

# Crossing Boundaries: Reflexive Analysis of Collaborative Learning in Research Institutions

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**Abstract:** Researchers have increasingly looked at characteristics of learning organizations, which engage in constant transformation to facilitate organizational learning in order to remain successful. While much of this research has looked at organizational practices and the embedded social networks within and across private firms, little research has reflexively considered academia. Yet, professional interactions within academic disciplines that cross narrow research specializations are critical for the continued advancement of public science. In this study, we employ a sequential mixed-methods study design to establish a base of empirical research that is introspective of the collaborative research environment of academia. We first employed purposeful semi-structured interviews to understand the value academic leaders place in cross-specialization interactions and then collected questionnaires from which we conducted statistical and social network analyses to describe the characteristics of and variation within disciplinary interaction networks and the relationships between network attributes and perceptions of a positive, collaborative learning environment.

## Introduction

In our research, we seek to better understand the organizational factors that facilitate a collaborative learning environment for faculty researchers. This study therefore focuses on “research interactions,” which we define as intellectual exchange across sub-disciplinary specializations within an academic discipline in ways that support the sharing of heterodox scholarship. As an example of this distinction, we seek more to capture professional interactions between a cognitive psychologist developing a learning tutor and a social psychologist researching attachment rather than those between two linguists who frequently collaborate together. We argue, as do many others (e.g., Maxwell, 2004; NRC, 2002; Phillips, 1993), that these diverse interactions are critical to the continued advancement of public research and the sciences.

Prior research investigating faculty communities in higher education finds significant cultural divides between disciplines and the sub-disciplines within them (Becher & Trowler, 2001) and characterizes the research environment as occupationally turbulent and extremely competitive (Cameron & Tschirhart, 1992). Current research into scholarly exchange often focuses on co-authorship and citation networks (e.g., Ding, 2011; Velden, Haque, & Lagoze, 2010) or on building research collaboration across disciplines and within the specializations that span them (Denicolo, 2004; Jedele, 2010). Previous research has also focused on organizational learning through network interactions within private workplaces (e.g., Cross & Israelit, 2009) and between firms (e.g., Larsson, Bengtsson, Henriksson, & Sparks, 1998; Powell, 1996) and how this leads to increased productivity. However, we found no empirical research that attempted to investigate the characteristics that support collaborative learning that spans research specializations within disciplinary communities in academia.

To address this gap, we designed a mixed-methods, dual-stage project to develop a foundation of the collaborative interactions among research faculty that do not share primary research interests. The first, qualitative phase focused on conceptualizing “interaction” using in-depth, semi-structured interviews with academic leaders. In the second, quantitative phase, we administered a questionnaire to research faculty and employed inferential statistics and social network analysis (SNA) to understand the relationships in each disciplinary unit of our research site.

## Methods

In phase one, we generated a semi-structured interview protocol from a review of the literature. We included questions to elucidate research interaction in formal and informal contexts as well as how these interactions support a community of practice (Wenger, 1998). Items sought to bring to light the value researchers place on scholarly interactions across specializations, the function and dimensions of professional trust in academia, and how contextual factors such as the physical environment, available resources, and social hierarchy affect opportunities for interaction.

Interviews were conducted in tandem, with one researcher as the lead and the other taking field notes to supplement the audio recording. This phase employed responsive interviewing (Rubin & Rubin, 2012) to collect

data and a grounded theory approach (Strauss & Corbin, 1997) to move toward an understanding of interaction. Grounded theory allows us to consider both consensus and diversity of data to develop a rich but bounded working definition of academic interaction that allow for variation in perspectives.

For phase two, we operationalized the dimensions identified in phase one into a two-part questionnaire administered electronically to all tenure-track faculty in disciplinary units with doctoral programs at the university. We define the “disciplinary unit” as the highest organizational level that represents a conceptual discipline, such as “Psychology” or “Social Work”; thus, the disciplinary unit at times refers to different formal units within the same university. The first part of the questionnaire asks each participant to identify colleagues in the disciplinary unit with whom they interact, the frequency of interaction, and a set of context variables. We use these data for a social network analysis that examines the frequency, density, and structure of each research discipline in our site to understand the degree of variation in professional disciplinary communities. The second part of the survey captures salient indicators of the organizational environment, including beliefs regarding the collaborative climate, the degree that interactions across specialization lead to productive outcomes for the field, whether interaction patterns are influenced by race and gender, and whether the local collaborative environment is supported or impeded by factors that include technology, the layout of the physical environment, and social hierarchy.

Research questions for the full study include:

1. How do faculty leaders understand research interactions across specialization and to what extent are they valued for collaborative learning and scientific progress?
2. What factors impede and facilitate such interactions?
3. With what frequency do research interactions across specializations happen in disciplinary units and how much variation is observed across a broad set of them?
4. How do characteristics of interaction networks relate to perceptions of professional climate?

## Sample

This study focused on all disciplinary units engaged in significant research at a large public university listed by the Carnegie Classification as having “high research activity.” We used the presence of a doctoral program leading to a research Ph.D. as an indicator of a significant research focus; this led to the inclusion of 62 units. From this set, we constructed a typology of “fields”, which are sets of disciplines with similar approaches (such as “the humanities”).

For phase one, we categorized university and academic leaders based on the level of their responsibility and then selected interview participants in order to obtain perspectives on scholarly interaction that cross disparate fields, as different disciplines have significantly different cultures (Becher & Trowler, 2001). We also selected participants to maximize demographic variation as research shows that race and gender have salient effects on academic research contexts and networks (Sax et al, 2002; Scheurich & Young, 1997). A total of 16 academic leaders were included (see Table 1). While we succeeded in obtaining significant gender variation (N=7 female), the lack of people of color in academic leadership roles (as described by Aguirre & Martinez, 2007) made it difficult to diversify based on race (N=3 nonwhite). Interviews lasted 30 to 90 minutes and were in person, with the exception of one that was conducted by videoconference. Table 1 shows participant codes, administrative level, and field for the phase one interviews. We interviewed two leaders at the disciplinary level of the humanities as the units at our site do not formally define programs in a way that meets our criteria.

Table 1: Matrix of disciplines

<b>Field:</b>	<b>Physical Sciences</b>	<b>Social Sciences</b>	<b>Interdisciplinary</b>	<b>Humanities</b>	<b>Professional</b>
<i>Example:</i>	<i>Physics,</i>	<i>Education,</i>	<i>Gender Studies,</i>	<i>English,</i>	<i>Social Work,</i>
<b>Level:</b>	<i>Biology</i>	<i>Economics</i>	<i>Ethnic Studies</i>	<i>Philosophy</i>	<i>Engineering</i>
<b>Above Discipline</b>	♂	♀	♂	♂	♂
<b>Disciplinary Unit</b>	♂	♀	♀	♀, ♂	♂
<b>Program</b>	♂	♂	♀	N/A	♀, ♀

For phase two, a custom online survey that leveraged modern web interfaces and a database backend was designed and administered to all tenure-track faculty within identified units. The first part of the survey asked

the participant to select all faculty with whom they regularly interact and asked them to indicate (a) if they share the same research focus, (b) if they have collaborated in the last two years, (c) how often they interact in person and electronically, (d) whether they would approach that individual to ask a question in their field of expertise, and (e) whether they would approach that individual to ask a question about their professional life. From the salient constructs that emerged from the first phase, we generated and field tested 50 survey items; each construct had between three and seven items connected to it. We attended faculty meetings in disciplinary units to introduce the project and to increase response rates. We additionally contacted faculty non-responders directly by email. Only units with better than 50% response rates will be included in final analysis, and we will highlight the range of variation we see in network density, centrality, and perceived organizational environment in our selection of units for presentation.

## Analysis

### Phase one qualitative analysis

During interviewing, we performed preliminary analysis and open coded emergent topics to develop the initial code set. We iteratively refined the protocol and code book to increase clarity and gain further insight into emergent themes. After all interviews were completed and initially coded, we decided upon the final codebook using a consensus model and re-coded all interviews to ensure complete coverage.

### Phase two quantitative analysis

The social networks for each disciplinary unit will be constructed and correlational statistics will be used to contextualize them. We compare network structures overall and consider centrality characteristics for individual nodes and for researcher cliques. Aggregated to the disciplinary level, we calculate measures for network centralization, network density, average tie strength, and clique census. From the survey questions, we calculate aggregate measures for perceptions of open sharing of research, fairness of resource allocation, factors in the physical environment, the use of new technology, and perceptions of cultural divides based on sub-discipline. We then use regression analysis to determine how organizational factors are seen to facilitate or inhibit the perceived collaborative environment and how it relates to network characteristics. We also will conduct HLM with disciplines nested within fields to see if there are systematic differences at the field level. Finally, we will conduct a cluster analysis on the results of the SNA and climate survey to determine where each disciplinary unit falls on three dimensions – network centralization, network density, and an aggregate indicator of the organizational climate.

## Findings

Preliminary results from phase one participants indicate that there appear to be points of convergence across disciplinary units and points of divergence between both units and fields. The importance of informal interactions was consistently regarded as critical to both heterodox interaction and organizational learning in academia, which is consistent with similar findings in the private sector (e.g., Fayard & Weeks, 2007). The time requirements for interactions that would not directly benefit scholarly output were consistently regarded as a constraint. Most factors, however, were more nuanced and could either inhibit or facilitate scholarly interactions. This included affordances in the physical environment (e.g., office configurations or the availability of comfortable spaces that encouraged informal meetings), leadership practices and staff support, resource allocations, cultural divides between sub-disciplines, and differential treatment and expectations of women and researchers of color. Technology was notable as it is substantially changing the organizational context in ways that most academic leaders believe are not yet clear: new communication modalities were often cited as a benefit to formal interaction, but the lack of physical presence due to off-site work was a significant inhibitor to informal interactions.

## Conclusions and implications

We find that all the academic leaders interviewed agreed that organizational practices and environmental affordances affect faculty interdynamics. Our study further establishes an empirical base quantifying the variation of characteristics. These include the collaborative environment and interaction networks within disciplinary communities of practice in academia. A limitation of our study is that the singularity of each discipline in our site prevents us from drawing inferences about broader cultures within disciplines or specializations. Future research will investigate whether variations are generally consistent, as well as provide insights into how interaction networks across schools might impact the role of local disciplinary units as learning organizations. More data is also needed to understand leadership policies that can improve the collaborative environment and

how knowledge transfer in research-based universities compares to private workplaces, where an established research base on organizational learning already exists.

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