

# **In the Absence of a Paradigm: The Construction of Interdisciplinary Research**

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## I. INTRODUCTION

Social aspects of academic knowledge production practices have been addressed in numerous ways. Paradigms, as Kuhn suggests, are "shared examples" among members of a group that enable both problem recognition and problem solving efforts (Kuhn, 1970). Paradigms are collective agreements and values obtaining among members of a particular discipline that influence the selection and identification of problems, the approval of methods of inquiry and the tools of data analysis, and the assessment of "facts" as accepted outcomes of inquiry. Disciplinary paradigms provide important socialization mechanisms for producers of academic knowledge. In this context, therefore, faculty conducting research often write to a particular audience, use specific exemplars of prior research both as points of agreement and departure, intend their research to contribute to a particular school or program, and employ agreed upon styles of writing and methods of inquiry. Academic disciplines are organized around common paradigms reflected in shared sets of problems and solution strategies. However, interdisciplinary knowledge production practices suggest that something different is going on. This notion is reflected in the scholarly literature addressing interdisciplinarity as an alternative relationship among knowledge producers.

What might interdisciplinary knowledge production practices look like in the absence of a paradigm? How do faculty engaged in interdisciplinary research "construct" this particular knowledge production practice? This paper considers faculty researchers as informants describing their experiences with interdisciplinary practice.

## II. The Context of Interdisciplinary Research

Interdisciplinary research is often described as an "integration" or "synthesis" of varied perspectives focused on a particular area of inquiry (Klein, 1990; Petrie, 1986; Birnbaum, 1982). This boundary-spanning knowledge production practice has been enthusiastically championed as the model for future university research efforts (Bruggemeier, 1991; Frank, 1992). This literature generally presumes the existence of interdisciplinarity as a natural "type" of inquiry. However, little has been written about the research practices of individuals and collaborative groups engaged in interdisciplinary inquiry. Nor has there been significant consideration of the logic of construction of interdisciplinary research and the implications of interdisciplinary research as an alternative knowledge production practice. What does it mean when faculty conduct research that is "interdisciplinary"?

For the most part, scholarship on the structure and organization of knowledge production practices within the academy offers little more than descriptive typologies (for example, Snow, 1959; Pantin, 1968; Biglan, 1973; Kolb; 1984). More recent literature, however, explores alternative epistemologies that provide open space for the study of interdisciplinary scholarly work. For example, Richard Whitley (1984) offers a sophisticated framework describing "intellectual communities" as "reputational work sites" rather than merely distinguishing among differences in disciplinary structures. Robert Silverman (1993) promotes several alternatives to a traditional logic of inquiry incorporating "regulative" and "constitutive" qualities. Steve Fuller (1993) describes Science and Technology Studies (and other interdisciplinary programs) as an "interpenetrative" agent challenging boundaries by raising difficult and uncomfortable questions. In the context of alternative knowledge production practices, this paper explores what it means for scholarship to be interdisciplinary.

## III. Methods of this Study

Research universities are important sites for academic scholarship and the production of new knowledge. The institutionally-based Interdisciplinary

Seed Grant Program, established at a large, public midwestern University and serving as the focus of this study, was developed to sponsor "grants [that] provide financial support to encourage new initiatives in interdisciplinary research" with the goal to "initiate new collaborative interdisciplinary research" (p. 1, Office of Research; 1992). Eighteen proposals were funded through the seed grant competition. This project examines the logic of construction for these research proposals through multiple frames, including analyses of scholarly references, rhetorical and textual analyses, and practitioner accounts from the researchers engaged in each project.

Faculty participating in this study provided copies of their proposals, which were read as rhetorical tools serving to position and define each work as an "interdisciplinary" project. In addition, academic references cited in the proposal were used as the basis for a co-citation analysis as a way of looking at aspects of scholarly relationship and community.

Finally, faculty were interviewed regarding their involvement with the grant and the development of the proposal. Interviews were conducted with faculty individually as well as with research groups collectively. Clearly, these three tools ask different questions about academic community; nevertheless, the varied perspectives offer a more intriguing look at interdisciplinary research.

Grant projects were funded in February, 1993 for a period of 18 months. It should be noted that all interviews were conducted for research that was "in-progress." This paper draws examples and observations from three of the projects, which include faculty from a wide range of academic homes. For this paper, observations are summarized from the rhetorical and co-citation analyses, with greater elaboration on the faculty interviews.

The first project is an interdisciplinary collaboration between a molecular geneticist and an entomologist. In order to better address components of learning and memory, their project seeks to develop a transgenic honeybee.

The second case involves a faculty member from organizational psychology in the School of Business and a colleague from Ecology and Natural Resources. This project addresses strategies for the resolution of environmental disputes.

The third project seeks to revive a "lost" production of a Benjamin Britten-Elizabeth Sitwell performance that includes a musical adaptation of Sitwell's poetry. The collaborators are from the Departments of English and Music.

#### IV. Co-Citation and the Uses of Scholarly Literature

A common feature of almost all scholarly writing—including grant proposals—is the use of references to literature. The analytic study of these references—co-citation analysis—has been used to show relationships among scholarship, ideas, and authors. Two articles that share several common references are more likely to deal with similar issues—and perhaps share a common academic community—than would be the case for two articles with no shared references. Co-citation analysis seeks articles linked by pairs of common references, and assigns increasing strength of relationship with increasing pairs of co-cited references. Within this study, scholarly references from each interdisciplinary proposal serve as the basis for a citation search (using the Science Citation Index, the Social Science Citation Index, and the Arts & Humanities Citation Index). Documents that co-cite pairs of articles referenced in the proposal might be considered to have a close scholarly and intellectual association (Small, 1977).

The relevance of citation analysis and bibliometrics to a study of interdisciplinary research is further noted by Pierce (1990). Discipline, for Pierce, is inextricably linked to a common literature. "The boundaries of a discipline reflect the knowledge, interests, and practices of researchers actively working in the field. Without some generally recognized body of work on which researchers build, a research tradition will not survive long" (p. 51). This is like the notion of "paradigm" described earlier. Pierce notes the role of bibliometric analysis as a tool to consider scholarly relationships around a core or common literature in use. Pierce further suggests that interdisciplinary work may "try to find a common meeting point, a body of research representing input from several fields on which to base a new research tradition" (p. 53).

Despite limitations and criticisms of the use of citation analysis (Chubin & Moitra, 1975; MacRoberts & MacRoberts, 1989), references and citations are consistently used within the academy as markers of scholarship, affiliation, and conceptual lineage. How do faculty utilize reference and citation practices in interdisciplinary projects?

For the proposals in this study, co-citation analysis suggested that literatures used have been drawn from the home disciplines of the investigators—as one might expect. Furthermore, proposal references were utilized primarily to support background research methods and evaluation plans, and to establish a research context. There were few references to similar projects. As a result, many of these projects could be considered

"isolated" within the literature—perhaps a reflection of their novelty and unique nature. All projects utilized references that were extensively cited—which may be related to aspects of proposal grantsmanship. Several investigators noted that they sought articles that would likely be known by proposal reviewers.

Generally, the co-citation analyses confirmed investigator assessments of the uniqueness of their projects. However, one question posed through the use of co-citation analysis—the identification of interdisciplinary academic communities through the shared use of literatures—suggests that, for these proposals, there is not an interdisciplinary community. The individual investigators—through the references in their grant proposals—appear to be connected to and part of academic communities through their uses of literatures; however, these are usually separate and distinct for each participating investigator, and are linked most often to the home disciplines of each investigator. There generally do not appear to be co-citation links among the literatures of both communities.

## V. The Rhetoric of Interdisciplinary Research

There is a growing literature studying the uses of rhetoric within scientific and disciplinary scholarship. Overington (1977) suggests the study of science from a rhetorical perspective in order to "understand the process of constructing scientific knowledge as a way of speaking about specific experiences before a limited and specially trained audience that is authorized to establish that discourse as knowledge" (p. 144). Myers (1993) specifically addresses the rhetorical construction of research proposals, noting that political and negotiation practices of academic boundary formation occur within the proposals.

The rhetoric of interdisciplinary proposals raises questions about audience and the structure of interdisciplinary associations. Several variations in description of interdisciplinary structure and appeal to audience are presented in these grant proposals.

Each proposal offers a different structure of interdisciplinarity. In one project, interdisciplinary work is serial—each investigator works on a part of the project separately. Another group regards interdisciplinary effort as an opportunity to focus "respective areas of expertise" on a particular problem. Problem focus—applied research—is highlighted in all of the proposals. The expertise to address a specific and critical problem requires a synthesis of effort possible only with interdisciplinary collaboration. As several of the

investigators mentioned, their goal when writing the grant was to position themselves as the logical recipients of funds for a necessary project. This tactical approach is similar to the strategies utilized in traditional discipline-based academic grantsmanship.

The interdisciplinary seed grant proposals also showcase how the principal investigators have used explicit strategies to locate themselves as interdisciplinary, without any prior definition of the term. In the process, the proposed relationship among the investigators clearly describes their expectations for interdisciplinary work. In the project on environmental disputes, the investigators intend to share equally in work on a mutually identified problem. The transgenic bee project requires an infusion of external technology from one investigator to support the on-going project of another investigator. The Britten-Sitwell performance notes the bridging of two disciplines within the subject of the study. The three projects thus represent very different conceptions of interdisciplinarity.

The proposals are written in very different ways, as well. While the transgenic bee proposal includes highly technical information about criteria and standards for achievement, the proposal addressing environmental disputes highlights social needs and beneficiaries of the prospective study.

## VI. The Construction of Shared Examples

Through the accounts of practitioners in this study, certain issues were raised that address aspects of interdisciplinary inquiry and community. For example, the investigators' interaction with and treatment of graduate students; uses of new technologies; the relationships among collaborators; concerns and responses to professional and conceptual risk; and notions of competence and expertise. While talking about their work, the investigators are re-constructing their logic for interdisciplinary work.

It is important to note that investigator accounts should be considered representations—narratives—that can be treated as forms of storytelling. In some ways, there is both more vitality and more confusion—less time to "clean up" the stories—than in what may be presented as written accounts of research (articles and texts for scholarly publications); however, there is also a certain "retrospective rationality" (Garfinkel, 1967; p. 114) in these stories—a coherent path or logic (not unlike that of discipline based inquiry) leading to an anticipated conclusion.

Within the accounts of interdisciplinary practice, investigators talk about aspects of academic status: what it means to be interdisciplinary and to do

interdisciplinary work, as well as considerations of hierarchy among participating disciplines:

We knew what our strengths were, we were really interdisciplinary. I mean, this wasn't a chemist and a biologist, you know ... which is perfectly interdisciplinary, but still within the natural sciences. My god, I mean, we were about as far apart as you can get disciplinarily, and we knew that if we played that up right, there would be a lot of sex appeal here. The second thing is, we had a body of theory ... a solid body of theory that bridged the two disciplines. And we had a project that allowed both of our disciplines to function, but to come together in a new way. Grantsmanship is just what it sounds like. What we were dealing with was a program. This just happened to be an interdisciplinary program with interdisciplinary sidebars on it.

One always wonders, particularly if you're in the arts and humanities, if you're presenting a project, and putting it up against the sciences, are you even going to be considered? And is all this work going to just go down the drain? So, that's sort of a chance you have to take.

The development of relationship—trust, role, and credibility—among investigators varied for each project. In only one of the cases did the collaborators have a prior relationship. In other projects, faculty sought colleagues with particular interests or technologies and then assessed whether the relationship would be successful:

Knowing a pedigree, to me, means that this person was worthy of a lot of trust. So it's not as though you just take someone who's career you don't know and say alright, let's just see if we can get something going. Here's someone who had a very respectable publication record—in highly regarded refereed journals—and come through several labs working with very well known people. And I didn't know him up until then, but these experiences command some respect. So then, of course, you say let's get together. And see if the person, personality-wise, you can work with a person—which you tend to get to know fairly quickly—then we sort of hit it off.

So, out of the blue at eight o'clock one night—I remember the time—I got a call. I thought it was a nut. A man who said, I'm very interested in Benjamin Britten, I'm a tenor, I'd like to apply

for forty thousand dollars for us to go to England and perform it. And I treated him the way one treats the callers about credit cards and gifts to firemans' funds and things. But eventually, he was pressing all the right buttons.

Each investigator addressed the issue of risk as a consideration of participation in an interdisciplinary project. The faculty were concerned that their involvement in this project be seen as "different" by colleagues. Explicitly, these faculty identify their primary association as within their home discipline and their involvement with an interdisciplinary project as a secondary one:

I would not say at the moment that this work affects substantially my main research that I do. ... beside that you have to spend time with it, I don't see it at this moment as really detrimental. I don't think that the community would see the connection. I need to be sure that my colleagues see that something positive could come of this.

So the project sort of evolves from an on-going one in that manner. And it evolves in that manner because you want to minimize the risk. Let's look at it this way—you do a project that's canned—a lab report. That's not going to interest anybody. If you do a project that's high risk, you risk—after putting four or five years of effort in—falling flat on your face. A normal kind of research project, in a way, tries to sort of split the difference between the two. Interdisciplinary research means, necessarily, you're applying a technique from one field to another—that hasn't been done before. And that's why it's riskier. And that's why it's fundamentally different because it goes a little bit farther toward the risk end of that spectrum than a normal research program would.

The accounts and stories of the investigators suggest extended periods of negotiation and exploration—especially after the grants were awarded. These negotiations, often informal—at a coffeeshop, or visiting each others' homes—serve an important function in the shaping of interdisciplinary activity. Through their interactions, faculty are actively involved in the mutual construction of shared examples—the development and maintenance of a local paradigm. For these investigators, this may be a necessary condition to conduct inquiry within the familiar constructs of disciplinary work— even if it is local, and particularly if it is interdisciplinary. Trained as "disciplinarians,"

the faculty involved in these projects have recreated in their interdisciplinary projects those conditions that are most familiar and comfortable: rules for determining correctness.

## VII. Observations

Interdisciplinary scholarship is not without discipline; there are elements of "regulativeness" in these research projects (for example, traditional aspects of scholarly structure and organization, a familiar appeal to "community" seeking acknowledgment and confirmation of "discovery" and "novelty"). The scholarly references and citations in the grant proposals are most closely linked to each investigators' home disciplines; the faculty were concerned about issues of publication and productivity, recognition and promotion. These qualities appear necessary for the faculty involved in these projects to consider what they are doing "academic work." "Expertise" of the investigators, as established in the proposals, is linked to prior success within traditionally defined discipline based settings.

There is also a "constitutive" quality to interdisciplinary research: a focus on applied problems, creative engagements, and borrowed technologies. Interdisciplinary work—and the practice of "integrating" across disciplines—requires greater conversation among collaborators. This, in part, further emphasizes the absence of prior "shared examples" often present in collegial work within traditional disciplinary scholarship. These conversations serve to construct new "local" disciplinary structures—that may be in place only for the duration of this particular project.

These particular interdisciplinary research projects have, as their foundation, a strong link to disciplinary practices and rhetoric. For faculty engaged in these projects, academic discipline continues to frame their logics of inquiry and construction.

There is a familiar rhetoric in these projects: an awareness of institutional and disciplinary rewards structures; an attentiveness to production and productivity as a necessary outcome for conducting inquiry; an acknowledgement of the role of funding and fundability in the selection of good and better research questions; and a careful assessment of risk in conducting interdisciplinary research. In short, there is a certain academic "ordinariness" in the work of these interdisciplinary research projects.

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