# Mapping Research and Writing Mentorship Assemblages in a Mixed Cohort Course-based Research Experience

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**Abstract:** This mixed methods study maps and characterizes assemblages of support in the context of a novel course-based undergraduate research experience (CURE). The CURE blends graduates and undergraduates and features a curricular emphasis on research mentorship, writing and antidisciplinarity. We find that explicit attendance to mentorship may contribute to an "open" and "safe" environment for intellectual risk-taking, and that non-supervisory, non-evaluative graduate student mentors may be uniquely useful to undergraduates navigating complex, high-stakes university research communities.

## Introduction

Course-based undergraduate research experiences (CUREs) are increasingly appreciated as ways of making valuable undergraduate research experiences more inclusive (Bangera & Brownell, 2014) and scalable (Auchincloss et al., 2014). While mentorship has been recognized as critical to the success of these experiences, and the general roles and characteristics of good individual mentors have been characterized, it is also clear that mentees tend to draw different kinds of support from a variety of mentors (Linn, Palmer, Baranger, Gerard, & Stone, 2015). In order to effectively leverage distributed mentorship to support and scale CUREs at a given institution, it will be important to understand not only general roles and attributes of good mentorship, but also how mentoring is experienced and enacted across students' intersecting research networks in institutional context.

We present data from an ongoing program of design research, which particularizes our understanding of mentoring and student support in one major university geosciences research community. This iterative study is being carried out in the context of a novel type of research methods course which engages *both* graduate and undergraduate students in designing and conducting their own scientific studies, explicitly develops mentoring skills and relationships, places a special emphasis on writing and quantitative analysis (with R), and seeks to establish an open and antidisciplinary scientific culture. As design research, the goal is to simultaneously inform the iterative development of the course, address chronic learning and teaching issues related to CUREs in context, and generate new theoretical insights into learning and mentorship.

## Framework and methods

We draw upon a cultural-historical activity theory framework (Engeström, 2008) and related concepts of contradictions, networks, and sociomaterial assemblages to analyze how mentorship is experienced and enacted across activity systems in and outside of the classroom. We frame mentorship broadly as teaching and learning educational process and build on work by Linn et al. (2015) who use *knowledge integration framework* to characterize typical activities of individual mentors, shifting the focus to how multiple mentorship (mosaic, constellation) emerges as a distributed sociomaterial phenomenon in one particular institutional context.

The mixed methods triangulation approach to this study integrates (1) quantitative assessment of scientific skills, conceptual knowledge, understanding of practice, confidence, identity development, and professional intentions based on a modified Undergraduate Research Student Self-Assessment (URSSA) instrument (Weston & Laursen, 2015); (2) an egocentric network analysis of support interactions and linkages among students; (3) qualitative analysis of student-generated coursework and reflective journaling to characterize knowledge gains and support relationships; and (4) a purposive sample of semistructured interviews with students on their classroom experience and learning to refine our understanding of how students experienced the course and used different kinds of support relationships. Of the 27 students in the Spring 2017 class, 20 participated in this study. All data was collected after the last day of the class. Data collection planned for Spring 2018 will also be included.

## Findings and discussion

Students reported gains in research and writing skills as well as higher confidence in their scientific research abilities (Figure 1). They cited peer-to-peer forms of mentorship as important for developing their research ideas, refining their writing, and gaining confidence in the quality of their work. Some graduate students reported that

 

undergrads were either unable or unwilling to comment substantively on their writing, but grad-graduate feedback on writing and research was common and highly valued (Figure 2 c).

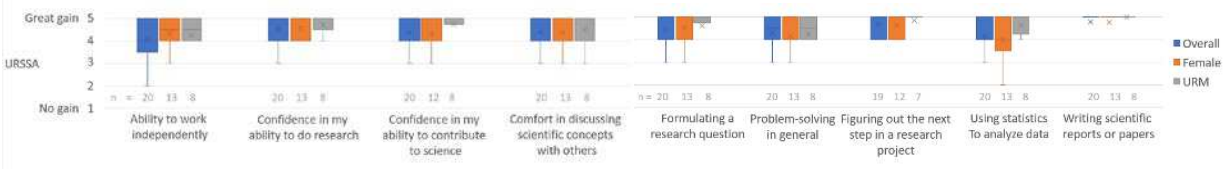


Figure 1. Self-reported gains in abilities and confidence. URM is underrepresented minorities.

Research and writing mentorship was distinctly distributed in nature, emerging via networked assemblages of support inside and outside of class (Figure 2). Formal, designed mentorship interactions in the CURE were reported by students as very important, as were pre-existing and emergent relationships. Undergrads gained insight into the diversity of lab norms, objectives, tools and techniques, and reported that in-class discussions with peers and graduate mentors helped them prepare for interactions with their external faculty research mentors. Students reported that the in-class focus on peer support contributed to a research environment that they described as "safe" and "open," an environment that they sometimes contrasted with other contexts in which they learned and acted as researchers. We find evidence that undergrads felt particularly comfortable learning from and working with graduate and undergraduate peers positioned as fellow student-researchers (i.e. rather than as TAs or lab managers). Access to non-evaluative, non-supervisory research mentors may be distinctly beneficial to emerging undergraduate researchers in this CURE context.

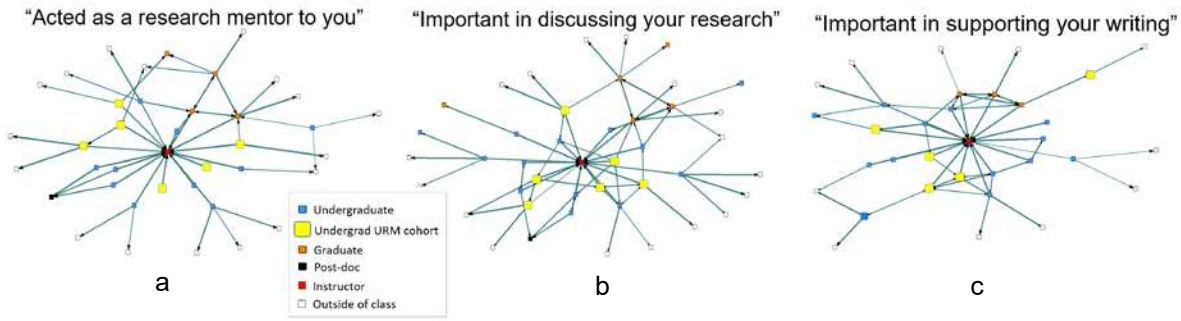


Figure 2. Support networks for research (a, b) and writing (c) as reported by course participants in a name generator survey instrument and visualized with UCINET and NetDraw.

Graduate students reported gaining a better understanding of the tensions and power dynamics between undergrads and their faculty mentors and advisors outside of the course, and suggested that the course could focus more specifically on preparing students to interact with their faculty research mentors. We find evidence that graduate student mentors in the class sought to provide professional and psychosocial support they saw as sometimes missing in undergrad-faculty mentoring interactions. This adaptation by graduate students may have been due to the way mentorship practices were specifically cultivated through readings and breakout discussions. Furthermore, grads and undergrads alike reported intentions and efforts to influence culture, research aims, tools and methods in their research labs external to the course. Adding spring 2018 data, we aim to move towards a typology of emergent mentorship assemblages and draw implications for the design and scaling of CUREs which more strategically leverage and influence the broader network and culture of research.

## References


Auchincloss, L. C., Laursen, S. L., Branchaw, J. L., Eagan, K., Graham, M., Hanauer, D. I., … Dolan, E. L. (2014). Assessment of Course-Based Undergraduate Research Experiences: A Meeting Report. *CBE-Life Sciences Education*, *13*(1), 29–40. https://doi.org/10.1187/cbe.14-01-0004

Bangera, G., & Brownell, S. E. (2014). Course-Based Undergraduate Research Experiences Can Make Scientific Research More Inclusive. *CBE Life Sciences Education*, *13*(4), 602–606.

Engeström, Y. (2008). *From teams to knots: Activity-theoretical studies of collaboration and learning at work*. Cambridge University Press.

Linn, M. C., Palmer, E., Baranger, A., Gerard, E., & Stone, E. (2015). Undergraduate research experiences: Impacts and opportunities. *Science*, *347*(6222), 1261757. https://doi.org/10.1126/science.1261757

Weston, T. J., & Laursen, S. L. (2015). The Undergraduate Research Student Self-Assessment (URSSA): Validation for Use in Program Evaluation. *CBE-Life Sciences Education*, *14*(3), ar33.