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The Structure of Mentoring in Undergraduate Research: Multi-Mentor Models

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Abstract

Mentoring research and development often uses a mentor-protégé model, but research often takes place in teams. In this exploratory study, the authors identify the structures and prevalence of multi-mentoring teams by surveying undergraduate researchers about the people who helped them and the support they received. Research teams were common, and interdisciplinary projects involved more mentors. Faculty were more often considered mentors than others, and those providing information and appraisal were more often mentors than those providing psychosocial support. Students with multiple mentors received more support than those with one or none. Natural science projects experienced higher rates of both mentorship and multi-mentoring, which carries implications for student and faculty development.

Keywords: *mentoring, undergraduate research, collaboration, interdisciplinary research, faculty development*

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Institutions have increasingly turned to mentored undergraduate research as a high-impact practice aimed at increasing student retention, particularly in STEM fields (Kuh 2008; Lopatto 2010). Although the value of mentored undergraduate research has been well documented, few have carefully considered the range of structures of the mentoring experience and the nature of the mentoring that occurs within each structure. Mentored research has typically focused on a one-to-one mentor-protégé model despite the fact that research teams often involve many

members in different roles. As students develop academically and professionally, they receive support from formally defined mentors (e.g., an assigned faculty supervisor) but may also seek support and receive mentorship from others. These supporters are often invisible and are often not developed intentionally or mindfully. Greater knowledge about the networks of individuals considered by students to be mentors, as well as the characteristics that define mentors in the eyes of students, can provide valuable information for faculty, support staff, and institutions about ways that more effective and intentional mentorship practices can be encouraged.

Background

Discussion and advice on mentoring often assume a mentor-protégé model—a one-to-one relationship in which the more experienced faculty member mentors a less experienced student, providing the student with multiple types of support in a one-way relationship (Johnson 2015). However, research often happens in teams, and students rely on many people for support. Research teams commonly include formal ladder experiences that encompass undergraduates, graduate students, postdoctoral scholars, and faculty members (Aikens et al. 2016), or students seek out informal mentoring from a wide range of individuals.

Other models have been proposed to account for the realities of mentoring. Relational mentoring (Ragins and Kram 2007) is an interdependent developmental relationship that promotes mutual growth, learning, and development; thus, the mentoring is not a one-way process. In many-to-one mentoring (Huizing 2012), at least two mentors are

involved in helping the mentee, and relational mentoring may also occur between mentors.

As students develop as scholars and researchers, they require a developmental network—a set of people who take an active interest in their career and act to advance it by providing developmental assistance (Higgins, Dobrow, and Roloff 2010). Ragins and Cotton (1999) point out that mentoring need not be a formally defined relationship; informal mentoring is a relationship that develops spontaneously, lasts longer, and is generally seen as having more benefits than formal mentoring. The presence of such informal mentoring relationships may mean that students' networks are larger than perceived by their formally assigned mentor. This may resemble a mentoring mosaic (Mullen 2000, 2009)—a group of people interacting around a shared interest, in which secondary mentors fill gaps unaddressed by primary mentors.

Goals

To more fully understand the mentoring mosaic for undergraduates, the authors explored the structures and characteristics of mentoring in undergraduate research projects. A greater awareness of the full extent of students' developmental networks can aid faculty mentors to mentor their students more intentionally and can aid institutions in more deliberately designing mentoring structures that match the needs of their students, promote depth in student learning, and can be sustained at an institutional level (Ketcham et al. 2017; Nicholson et al. 2017). In particular, interdisciplinary fields and programs can benefit from a heightened awareness of students' mentoring networks, as single mentors may not have sufficient expertise to provide the range of support required by students, and invisible mentors may lack institutional support.

To explore the prevalence and structures of mentoring, the authors asked undergraduate researchers at four institutions to respond to a survey about the people who mentored them and what kinds of support they received. The survey was designed to answer three primary questions:

1. How prevalent are undergraduate research projects involving more than one mentor?
2. What types of support are most associated with being a mentor, as opposed to other individuals who help students? Does this vary for multi-mentor teams?
3. Do mentoring structures and practices differ between fields (e.g., sciences versus humanities)? What about interdisciplinary fields?

Method

Survey

The survey was presented online using Qualtrics. All respondents agreed to participate, and all aspects of the survey and deployment were approved by the respective

institutional review boards at each participating institution. Responses were collected anonymously, but students had the option to provide their contact information if they were interested in participating in follow-up interviews.

Basic demographic information was collected from all respondents, including their institution, race and ethnicity (U.S. census categories), gender, and current level in school (undergraduate year, master's, doctoral).

Respondents described the nature of a particular completed research project or one in process, including the discipline, whether the student considered the project interdisciplinary, and the influence of the experience on the student's educational and career interests (4-point Likert scale).

Respondents were asked to list up to 15 individuals (by name or pseudonym) who "helped [them] with [their] research projects." This list was intended to be broad so that the full structures of project teams and potential unexpected sources of mentorship could be assessed. Respondents were then asked to make a series of ratings for each individual listed:

1. The institutional role of each individual (multiple choice: undergraduate or graduate student, faculty member, post-doctoral researcher, staff member, librarian, community partner, other).
2. Whether the individual provided any of five types of support for the project: Emotional (e.g., reassurance), Appraisal (e.g., feedback), Informational (e.g., expertise), Logistical (e.g., resources), and Networking (e.g., connections).
3. Whether they considered each individual to be a "mentor," which was defined as "a more experienced person acting as a guide in a dynamic, reciprocal, personal relationship" (Johnson 2002) on a 4-point Likert scale.

Sample

The survey was deployed at four of the authors' home institutions (Clark University, College of Wooster, Elon University, and Penn State University), including multiple campuses of one institution (Penn State) over two years. These institutions represent a varied sample in terms of size and type (public/private, undergraduate/graduate). The survey was advertised via email, web postings, and the research offices at each institution, targeting students likely to have participated in undergraduate research projects, participants in summer research internships, presenters at research events, and research award winners. In total, 146 respondents completed the survey.

Results

Respondents' Support Networks

Size of Support Networks. Respondents reported between zero and 15 helpers (the maximum allowed by the survey). The average number of individuals listed was 3.82

(SD = 2.88). A one-way analysis of variance revealed that respondents who classified their projects as interdisciplinary (79, or 58 percent) reported more people who helped them than those (58, or 42 percent) who said their projects were not interdisciplinary: $F(1, 135) = 5.6448, p = 0.0189$ (those who were “not sure” whether their projects were interdisciplinary were excluded). Interdisciplinary projects had an average of 4.32 team members (SD = 3.23), whereas projects that were not interdisciplinary had an average of 3.12 team members (SD = 2.88).

Number of Mentors. For each respondent, the number of mentors was counted by totaling the number of helpers for whom respondents agreed or strongly agreed that the person was a mentor. The average number of mentors per project was 2.32 (SD = 1.82). Mentors per project ranged from zero to 10, with 20 projects (13.7 percent) reporting no mentors, 34 projects (23.3 percent) reporting one mentor, and 92 projects (63 percent) reporting multiple mentors. A one-way analysis of variance revealed that interdisciplinary projects reported more mentors than projects that were not interdisciplinary: $F(1,135) = 5.9014, p = 0.0164$. Interdisciplinary projects had an average of 2.63 mentors (SD = 2.03), whereas projects that were not interdisciplinary had an average of 1.88 mentors (SD = 1.40).

Composition of Support Networks. Table 1 summarizes the frequency with which the various institutional roles occurred in research support teams, including the frequency with which teams included multiple members in that role (e.g., two faculty members). Faculty members were the most frequently reported members of support networks (90 percent), followed by undergraduate students (41 percent). Nearly half of support networks included more than one faculty member, and multiple undergraduates were present in a significant portion (27 percent) of teams.

It should be noted that not every institution surveyed includes a significant population of graduate students or postdoctoral scholars.

Who Is a Mentor?

Institutional Role of Mentors. Table 1 also summarizes mentorship ratings by the institutional role of the mentor. Eighty-four percent of faculty were described as mentors, followed by graduate students and community partners. Undergraduate students were least likely to be regarded as mentors. Factors predicting mentorship were examined using mixed-effects regression, using mentorship rating as the dependent variable, binary dummy variables representing role as fixed effects, and subjects as a grouping factor. Faculty members ($B = 0.8822, t(113) = 2.100, p < 0.05$) were the role mostly strongly predictive of mentorship rating. The other roles were not individually significant predictors of mentorship rating. The fixed effects explained over one-quarter of the variation in mentorship ratings (adjusted $R^2 = 0.2827, F(7, 536) = 51.6, p < 0.001$).

Types of Support Provided by Mentors. Respondents indicated whether each helper provided particular kinds of support (Informational, Emotional, Appraisal, Logistical, and/or Networking). The number of types of support provided was totaled for each helper. Mentorship rating strongly correlated with the total number of types of support given ($r = 0.4385, p < 0.001$). The more types of support given, the more strongly the respondent agreed that the helper was their mentor, a pattern that largely holds true within each institutional role.

To examine the importance of each support type to mentorship, a linear mixed-effects regression was conducted. Mentorship rating was used as the dependent variable. Binary ratings of Emotional, Appraisal, Information, Logistical, and Networking support were used as fixed

TABLE 1. Frequency of Involvement in Research Teams by Institutional Roles

Role	N	% Mentors	Teams with ≥ 1	Teams with ≥ 2
Faculty member	250	84%	131 (90%)	71 (49%)
Undergraduate	129	22%	60 (41%)	39 (27%)
Graduate student	46	78%	28 (19%)	9 (6%)
Staff member	44	41%	27 (18%)	10 (7%)
Librarian	38	55%	16 (11%)	12 (8%)
Postdoctoral scholar	17	52%	11 (8%)	5 (3%)
Community partner	16	69%	11 (8%)	4 (3%)
Unknown role	4	50%	3 (2%)	1 (<1%)

Note: Individuals (N = 544), research support teams (N = 146). “% Mentors” indicates the proportion of individuals in these roles whom respondents agreed or strongly agreed that they were a mentor (individuals for whom no mentorship rating was given were excluded).

effects. Subject was used as a grouping factor. The model is summarized in Table 2. Appraisal and informational support were the type of support most associated with being considered a mentor. Networking and logistical support were somewhat predictive of mentorship. Emotional support was the weakest predictor of who was rated as a mentor.

Table 3 summarizes support given by individuals in each institutional role. Notable similarities between roles include the fact that faculty members, graduate students, and postdoctoral scholars all frequently provide informational and appraisal support, and somewhat frequently provide emotional support; faculty members are distinguished from the other roles by providing the most types of support on average, especially informational, logistical, and appraisal support. Librarians are notable for providing logistical and information support. Undergraduate students (respondents' peers) are distinguished by frequently providing emotional support.

Multi-Mentor Teams

To explore possible differences in practices between teams with multiple mentors and one-to-one mentoring relationships, responses were compared based on the number of reported mentors. Twenty projects (14 percent) reported no mentors, 34 projects (23 percent) reported a single mentor, and 92 projects (63 percent) reported two or more mentors. Among individual helpers listed by respondents, 23 (4 percent) were members of teams with no mentors, 74 (13 percent) were members of single mentor teams (34 of whom were mentors), and 465 (83 percent) were a part of teams with multiple mentors (227 of whom were mentors). Multi-mentor groups tended to be larger on average, with an average of 5.05 (SD = 2.62) total helpers, compared to 2.18 (SD = 1.64) for single-mentor groups. Multi-mentor groups include an average of 3.29 (SD = 1.58) mentors.

Disciplinary Differences in Mentoring

Responses were classified into division (natural sciences, social sciences, humanities, or interdisciplinary) based on

TABLE 2. Summary of Mentoring Rating Regressed on Support Types

	B	SE	t
(Intercept)	1.45765	0.10690	** 13.636
Informational	0.74353	0.09076	** 8.192
Emotional	0.14303	0.07562	1.891
Appraisal	0.75807	0.08174	** 9.274
Networking	0.45143	0.08073	** 5.592
Logistical	0.23394	0.07835	* 2.986

Note: * = $p < .005$, ** = $p < .001$; $R^2 = 0.3179$, $F(5, 538) = 51.6$, $p < 0.001$

TABLE 3. Types of Support Given by Institutional Roles

Institutional role	Types	Informational	Logistical	Appraisal	Emotional	Networking
Faculty member	3.21	87.89%	70.31%	78.91%	44.53%	39.84%
Graduate student	3.04	93.62%	51.06%	78.72%	57.45%	23.40%
Postdoctoral scholar	2.94	94.12%	52.94%	70.59%	58.82%	17.65%
Librarian	2.68	78.05%	82.93%	36.59%	19.51%	51.22%
Undergraduate student	2.33	54.41%	54.41%	47.79%	64.71%	11.76%
Staff member	2.07	73.33%	71.11%	22.22%	22.22%	17.78%
Community partner	2.06	62.50%	31.25%	43.75%	18.75%	50.00%
Unknown role (N=4)	1.75	100.00%	75.00%	0.00%	0.00%	0.00%
Average	2.80	77.94%	64.23%	61.92%	46.26%	30.07%

Note: Types indicates average number of types of support given by individuals in that role. Percentages indicate the proportion of those in each role indicated by respondents as providing that type of support. Institutional roles are arranged in descending order of types of support, and types of support are arranged in descending order of prevalence.

the reported discipline of the research. Those not reporting a discipline were excluded. A one-way analysis of variance was conducted to examine the effect of division on the number of people reported in each support network. There was a significant effect of division on team size: $F(3, 520) = 25.76, p < 0.001$. Team size varies by division, with social science having the largest networks ($M = 7.54, SD = 4.10$) followed by interdisciplinary fields ($M = 6.36, SD = 3.19$), humanities ($M = 5.34, SD = 3.49$), and natural science ($M = 4.81, SD = 1.92$). A one-way analysis of variance was conducted to examine the effect of division on the number of mentors per project. The humanities appear to have fewer mentors per team, but this effect was not significant: $F(1, 133) = 0.856, p = 0.357$.

The discrepancy between network size and mentors per team suggests differences in who mentors based on discipline (of the project, not necessarily the discipline/division of the person/mentor reported). Table 4 illustrates the likelihood that support network members are considered mentors by division. A chi-square test indicated a significant difference in likelihood that a team member is a mentor by division, $\chi^2(3, N = 524) = 8.88, p = .031$. Members of natural science teams are most likely to be considered mentors.

Mentorship ratings were examined by division using chi-square tests for each role, comparing the likelihood that individuals in each that role were considered mentors. There was a significant difference in likelihood of mentorship by division for undergraduates, $\chi^2(3, N = 134) = 11.114, p = 0.011$, but no significant difference between divisions for any other position. Table 5 summarizes mentorship according to institutional role within each division. The primary difference in mentorship rating by division is that undergraduates are more likely to be considered mentors in the natural sciences.

Discussion

Support Networks and Mentor Networks

Respondents reported wide support networks, frequently with multiple mentors. The majority of mentors (67 percent) were mentoring students who also have another mentor. Interdisciplinary projects tend to have more supporters and more mentors. Although the authors did not assess

whether the support team members and mentors are aware of each other or whether they collaborated, the prevalence of multi-mentor research is somewhat at odds with the common mentor-protégé approach implicit in many institutional approaches to supervising and supporting student research. Although it was not known which support team members were assigned to the student and which relationships developed spontaneously or were sought out by the student, the incidence of mentorship by individuals in roles other than faculty members suggests that students may be seeking mentorship beyond their nominal project supervisor.

Who Is a Mentor?

Mentorship was conceptualized here as a role that is earned or that is bestowed by students upon those who fulfill certain needs. Classification of individuals as mentors was based on a combination of position and behavior, but the causal nature of these associations was not assessed. It is likely that many faculty members identified by students occupied some institutionally defined supervisory role, but given the prevalence of multiple faculty mentors in networks, many likely do not. Other individuals in a variety of roles are considered mentors, even though they are less likely to occupy a formally defined supervisory role (e.g., librarians, undergraduates).

Providing information, feedback, and logistical support was associated most with whether respondents considered individuals as mentors. Notably, emotional support and networking were not highly associated with mentorship, despite the emphasis on psychosocial support in the mentoring literature (Ragins and Kram 2007). This does not mean that faculty mentors should not provide psychosocial support, but it suggests that students can find emotional support from a variety of sources (especially from peers), whereas certain key support functions (e.g., specialized skills, evaluation of student work) are more likely to be available from mentors in more specialized roles.

Disciplinary and Interdisciplinarity

The primary difference that emerged between disciplines was that, although support networks in the natural sciences are not larger than those in other divisions (in fact, they were

TABLE 4. Number of Mentors and Other Supporters Composing Support Teams by Academic Division

Division	Mentors	Others	% Mentors
Natural sciences	162	81	67%
Social sciences	73	69	51%
Humanities	17	12	59%
Interdisciplinary fields	68	42	62%

Note: There is a significant difference in likelihood that a team member is a mentor by division: $\chi^2(3, N = 524) = 8.88, p = .031$.

the smallest), they contained more mentors, which was driven by more peer (undergraduate) mentoring. This may result from disciplinary norms in the research process in the sciences, such as in the case of more experienced students in a lab group helping new students. Although other disciplines contain large networks, peer mentoring is not as prevalent. This aspect of science mentoring could be adapted within other disciplines, given that support networks are already in place; but if peer mentoring is desired, mentors may need to be intentional about developing those peer relationships.

Interdisciplinary projects (regardless of field) also had more mentors than disciplinary projects. The complexity of working between disciplines may require greater support of student inquiry. With increasing emphasis on interdisciplinary research at all levels, the more complex mentoring and support structures they bring with them could potentially benefit from collaborative mentoring. Collaborative mentoring is defined here as two or more mentors working together in an intentional, egalitarian way to guide students in inquiry and development. Such collaborative mentoring may be particularly beneficial for interdisciplinary research, which involves knowledge, theories, or techniques from several disciplines and in which a single mentor may not have sufficient expertise (Ketcham et al. 2017; Nicholson et al. 2017).

Implications for Institutions and Faculty Development

These data capture only the student's perspective; the nature of the relationship between members of respondents' networks is unknown (e.g., their awareness of one another or the presence of relational mentoring). Nonetheless, some lessons can be derived for faculty and institutions to improve the effectiveness of their mentoring.

First, if institutions are committed to providing mentored research experiences to their students, then they must ensure that faculty members (or others in assigned supervisory capacities) move beyond simply supervising research and consider whether they are actually mentoring. Certainly, every support person listed by respondents would not expect (and does not need to be) a mentor. However, those faculty who were listed as the sole supporter yet were not rated as mentors might be surprised by this. Conceptualizing mentoring as a set of support behaviors that mentors provide to students and *mentor* as a role that is earned rather than a position to which a person is assigned could improve student support. This could be accomplished through more deliberate conversation with potential mentees about their expectations and needs for mentorship.

Faculty may also benefit from a greater awareness of the other sources of support that students are using or seeking,

TABLE 5. Mentorship by Division and Institutional Role

Institutional role		Natural sciences	Social sciences	Humanities	Interdisciplinary
Faculty	mentors	100	42	14	46
	nonmentors	12	9	5	12
Undergraduate student	mentors	22	3	1	2
	nonmentors	46	35	6	19
Graduate student	mentors	22	6	2	4
	nonmentors	8	2		
Postdoctoral scholar	mentors	5	3		1
	nonmentors	5	1		2
Staff	mentors	7	7		2
	nonmentors	8	11	1	
Librarian	nonmentors	2	7		8
	mentors	1	8		11
Community partner	mentors	5	2		2
	nonmentors		2		1
Unknown role	mentors		2		
	nonmentors		2		

Note: There was a significant difference in likelihood of mentorship by division for undergraduates, $\chi^2(3, N = 134) = 11.114, p = 0.011$, but no significant difference between divisions for any other position.

so that they can coordinate with those supporters (and potentially refer future students to the same sources of support). Likewise, institutions stand to benefit from a better awareness of the (potentially invisible) sources of mentoring beyond formally defined official mentors. Incentives and support structures at the institutional level may implicitly assume or favor single mentor-protégé models and leave co-mentors, secondary mentors, and others unsupported and unrecognized. The results of this survey suggest that other forms of mentoring such as relational (Ragins and Kram 2007), many-to-one (Huizing 2012), and mosaics (Mullen 2000, 2009) may be occurring frequently and that greater awareness of other models of mentoring could be beneficial (Nicholson et al. 2017).

Conclusions

Undergraduate researchers described individuals who helped them in their research. Students often reported large support networks containing several mentors. The composition of these networks varied depending on the disciplinary field of the research, which may reflect different disciplinary norms in research processes. Mentorship was associated with the institutional role of the supporter and support provided, especially information and feedback. Those not defined as mentors also provide essential help such as emotional support.

Although students' motivation was not assessed for seeking out or working within such distributed networks, their frequency in this sample suggests that a one-to-one mentor-protégé structure is not the norm and that many student may benefit from alternative models. Therefore, it may be warranted for institutions to broaden their focus and to support a range of mentoring models that provide mentoring beyond the mentor-protégé structure. Future work should address the dynamics within such networks, and how and why these larger networks develop over time.

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References

Aikens, Melissa L., Sona Sadselia, Keiana Watkins, Mara Evans, Lillian T. Eby, and Erin L. Dolan. 2016. "A Social Capital Perspective on the Mentoring of Undergraduate Life Science Researchers: An Empirical Study of Undergraduate-Postgraduate-Faculty Triads." *CBE—Life Sciences Education* 15: ar16. doi: 10.1187/cbe.15-10-0208

Higgins, Monica, Shoshana R. Dobrow, and Kathryn S. Roloff. 2010. "Optimism and the Boundaryless Career: The Role

of Developmental Relationships." *Journal of Organizational Behavior* 31: 749–769. doi: 10.1002/job.693

Huizing, Russell L. 2012. "Mentoring Together: A Literature Review of Group Mentoring." *Mentoring & Tutoring: Partnership in Learning* 20(1): 27–55. doi: 10.1080/13611267.2012.645599

Johnson, W. Brad. 2002. "The Intentional Mentor: Strategies and Guidelines for the Practice of Mentoring." *Professional Psychology: Research and Practice* 33: 88–96.

Johnson, W. Brad. 2015. *On Being a Mentor: A Guide for Higher Education Faculty*. New York: Routledge.

Ketcham, Caroline J., Eric E. Hall, Heather Fitz Gibbon, and Helen Walkington. 2017. "Co-Mentoring in Undergraduate Research: A Faculty Development Perspective." Unpublished report, Elon University.

Kuh, George D. 2008. *High-Impact Educational Practices: What They Are, Who Has Access to Them, and Why They Matter*. Washington, DC: Association of American Colleges and Universities.

Lopatto, David. 2010. "Undergraduate Research as a High-Impact Student Experience." *Peer Review* 12(2): 27–30.

Mullen, Carol A. 2000. "Constructing Co-Mentoring Partnerships: Walkways We Must Travel." *Theory into Practice* 39(1): 4–11.

Mullen, Carol A. 2009. "Re-Imagining the Human Dimension of Mentoring: A Framework for Research Administration and the Academy." *Journal of Research Administration* 40(1):10–31.

Nicholson, Brittany A., Meagen Pollock, Caroline J. Ketcham, Heather M. Fitz Gibbon, Evan D. Bradley, and Michelle Bata. 2017. "Beyond the Mentor-Mentee Model: A Case for Multi-Mentoring in Undergraduate Research." *Perspectives on Undergraduate Research and Mentoring* 6(1): 1–14.

Ragins, Belle Rose, and John L. Cotton. 1999. "Mentor Functions and Outcomes: A Comparison of Men and Women in Formal and Informal Mentoring Relationships." *Journal of Applied Psychology* 84: 529–550. doi: 10.1037/0021-9010.84.4.529

Ragins, Belle Rose, and Kathy E. Kram. 2007. *The Handbook of Mentoring at Work: Theory, Research, and Practice*. Thousand Oaks, CA: Sage Publications.

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