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#### Abstract

The purpose of this research paper is to explore the fostering of psychologically safe spaces within multi-institutional research networks in higher education. Doing so provides insights to the leadership and administrators of these networks to improve researcher well-being and productivity across academic ranks.

Multidisciplinary, interdisciplinary, and multi-institutional research networks have become critical for addressing the complex challenges of the 21st century, particularly in science and engineering fields. U.S. funding agencies, such as the National Science Foundation, have invested in large-scale initiatives that require cross-institutional collaborations. These research networks encompass different disciplinary contexts, geographical regions, institutional cultures, and academic ranks, all the while seeking to develop cohesive and inclusive teams. Collaboration of this nature across institutions may create tensions in organizational structures if the well-being and psychological safety of their members are not addressed. As the field of engineering seeks to broaden participation and foster supportive learning environments, understanding how multi-institutional networks which are meant to address societal challenges support their members is critical.

Our study focuses on understanding how members of a prominent multi-institutional research network, Multiscale Resilient, Equitable, and Circular Innovations with Partnership and Education Synergies (RECIPES) for Sustainable Food System, perceive the network to foster psychological safety (PS) (Edmondson, 1999). We draw on qualitative data from two focus groups involving twenty-five members of the network. By analyzing the contributions from the participants' interviews on aspects of the culture (such as leadership, power dynamics, participation, etc.) with the research network, we uncover the ways in which fostering psychological safety is demonstrated within the network.

Our findings suggest that psychological safety is a critical factor in fostering collaboration, inclusivity, and well-being within multi-institutional research networks. By creating environments where members feel safe to express themselves, take risks, and engage in constructive dialogue, these networks can enhance productivity and cultivate a culture of mutual respect and trust. Our paper concludes with recommendations for prioritizing psychological safety and researcher well-being in multi-institutional networks and other higher education spaces where research is conducted.

**Keywords**: multi-institutional network, psychological safety, researcher well-being, research community, engineering education

## Introduction

This paper reports findings from two focus group interviews in a multi-institutional research network to explore the demonstration of psychological safety within the network. In a multi-institutional research network such as [Name of Research Network], the organization's primary goals involve creating new knowledge and finding new ways to tackle systemic problems.

To achieve the goals of the research network, participants are required to contribute to the continuous improvement of activities and research products to achieve the goals of the network. Participants make their contributions by sharing their ideas, by collaborating with other participants, as well as by trying out new ways of doing things. While these activities have the potential to benefit the goals of the research network, they could pose certain risks to the participant(s) involved. When there is an established way of doing things for instance, sharing one's ideas or seeking to try out new methods that may challenge the status quo could go against the vested interest of other participants – hence there is a personal risk consideration [1]. Given the nature of organizations, the presence of roles and positions set the stage for a participant introducing a new input to be viewed in a negative light or as unsuccessful if their experimentation with a new approach is not successful [2].

In higher education institutions, multi-institutional research networks collaborate across disciplinary contexts, geographical regions, institutional cultures, and academic ranks, all the while seeking to develop cohesive and inclusive teams. In this context, there is the potential for participants of the research network to experience varying levels of psychological safety in their participation in the network. Given the role and importance of the innovations and knowledge advancing outputs of multi-institutional research networks, understanding how they support their members is critical, especially since researcher well-being (i.e. productivity and satisfaction) has been tied to factors such as supportive environments and feelings of confidence [3].

In this paper, we explore the fostering of psychologically safe spaces within a multi-institutional research network by asking, how do members of a multi-institutional research network perceive and experience the fostering of psychologically safe spaces that promote researcher well-being, inclusion, and collaboration? Findings offer insights about how members of the [Name of Research Network] perceive the network to foster psychological safety, therefore uncovering insights and providing recommendations that can guide leadership and administrators of these networks in improving their organizational cultures.

#### Background

Over the past four decades, U.S. funding agencies for science and technology have increasingly invested in large-scale, centralized research projects, often through block grants and research collaborations. Various research collaborative models are commonplace in sectors such as higher education because of the benefits these collaborations provide [4].

A research collaborative model may include researchers with diverse disciplinary backgrounds, levels of experience, and locations [5], [6]. This diversity offers interdisciplinary perspectives, expands geographic data collection, and enhances the depth and breadth of expertise within the project. As the prevalence of these collaborative models grows, so does the need to understand their management and effectiveness, particularly to ensure equitable and inclusive participation across all stakeholders involved.

Multi-institutional research networks (MIRNs) are a type of research collaborative model designed to address complex challenges that exceed the capabilities of individual institutions. MIRNs can be described as specialized social systems within scientific communities, typically organized around convergent research initiatives. These networks bring together researchers from multiple institutions and disciplines to address complex problems that exceed the capacity of any single institution or field of study.

Beyond academia, these networks often include stakeholders from industry, government, and non-profit sectors, aligning diverse expertise and resources to tackle multifaceted challenges. An example is the Sustainable Regional Systems (SRS) Research Networks program funded by the National Science Foundation (NSF), which supports collaborative teams across institutions to produce convergent research addressing grand regional challenges [7]. Such networks aim to generate innovative solutions while advancing education and public outreach through interdisciplinary partnerships.

Structurally, MIRNs are characterized by their decentralized nature, with participants dispersed across different institutions, disciplines, and often geographical locations. These participants or members of these networks are central to their success. The diversity tied to the character of MIRN is both a strength and a challenge, as it demands effective coordination, communication, and a shared understanding of objectives [4].

To manage the incorporation of varied perspectives, expertise, and problem-solving approaches of MIRNs inevitably must address unique challenges, including reconciling different institutional priorities, navigating inequitable power dynamics, and addressing disparities in access to

resources [8]. The presence or absence of cohesive organizational culture within the network can mitigate or exacerbate feelings of exclusion or disconnection among participants.

# Psychological Safety and Researcher Well-being

The well-being of researchers, including faculty, postdocs, and students, is a critical determinant of satisfaction, performance, and retention in higher education. Numerous factors influence researcher well-being, including workload, institutional support, funding pressures, and access to mentorship [9], [10], [11]. Of these factors, psychological barriers have been found to be common experience amongst higher education's faculty, students and postdocs [12], [13], [14], [15], [16], [17]. In MIRNs, where participants must navigate complex structures, diverse institutional cultures, and the demands of collaboration across disciplines and geographies, these factors and barriers may be exacerbated–especially for participants from historically underrepresented groups in science and engineering.

Historically, the culture of science, technology, engineering, and math (STEM) fields has been characterized by rigid hierarchies, intense competition, and an emphasis on individual achievement over collaboration [14], [18]. These characteristics have often contributed to environments that are perceived as exclusionary and unwelcoming, particularly for underrepresented groups in science and engineering [19], [20], [21].

In recent years, the push for diversity, equity, and inclusion (DEI) in higher education has brought greater attention to the systemic barriers that hinder the participation and success of underrepresented scholars. This so-called "DEI craze" spurred a wave of institutional efforts, including the implementation of training, mentorship programs, and initiatives aimed at creating more inclusive spaces [8]. However, as momentum around DEI has begun to wane, questions remain about the sustainability and long-term impact of these efforts [22], [23].

A critical element to fostering inclusivity and well-being among researchers is creating environments where individuals feel safe to express themselves, take risks, and contribute without fear of embarrassment, rejection, or negative consequences. These kinds of spaces are referred to as psychologically safe spaces [24].

In the context of MIRNs, psychological safety is particularly important given the diverse backgrounds, disciplines, and institutions that participants represent. A lack of psychological safety can stifle creativity, collaboration, and open communication, ultimately undermining the goals of a research network. Fostering psychological safety, on the other hand, can lead to higher levels of trust, engagement, and innovation among network members.

The [Name of Research Network] recognized these challenges and prioritized creating a supportive culture to address them [8]. As part of its mission to transform food systems through

sustainability research, the network intentionally incorporated practices aimed at fostering inclusion and psychological safety among its members. This work included the development of guiding principles, norms, and structures designed to support collaboration, promote well-being, and ensure that all participants felt valued and empowered [25]. By examining the experiences of [Name of Research Network] members, this study aims to uncover insights into how psychological safety and inclusive practices can be embedded within MIRNs to enhance researcher well-being and productivity.

## Literature Review

# Definitions of Psychological Safety

Almost sixty years ago, the construct of psychological safety was first introduced in academic literature in relation to organizations and work [12]. Since then, several definitions of psychological safety have been proposed [1]. Psychological safety has been defined as people's perceptions of the potential outcomes of taking interpersonal risks within a specific setting, such as a workplace, or a state where interpersonal risks are minimized [26], [27].

A systematic literature on psychological safety reported that the majority of studies have used Edmondson (1999)'s definition, which states that psychological safety is a shared belief amongst persons as to whether it is safe to engage in interpersonal risk-taking in their workplace [1]. Psychological safety can be viewed on an interpersonal level or as a group-level construct. Within a team, it describes a climate characterized by mutual respect and interpersonal trust in which people are comfortable being themselves [24]. Psychological safety has been identified as important for fostering learning and facilitating change in environments defined by high stakes, complexity, and critical human interactions, such as multi-institutional research networks.

Edmondson (1999) identifies five key characteristics of workers in psychologically safe environments. First, workers feel confident that their colleagues will not reject them for being authentic or expressing their thoughts. Second, they demonstrate mutual respect for each other's competence and show genuine interest in one another as individuals. Third, workers approach interactions with positive intentions toward their peers. Fourth, they can engage in constructive conflict or confrontation effectively. Finally, workers perceive the environment as safe for experimentation and risk-taking without fear of negative repercussions.

#### Multi-Institutional Research Networks as Organizations

We characterize multi-institutional research networks as organizations based on definitions of the terms "organization" and "institution".

Sociologists define institutions as collections of norms that extend across multiple specific organizations, whereas organizations are structures of social relationships, involving social actors occupying roles and positions [28]. These structures of social relationships are usually designed with the intention to accomplish particular objectives. In this work, we define a multi-institutional research network as an organization, i.e. a social structure involving a group of people (i.e. researchers, faculty, students and participating stakeholders across federal and industry spaces) working together to achieve a goal.

Scholars have highlighted numerous variables that influence the success of multi-institutional research collaborations, ranging from resource availability to governance structures [29]. Among these, institutional design variables, such as epistemic norms and organizational structures, have been identified as critical determinants of effectiveness. Specifically, successful collaborations are often dependent on (1) the development and alignment of epistemic norms within the disciplines involved, and (2) the type and maturity of the organizational structure that supports the collaboration.

# Psychological Safety at Play in MIRNs

Building on this foundation, this study contributes to the growing body of literature by emphasizing the importance of psychological safety within multi-institutional networks. Organizational structures are not only shaped by policies and frameworks but are also deeply influenced by the experiences and interactions of the individuals who make up these structures. As such, understanding and fostering psychological safety is vital, as it directly impacts how members engage, collaborate, and contribute within these networks.

# **Research Design and Methodology**

This study uses a qualitative research design to explore the experiences of members within a multi-institutional research network and how the network fosters psychological safety. We chose this design since qualitative research is particularly well-suited for examining complex, socially constructed phenomena, such as organizational culture and interpersonal dynamics. It allows for an in-depth exploration of participants' lived experiences and perceptions [30].

# Data Collection

Prior to collecting data, the research team submitted and received approval for protocols by the researchers' home university's Institutional Review Board.

The primary method of data collection involved conducting two (2) focus groups with twenty-five (25) [Name of Research Network] members. Each focus group included a mix of students, staff, faculty, and researchers to ensure diverse perspectives. These focus groups,

structured as small, interactive sessions, were designed to gather rich, qualitative insights into the culture and dynamics of the network [31].

Participant recruitment occurred in two ways and was designed to ensure transparency and encourage voluntary participation. The first method recruited study participants through the [Name of Research Network] database, an established communication channel containing a comprehensive pool of students, staff, faculty, and researchers. The second took place on-site at the network's annual network meeting. This setting provided an ideal opportunity for direct engagement with network members.

Focus group sessions were held in-person during the annual meeting, leveraging the presence of network members in a shared space. Groups remained small to facilitate open dialogue and deeper engagement [31].

Members of the research team provided participants with detailed consent forms outlining the study's purpose, procedures, and their rights as participants. Physical signed consent forms were collected prior to participation. From there, researchers guided participants using a set of semi-structured interview questions aligned with the study's research objectives. Questions explored topics such as: experiences with [Name of Research Network] structures and procedures related to diversity and inclusion; perceptions of power dynamics and positionalities within the network; and the culture of collaboration and participation in [Name of Research Network] activities. Each focus group session lasted approximately 25–40 minutes, providing ample time for participants to reflect on and discuss their experiences. The team audio-recorded interviews with participants' consent to ensure accuracy in data collection.

## Data Analysis

At the completion of the interviews, the team generated transcripts for analysis, with identifying information anonymized to protect participant confidentiality [32]. Audio recordings and transcripts were stored on password-protected servers with restricted access.

The team analyzed key themes related to organizational culture, diversity, and inclusion within [Name of Research Network]. Thematic analysis, as detailed in the next section, uncovered patterns, and insights to inform the study's recommendations for fostering inclusive, psychologically safe research environments.

The analysis of focus group data followed a two-cycle coding approach with the purpose of understanding how members of the [Name of Research Network] perceive the network's culture in fostering psychologically safe spaces that promote researcher well-being and productivity across diverse academic ranks.

In the first cycle, descriptive coding was used to summarize and organize the data into meaningful segments, capturing participants' experiences and perceptions as expressed in their own words. This process involved reading and re-reading the transcripts to identify recurring topics and patterns. The descriptive codes included phrases related to leadership, participation, power dynamics, collaboration, and inclusion. The focus group transcripts were coded line by line to capture the nuances of participant responses, ensuring that no significant data was overlooked. The descriptive coding revealed several key themes, such as participants' experiences with inclusivity in cluster meetings, reflections on the network's collaborative nature, and perceptions of trust and openness within the network's structure. These codes provided a foundation for deeper analysis in the second cycle of coding.

In the second cycle, we used thematic coding (Saldaña, 2021), while applying five characteristics of psychologically safe environments from Edmondson [25] to organize the data into five overarching themes (see Figure 1): (1) authenticity and acceptance; (2) mutual respect and personal interest; (3) positive intentions; (4) constructive conflict and confrontation, and (5) safety for experimentation and risk-taking. These themes provided a lens to analyze the culture of the [Name of Research Network] and its impact on the experiences of participants.



Figure 1: Five Characteristics of a Psychologically Safe Research Environment [24]

- *Authenticity and Acceptance:* Participants frequently mentioned "feeling free" to be themselves, without fear of judgment or rejection. They highlighted how the network intentionally fosters openness.
- *Mutual Respect and Personal Interest:* Participants referred to the genuine care and respect they experienced within the network. They described the culture as one that values interpersonal connections and collaboration, with members showing interest in each other's perspectives and expertise.
- *Positive Intentions:* Many participants expressed appreciation for the intentionality behind the network's design, particularly its emphasis on inclusion, equity, and shared success [8]. The guiding principles and norms established by the network were seen as central to its positive environment [25].

- *Constructive Conflict and Confrontation:* While conflict appeared minimal, participants noted that the network provided a safe space for addressing disagreements constructively. This openness to dialog and differing opinions was seen as a strength.
- *Safety for Experimentation and Risk-Taking:* Participants described the network as a supportive environment for intellectual risk-taking.

Saldana's Coding Manual for Qualitative Researchers guided the coding process. This involved systematic organization and retrieval of codes during first and second cycles of coding [33]. To enhance clarity, researchers summarized codes in a table format, showing the alignment of participant responses with the five psychological safety themes (see Table 1). This visualization made it easier to identify the connections between the network's cultural practices and participants' perceptions of psychological safety. To ensure the trustworthiness of the findings, the research team peer-debriefed and utilized triangulation [34], [35].

Psychological Safety Theme	Focus Group 1 Examples	Focus Group 2 Examples
Authenticity and Acceptance	Participants feel they can "be themselves" and are not judged by traditional academic standards, such as attire. Norms foster openness to express personal ideas	Emphasis on creating a welcoming environment where everyone feels free to contribute. "People genuinely seem like they enjoy
	without fear of rejection.	themselves" and can "bring their authentic selves."
Mutual Respect and Personal Interest	Participants describe a genuine interest in others' work and perspectives.	Emphasis on collaboration between diverse groups, including farmers and marginalized researchers.
	The network fosters a culture of care, with participants describing it as "like a family."	"We feel included, and everyone listens to each other."
Positive Intentions	Intentionality in creating norms and guiding principles to support inclusion.	The network is described as non-competitive and ego-free, with participants working toward common goals.
	Participants express appreciation for the trust and authenticity of network leaders.	"The group focuses on collective wins over individual losses."
Constructive Conflict and Confrontation	Participants describe an openness to addressing challenges, though no direct examples of conflict were shared.	Disagreements are seen as opportunities for dialog and learning.
	Norms allow for transparent discussions when issues arise.	"The culture opens doors to dialog and disagreement in a constructive way."
Safety for Experimentation and Risk-Taking	Participants feel empowered to suggest and experiment with new ideas without fear of failure.	Participants highlight the flexibility in exploring innovative approaches within their clusters.
	"There's a sense of trust to take initiative and pivot projects as needed."	"We're free to try new methods and contribute in our own ways."

Table 1: Mapping Participant Responses with the Psychological Safety Themes

#### Discussion

The findings of this study provide insights into how multi-institutional research networks foster psychological safety and its implications for researcher well-being and productivity. Through thematic analysis guided by Edmondson 1999's characteristics of psychological safety, the study identified key aspects of the network's culture that contribute to a supportive and inclusive environment.

#### Authenticity and Acceptance

One of the central themes that emerged was the importance of authenticity and acceptance within the network. Participants consistently highlighted the freedom to express their ideas, share vulnerabilities, and engage in open dialogue without fear of rejection or judgment.

For instance, one participant remarked, "I feel like everybody is willing to listen and learn. Even if someone says, 'Hey, I don't know what this is about,' it's met with curiosity and openness rather than judgment."

Another participant described the culture as a *"human-first network, rather than a job-first network,"* emphasizing the prioritization of personal connections and authenticity over rigid professional hierarchies.

In speaking about feeling accepted, one participant shared that, "...a foundation of a culture of inclusion, and I'm guessing that was part of the goal for the grant. But I think having that foundation helped to make it so that everybody felt free and welcome in the group. So even though I wasn't part of the initial group coming in, I felt that welcome from the whole RECIPES group."

"I've never been in a project where the first thing we do is sit down and decide together what our community norms should be. That set the tone for everything that followed."

This finding aligns with existing research on the significance of authenticity, the freedom to express one's ideas and acceptance in building collaborative environments and promoting psychological safety [12], [24], [26].

## Mutual Respect and Personal Interest

The study also revealed that mutual respect and personal interest are critical for fostering meaningful interpersonal relationships.

One participant shared, "There's this genuine desire for people to support others and help them succeed—it's not just about research, but about the people behind the research."

Another participant added, "Even though we come from different disciplines and institutions, there's a level of respect for each other's expertise and experiences that makes collaboration seamless."

"It doesn't matter if you're a student or a senior faculty member—your input is valued just the same, and that makes all the difference in how we work together."

# Positive Intentions

In the focus groups, we noted that participants took notice of the intentional efforts made by the network to value individual contributions and create opportunities for personal connections, which enhanced their sense of belonging and commitment to the network's goals [8], [24], [29].

One participant shared, "I feel like a genuine interest of, not only like purposes from, you know, my university, but in general to, you know, support other researchers, support other students, and like, a genuine desire for you to do well."

Participants expressed that although there were traditional organizational structures in place, power was downplayed, meaning, there was the openness to collaborate with other participants at different stages of their academic careers.

As one participant described, *"There really aren't these power plays, these dynamics… It starts with the top down as well as the bottom up."* 

"I've worked in other networks where power dynamics were obvious—PIs led, students followed. Here, it feels like there's space for everyone to contribute, no matter their rank."

## Constructive Conflicts

The study also identified constructive conflict and confrontation as a key component of psychological safety within the network. Unlike traditional hierarchical structures that discourage dissent or challenge, the network provided mechanisms for open and respectful disagreements [18].

A participant noted, "It's a very supportive culture that opens the door to discourse and disagreement, but in a way that feels uplifting rather than contentious."

"We can push back on ideas, ask tough questions, and challenge assumptions without anyone taking it personally. That's rare in academic spaces."

Members of the network are provided with spaces during their network-wide and cluster level meetings to share thoughts at the cluster level, within their research groups, and regarding administrative and network-wide concerns.

# Safety for Experimentation

Another significant contribution of the study is its emphasis on safety for experimentation and risk-taking. Participants reported feeling encouraged to propose novel ideas and take intellectual risks without fear of negative repercussions.

For example, one participant shared, "I didn't necessarily fit into what was already being done, but they found a way to make my research integrate into the cluster."

This sentiment was echoed by others who felt that their unique contributions were valued regardless of their academic rank or institutional affiliation. Whether participants were students, postdocs, or early-career faculty, they described a welcoming culture of experimentation that fostered creativity and collaboration.

"I was able to propose a new approach that I wasn't sure would be accepted. Instead of shutting it down, the group helped me refine it and actually put it into practice."

# Possible Challenges

Despite these positive aspects, participants noted some challenges. For instance, participants expressed concerns about the sustainability of psychological safety, particularly as the network grows and evolves.

One participant observed, "It's great now, but I wonder if we can keep this culture intact as more people join and new dynamics emerge."

Others reflected on the initial stages of their involvement in the network, describing the difficulty of navigating the multitude of opportunities and situating themselves within the network.

One participant explained, "In the beginning, it felt overwhelming—there were so many clusters and opportunities that it was hard to figure out where I fit in."

Participants frequently emphasized the need for ongoing efforts to institutionalize inclusive practices and address structural barriers. There was also concern about sharing best practices with other MIRNs and expanding the impact of their successful initiatives.

As one participant put it, "We need to figure out how to take what works here and apply it elsewhere. How do we get other research networks to do this too?"

This suggests an opportunity for MIRNs to create frameworks that can be adapted and implemented across other collaborative networks.

## Limitations

While the focus group data provided rich insights into participants' experiences, it is important to acknowledge potential limitations, including the small sample size and the context-specific nature of the study. Future research could expand on these findings by incorporating additional data sources, such as surveys or interviews with participants from other multi-institutional research networks.

# Conclusion

This study contributes to the growing body of literature on organizational culture and psychological safety in multi-institutional research networks. Our findings highlight that authenticity, mutual respect, constructive conflict, and safety for experimentation are integral to creating supportive research environments. Results also emphasize the role of intentional leadership, transparent communication, and inclusive practices when creating environments where researchers can thrive.

The implications of this study extend beyond this network to broader academic and professional settings. We recommend that multi-institutional networks and higher education institutions institutionalize practices that support psychological safety, such as co-developing norms [25], creating spaces for open dialogue, and encouraging inclusive leadership practices. See *Guiding Principles and Community Norms* by Agarwalla et al. (2024). Other practical strategies include designing feedback and assessment opportunities on the MIRN's culture, and providing resources not only for academic research purposes, but also for professional and personal development related to researcher well-being. Leaders and administrators of multi-institutional research networks are encouraged to adopt these recommendations and seek to explore frameworks for building successful research networks during the initial setting up phases.

Future research should explore the long-term impact of psychological safety on researcher productivity and well-being across researcher roles, as well as strategies for scaling these practices to broader institutional contexts. Comparative studies across different types of research networks could also provide insights into best practices for fostering psychological safety in diverse contexts (e.g. academic departments).

Fostering psychological safety is not merely a theoretical ideal but a practical necessity for the success of multi-institutional research networks at the forefront of science and engineering challenges. By prioritizing well-being and inclusion, these networks can unlock their full potential for innovation and impact, ultimately advancing the collective capacity to address

complex global challenges and provide spaces for underrepresented groups in science and engineering to thrive.

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