). Reconceptualizing mentoring at work: A developmental network perspective. *Academy of Management Review*, 26\(2\), 264-288. https://doi.org/10.5465/amr.2001.4378023](https://doi.org/10.5465/amr.2001.4378023)
- [Montgomery, B. L. \(2017\). Mapping a mentoring roadmap and developing a supportive network for strategic career advancement. *SAGE Open*, 7\(2\), 2158244017710288. doi:10.1177/2158244017710288](https://doi.org/10.1177/2158244017710288)
- [Christou, H., Dookeran, N., Haas, A., Di Frances, C., Emans, S. J., Milstein, M. E., . . . Seely, E. W. \(2017\). Establishing effective mentoring networks: Rationale and strategies. *MedEdPORTAL*, 13\(10571\). doi:https://doi.org/10.15766/mep_2374-8265.1057](https://doi.org/10.15766/mep_2374-8265.1057)
- Helping students grow their support network results in higher science identity, adaptive coping with stress, and ultimately higher intentions to persist in scientific careers.
 - [Hernandez, P. R., Adams, A. S., Barnes, R. T., Bloodhart, B., Burt, M., Clinton, S. M., . . . Fischer, E. V. \(2020\). Inspiration, inoculation, and introductions are all critical to successful mentorship for undergraduate women pursuing geoscience careers.](https://doi.org/10.15766/mep_2374-8265.1057)

Working Lunch and Outdoor Break

- **Goal:**
 - Mentors discuss aspects of their career pathway thus far and the value of mentoring.
- Students are either seated at a table (in person) or put in a breakout room (virtual) with one of our volunteer mentors.
- This 30-minute lunch discussion is in a relaxed informal setting.
- The students will be able to move rooms to meet as many new faces as possible.
- This activity is another opportunity for **exposure** to career role models and a chance for students to grow their networks.

Panel Discussion: What Mentoring Means to Me

- **Goals:**
 - **Inoculation** to the stresses, uncertainties, and challenges of navigating professional mentoring relationships.
 - **Exposure** to career role models discussing the benefits, challenges, and solutions to navigating professional mentoring relationships.
 - Perspectives include diverse people who identify as women, working in diverse career fields in the Earth/Environmental Sciences.
- Female career role models can inoculate college women from the deleterious effects of negative stereotypes.
- Modeling successful navigation of professional mentoring relationships can help inspire and motivate college women to do the same - even when they experience setbacks and challenges.
 - [Dasgupta, N. \(2011\). Ingroup experts and peers as social vaccines who inoculate the self-concept: The stereotype inoculation model \[Article\]. *Psychological Inquiry*, 22\(4\), 231-246. https://doi.org/10.1080/1047840X.2011.607313](https://doi.org/10.1080/1047840X.2011.607313)
 - [Herrmann, S. D., Adelman, R. M., Bodford, J. E., Graudejus, O., Okun, M. A., & Kwan, V. S. Y. \(2016\). The effects of a female role model on academic performance and persistence of women in STEM courses. *Basic and Applied Social Psychology*, 38\(5\), 258-268. https://doi.org/10.1073/pnas.1613](https://doi.org/10.1073/pnas.1613)
 - [Dennehy, T. C., & Dasgupta, N. \(2017\). Female peer mentors early in college increase women's positive academic experiences and retention in engineering. *Proceedings of the National Academy of Sciences*, 114\(23\), 5964-5969. https://doi.org/10.1073/pnas.1613](https://doi.org/10.1073/pnas.1613)
 - [Hernandez, P. R., Bloodhart, B., Adams, A. S., Barnes, R. T., Burt, M., Clinton, S. M., Du, W., Godfrey, E., Henderson, H., Pollack, I. B., & Fischer, E. V. \(2018\). Role modeling is a viable retention strategy for undergraduate women in the geosciences. *G*](https://doi.org/10.1073/pnas.1613)

- In college STEM contexts, women and students of color frequently report wanting to have a same-gender or -race mentor. There is some limited evidence that having a same-gender mentor can improve outcomes for college women in STEM. The robust discussion of mentoring experiences helps PROGRESS participants contextualize and navigate their own professional mentorship networks.
 - [Blake-Beard, S., Bayne, M. L., Crosby, F. J., & Muller, C. B. \(2011\). Matching by race and gender in mentoring relationships: Keeping our eyes on the prize. *Journal of Social Issues*, 67\(3\), 622-643. https://doi.org/10.1111/j.1540-4560.2011.01717](https://doi.org/10.1111/j.1540-4560.2011.01717)
 - [Dennehy, T. C., & Dasgupta, N. \(2017\). Female peer mentors early in college increase women's positive academic experiences and retention in engineering. *Proceedings of the National Academy of Sciences*, 114\(23\), 5964-5969. https://doi.org/10.1073/pnas.1613](https://doi.org/10.1073/pnas.1613)

Growing Equitable Inclusion

- **Goals:**
 - To increase awareness about self and other people's social identities
 - Learn about the impact of first impressions (particularly thin slices of behavior)
 - Reflect on how kindness impacts education and how to actively engage in inclusive actions such as advocating or being a co-conspirator.
- Increased student engagement in inclusive and kind behaviors in their classrooms benefits the learning experience for everyone. To achieve this, students will learn that they come to the education system holding numerous social identities and we want to welcome all these into the learning space.
 - Having arrived, students learn how first impressions form and can influence how students take in new information and integrate it into their existing knowledge.
 - They will learn that if they slow down and notice this automatic impression formation process can be a way to convey kindness and increase inclusion.
 - Kindness is not just a nice concept, it is important to how students experience classrooms, mentorship and research experiences.
 - Whatever our social location in terms of influence and power, we can engage in kindness action, which may include being an ally or co-conspirator. The higher the power one has in a situation, the more kindness and action of inclusion will be remembered.
 - [Estrada, M., Eroy-Reveles, A., Matsui, J. \(2018\). The influence of affirming kindness and community on broadening participation in STEM career pathways. *Social Issues and Policy Review*, 12, 258-97. DOI 10.1111/sipr.12046.](https://doi.org/10.1111/sipr.12046)
 - [Baumeister, R. F., & Leary, M. R. \(1995\). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological bulletin*, 117\(3\), 497-529.](https://doi.org/10.1037/0096-3445.117.3.497)
 - [Ambady, N., Shih, M., Kim, A., & Pittinsky, T. L. \(2001\). Stereotype susceptibility in children: Effects of identity activation on quantitative performance. *Psychological Science*, 12\(5\), 385-390.](https://doi.org/10.1037/0096-3445.117.3.497)
 - Schultz, P. W. and M. Estrada (2008). [The U.S.E. of theory in applied social psychology](#). In Steg, L., Buunk, A. P., & Rothengatter, J. A. (Eds.). [Applied social psychology: Understanding and managing social problems](#), 2nd ed. Cambridge University Press.

Communication and Connecting Toolkit Goals:

- **Inoculation** to the stresses, uncertainties, and challenges of navigating professional mentoring relationships.
 - **Strategies and worked examples** of how to successfully engage in professional communication and networking with potential mentors.

- College women typically have small mentorship networks at the start of college, and these networks “grow” naturally at a relatively slow rate through the undergraduate tenure.
 - Growing a network of mentors involves strategic planning and networking.
 - Mentorship networks characteristics, such a strength, diversity, and size are related to professional identity development, motivation, persistence intentions, and career success.
 - Packard, B. W. L., Walsh, L., & Seidenberg, S. (2004). Will that be one mentor or two? A cross-sectional study of women's mentoring during college. *Mentoring & Tutoring: Partnership in Learning*, 12(1), 71-85. <https://doi.org/10.1080/1361126042000183039>
 - Higgins, M. C., & Kram, K. E. (2001). Reconceptualizing mentoring at work: A developmental network perspective. *Academy of Management Review*, 26(2), 264-288. <https://doi.org/10.5465/amr.2001.4378023>
 - Dobrow, S. R., & Higgins, M. C. (2005). Developmental networks and professional identity: A longitudinal study. *Career Development International*, 10(6/7), 567-583. <https://doi.org/doi:10.1108/13620430510620629>
 - Hernandez, P. R., Adams, A. S., Barnes, R. T., Bloodhart, B., Burt, M., Clinton, S. M., Du, W., Henderson, H., Pollack, I., & Fischer, E. V. (2020). Inspiration, inoculation, and introductions are all critical to successful mentorship for undergraduate women pursuing geoscience careers. *Communications Earth & Environment*, 1(1), 7. <https://doi.org/10.1038/s43247-020-0005-y>
 - Hernandez, P. R., Bloodhart, B., Barnes, R. T., Adams, A. S., Clinton, S. M., Pollack, I., Godfrey, E., Burt, M., & Fischer, E. V. (2017). Promoting professional identity, motivation, and persistence: Benefits of an informal mentoring program for female u

Concluding Remarks, Resources, Evaluation, Mentee-Mentor Connections

- **Goals:**
 - **Introductions** to a local and **similar** Earth/Environmental Science mentor
 - **Set and align expectations** that the mentor will reach out and that the pair should meet at least once per semester for one year.
- Unlike gender and racial/ethnic mentor-mentee similarities, there is strong evidence that psychological similarities between mentors and mentees promotes the quality of the relationship and support. Further, there is robust experimental evidence that psychological similarities can be made salient fairly easily.
 - We use a Creating Birds of a Feather approach, which asks prospective mentors and mentees to answer a “Getting to Know You” survey about surface level preferences, attitudes, behaviors
 - (e.g., “Would you rather:
 - 1. Go to a museum;
 - 2. Go to a sporting event;
 - 3. Go to a music concert;
 - 4. Go hiking”).
 - We match mentors with mentees based on their location and their disciplines (e.g., geoscience with geoscience, biology with biology) and then share 3-5 shared similarities based on the results of the “Getting to Know You” survey. This makes for stronger and faster formation of similarity, liking, and social bonds.
 - Mackinnon, S. P., Jordan, C. H., & Wilson, A. E. (2011). Birds of a feather sit together: Physical similarity predicts seating choice. *Personality and Social Psychology Bulletin*, 37(7), 879-892. <https://doi.org/10.1177/0146167211402094>
 - Gehlbach, H., Brinkworth, M. E., King, A., Hsu, L., McIntyre, J., & Rogers, T. T. (2016). Creating birds of similar feathers: Leveraging similarity to improve teacher-student relationships and academic achievement. *Journal of Educational Psychology*, 108(3)

- [Robinson, C. D., Scott, W., & Gottfried, M. A. \(2019\). Taking it to the next level: A field experiment to improve instructor-student relationships in college. *AERA Open*, 5\(1\), 2332858419839707. https://doi.org/10.1177/2332858419839707](https://doi.org/10.1177/2332858419839707)
- Aligning appropriate and realistic expectations for the mentor-mentee relationship is critical for success. Aligned expectations are related to higher levels of relationship satisfaction and mentoring outcomes.
 - [Balster, N., Pfund, C., Rediske, R., & Branchaw, J. \(2010\). Entering research: A course that creates community and structure for beginning undergraduate researchers in the STEM disciplines. *CBE Life Sciences Education*, 9\(2\), 108-118. doi:10.1187/cbe.09-10](https://doi.org/10.1187/cbe.09-10)
 - [Butz, A., Branchaw, J., Pfund, C., Byars-Winston, A., & Leverett, P. \(2018\). Promoting STEM trainee research self-efficacy: A mentor training intervention. *Understanding Interventions*, 9\(1\), 3730.](https://doi.org/10.1187/cbe.19-04-0073)
 - [Branchaw, J. L., Butz, A. R., & Smith, A. R. \(2020\). Evaluation of the Second Edition of Entering Research: A Customizable Curriculum for Apprentice-Style Undergraduate and Graduate Research Training Programs and Courses. *CBE—Life Sciences Education*, 19\(1\), ar11. doi:10.1187/cbe.19-04-0073](https://doi.org/10.1187/cbe.19-04-0073)