BOARD # 411: NSF RFE Project Update: An exploration of how faculty advising influences doctoral student psychological safety and the impact on work-related outcomes

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Introduction

Faculty advisors play an integral role in the experiences of graduate students [1]. Advisors serve in many different capacities for doctoral students: teachers, career guides, research mentors, and more [1]. However, faculty advisors often receive little to no training on how to serve effectively as mentors. The training that faculty may receive is often lacking in how to provide psychosocial support, which is an important part of developing psychological safety in a team [2].

A psychologically safe environment is one where an individual feels safe to be themselves and take risks without fear of negative consequences [2]. Psychologically safe environments enable team members to be creative [3], [4], innovative [5], [6], and share ideas [7], [8], which is a necessary part of the doctoral student research process. Psychological safety (PS) in a graduate student-advisor relationship can have positive or negative effects on student mental health and well-being as well as learning outcomes. The impact that psychological safety has on graduate students' work outcomes and mental health and well-being needs to be more deeply explored to best support students throughout their degree programs and beyond.

Project Overview

This paper is an update on an NSF RFE project started in 2023 that leverages mixed methods to combine a survey of graduate engineering students and two sets of interviews [9]. We have completed data collection and begun analysis of the survey responses and the first set of interviews. We use the Conservation of Resources (COR) theory to examine psychological safety in relationships between doctoral engineering students and their research advisor(s). COR states that people seek to gain, retain, and protect their resources, and that they experience stress when their resources are threatened or lost [10]. Resources can include physical objects, energy, relationships, and more [10]. We posit that faculty advisors serve as a resource to students and, in turn, influence psychological safety in student research environments, which impacts student outcomes such as well-being and research quality.

Methods

The survey was completed by 469 doctoral engineering students across two R1 institutions. Survey methods and preliminary results can be found in [9], [11]. Explanatory interview participants were selected to stratify demographics and offer a broad range of advisor experiences. Twenty-eight survey participants were invited to complete explanatory interviews.

Nineteen participants completed an explanatory interview during which they provided insights and additional context into their survey responses. Interviewers provided participants with their responses to survey items and asked them why they selected their answer and for examples of times when their survey response was representative or not of their overall advising relationship.

Additional narrative interviews were conducted in the Fall 2024 semester with a different subset of survey participants. These narrative interviews were designed to capture specific events and stories from students about critical moments in their relationships with their advisors. We were particularly interested in understanding how advisor actions (or inaction) in these critical moments impacted graduate student psychological safety and work outcomes, as well as how these experiences changed over time. Narrative interview participants were also selected to stratify demographics and offer a broad range of advisor experiences. We interviewed 11 participants from the larger study in Fall 2024 who had shared engaging stories in their short answer responses to the survey questions. Using the critical moments from across participant interviews, we intend to create composite narratives telling a fuller picture of the graduate engineering student experience.

Preliminary Results

Our proposed conceptual framework combining COR and PS to illustrate how faculty advisors impact graduate student outcomes (Figure 1) was supported by preliminary survey results.

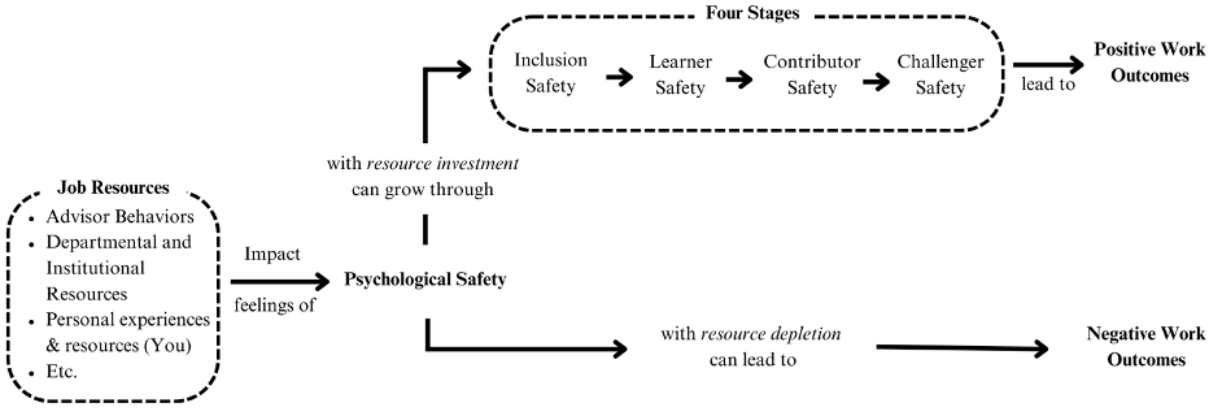

Figure 1. Conceptual framework that combines COR and PS to illustrate how faculty mentoring impacts graduate student outcomes.

Preliminary results indicated that dyadic psychological safety (Dyadic PS) [12], advisor mentoring skills as reported through the mentoring competency assessment (MCA) [13], and student mental health and well-being [14] were strongly positively correlated (Figure 2). Team psychological safety (Team PS) [2] and job stress and wellness [15], [16] were also correlated with advisor mentoring skills, and the impact of psychological safety on work outcomes [17] was weakly correlated with mentoring skills.

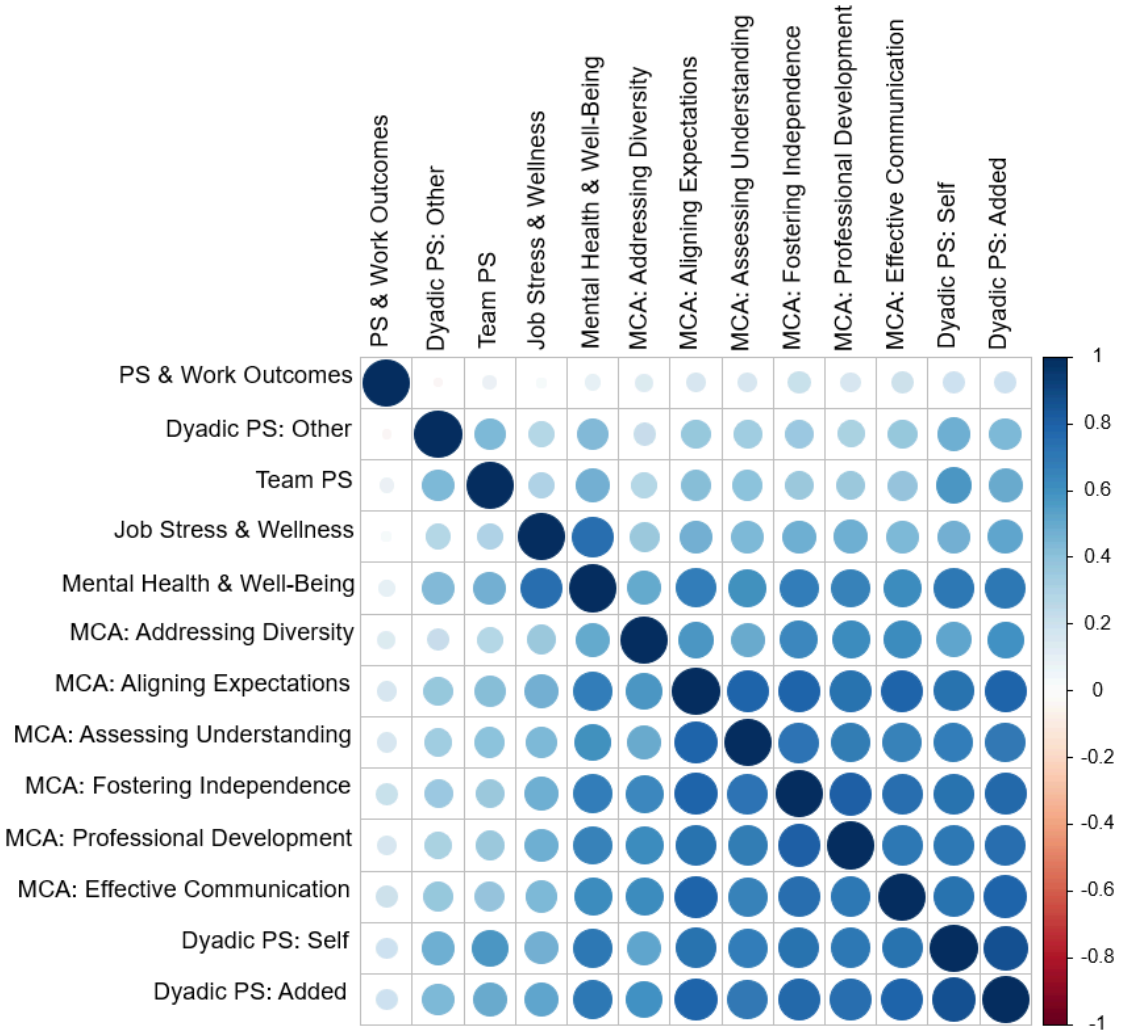

Figure 2. Spearman correlation plot that shows how the survey scales and subscales correlated with each other.

Explanatory interview findings emphasized the variability of student experiences with advisor mentorship. Student experiences illustrated the presence and absence of four different types of psychological safety in individual student-advisor relationships: inclusion, learner, challenger, and contributor safety [18]. Examples of each type of psychological safety are in Table 1.

Table 1. Definitions and examples of the four types of psychological safety.

Type	Definition	Examples
Inclusion Safety	Feelings of acceptance and shared identity within a group or relationship	Being valued as a useful member of the team, sharing cultural experiences
Learner	Feeling safe to engage in the learning	Being able to ask “silly” questions

Type	Definition	Examples
Safety	process: discovering, asking questions, experimenting, and making mistakes	without judgement, engaging in discussion around new research ideas
Contributor Safety	Feeling safe to work independently, perform in a role, and provide results	Getting support in exploring new areas, providing feedback effectively
Challenger Safety	Feeling of being able to challenge the status quo without fear of retribution, rejection, or risk to personal reputation	Standing up for what is "right" in ethical dilemmas, embracing difficult conversations

Discussion

Collectively, these results will inform training for faculty advising graduate students to create psychologically safe environments where students will thrive. We will use our findings to create resources for both faculty advisors and graduate students to support building this psychologically safe relationship. We plan to leverage this research to develop workshop materials, virtual tools, and guidelines for students and faculty advisors.

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References

[1] L. L. Baird, "Helping graduate students: A graduate adviser's view," *New Dir. Stud. Serv.*, vol. 1995, no. 72, pp. 25–32, 1995, doi: 10.1002/ss.37119957205.
[2] A. Edmondson, "Psychological Safety and Learning Behavior in Work Teams," *Adm. Sci. Q.*, vol. 44, no. 2, pp. 350–383, Jun. 1999, doi: 10.2307/2666999.
[3] M. E. Palanski and G. R. Vogelgesang, "Virtuous Creativity: The Effects of Leader Behavioural Integrity on Follower Creative Thinking and Risk Taking," *Can. J. Adm. Sci. Rev. Can. Sci. Adm.*, vol. 28, no. 3, pp. 259–269, Sep. 2011, doi: 10.1002/cjas.219.

[4] A. Carmeli, R. Reiter-Palmon, and E. Ziv, “Inclusive Leadership and Employee Involvement in Creative Tasks in the Workplace: The Mediating Role of Psychological Safety,” *Creat. Res. J.*, vol. 22, no. 3, pp. 250–260, Aug. 2010, doi: 10.1080/10400419.2010.504654.
[5] Y. Liu and R. T. Keller, “How Psychological Safety Impacts R&D Project Teams’ Performance,” *Res.-Technol. Manag.*, vol. 64, no. 2, pp. 39–45, Mar. 2021, doi: 10.1080/08956308.2021.1863111.
[6] A. C. Edmondson and Z. Lei, “Psychological Safety: The History, Renaissance, and Future of an Interpersonal Construct,” *Annu. Rev. Organ. Psychol. Organ. Behav.*, vol. 1, no. 1, pp. 23–43, Mar. 2014, doi: 10.1146/annurev-orgpsych-031413-091305.
[7] Y. Zhang, Y. Fang, K.-K. Wei, and H. Chen, “Exploring the role of psychological safety in promoting the intention to continue sharing knowledge in virtual communities,” *Int. J. Inf. Manag.*, vol. 30, no. 5, pp. 425–436, Oct. 2010, doi: 10.1016/j.ijinfomgt.2010.02.003.
[8] E. Siemsen, A. V. Roth, S. Balasubramanian, and G. Anand, “The Influence of Psychological Safety and Confidence in Knowledge on Employee Knowledge Sharing,” *Manuf. Serv. Oper. Manag.*, vol. 11, no. 3, pp. 429–447, Jul. 2009, doi: 10.1287/msom.1080.0233.
[9] L. Martini, D. Bobbett, J. Sanders, K. Jensen, and M. Huerta, “Board 197: An Exploration of How Faculty Advising Influences Doctoral Student Psychological Safety and the Impact on Work-Related Outcomes,” in *2024 ASEE Annual Conference & Exposition Proceedings*, Portland, Oregon: ASEE Conferences, Jun. 2024, p. 46762. doi: 10.18260/1-2--46762.
[10] S. E. Hobfoll, “Conservation of Resources,” *Am. Psychol.*, 1989.
[11] D. Bobbett, J. Sanders, L. Martini, M. Huerta, and K. Jensen, “Work in Progress: Design and Preliminary Results of a Survey to Explore Relationships Between Faculty Mentoring, Engineering Doctoral Student Psychological Safety, and Work Outcomes,” in *2024 ASEE Annual Conference & Exposition Proceedings*, Portland, Oregon: ASEE Conferences, Jun. 2024, p. 48345. doi: 10.18260/1-2--48345.
[12] R. Tynan, “The Effects of Threat Sensitivity and Face Giving on Dyadic Psychological Safety and Upward Communication1,” *J. Appl. Soc. Psychol.*, vol. 35, no. 2, pp. 223–247, Feb. 2005, doi: 10.1111/j.1559-1816.2005.tb02119.x.
[13] H. Haeger and C. Fresquez, “Mentoring for Inclusion: The Impact of Mentoring on Undergraduate Researchers in the Sciences,” *CBE—Life Sci. Educ.*, vol. 15, no. 3, p. ar36, Sep. 2016, doi: 10.1187/cbe.16-01-0016.
[14] World Health Organization, “Mental Health.” who.int. Accessed: Feb. 05, 2024. [Online]. Available: https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response
[15] S. Cohen, T. Kamarck, and R. Mermelstein, “A Global Measure of Perceived Stress,” *J. Health Soc. Behav.*, vol. 24, no. 4, p. 385, Dec. 1983, doi: 10.2307/2136404.
[16] E. D. Dolan *et al.*, “Using a Single Item to Measure Burnout in Primary Care Staff: A Psychometric Evaluation,” *J. Gen. Intern. Med.*, vol. 30, no. 5, pp. 582–587, May 2015, doi: 10.1007/s11606-014-3112-6.
[17] W. A. Kahn, “Psychological Conditions of Personal Engagement and Disengagement at Work,” *Acad. Manage. J.*, vol. 33, no. 4, pp. 692–724, 1990, doi: 10.2307/256287.
[18] T. R. Clark, *The 4 Stages of Psychological Safety: Defining the Path to Inclusion and Innovation*, 1st ed. Berrett-Koehler Publishers, 2020.