

Crossing the line: Opportunities and challenges of interdisciplinary research by untenured researchers

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Introduction

Throughout the history of modern science, interdisciplinary research has led to important discoveries (e.g. the structure of DNA through the application of physics to biology) and to the emergence of new fields (e.g. biochemistry). In recent years, interdisciplinary research has become an obligatory mantra in any discussion on science policy (Metzger and Zare, 1999). This rallying cry is reflected in significant organizational changes within funding agencies (e.g. the National Science Foundation), and within schools which increasingly house many different disciplines under one roof (e.g. i-Schools). Such changes are based on the realization that complex real-world problems often require solutions that cross disciplinary lines (Rhoten and Parker, 2004).

However, several studies warn about the difficulties and costs in conducting interdisciplinary research (e.g. Cummings and Kiesler, in press). These difficulties range from the excessive time and specialized skills needed for successful interdisciplinary research (Rhoten and Parker, 2004), and the difficulties that untenured researchers face in pursuing such a research path because their success is often measured in terms of disciplinary prestige (Metzger and Zare, 1999).

Untenured researchers who wish to conduct interdisciplinary research therefore need to learn how to rapidly acquire the knowledge and research culture of an unfamiliar discipline, and how to survive in an academic environment where disciplinary prestige is a key component of success. This position paper describes my experience in grappling with the above issues while conducting interdisciplinary research as an untenured researcher.

Reflections on a career built on interdisciplinary research

Throughout my academic career, I have collaborated with researchers from a number of disciplines, including computational architectural design, cognitive science, educational psychology, anthropology, information science, and public health. These collaborations have resulted in theoretical and applied contributions with direct impact to real users, in addition to publications in human-computer interaction, information science, medical informatics, and architecture. Reflecting back on the above experiences, my successes and difficulties in conducting interdisciplinary research can be grouped under (1) selection and scoping of research questions, (2) acquisition of knowledge and research culture in an unfamiliar discipline, and (3) cultivation of a collaborative attitude.

1. Selection and scoping of research questions. Several studies have shown that interdisciplinary research is often motivated by a desire to tackle a complex practical problem, which in turn results in the need for knowledge and methods from many disciplines (Rhoten and Parker, 2004). For example, my research has focused on the problem of enabling users to rapidly acquire effective and efficient strategies to perform complex computer-related tasks (e.g. manipulating a large spreadsheet or searching for comprehensive information on the web). Such practical problems motivated research questions requiring knowledge from several disciplines including anthropology (what are the difficulties that users have in using computers in real-world contexts?), computer science (what are the general capabilities offered by computer systems?), cognitive science (what are the knowledge components required to exploit computer capabilities?), and education (how can effective and efficient strategies to use computers be taught in a short amount of time?)

Such cascading complexities are daunting to a young researcher, and there is always a temptation to limit the scope of the research to one's primary discipline, and leave the rest to "future research" by other

researchers. However, such an approach often leaves the larger problem unsolved. To address this difficulty, I had to determine which aspects of different disciplines are required to be learned and incorporated, whether the contributions in a particular discipline were of a basic or applied nature, and how to frame the problem when writing articles and proposals for different audiences.

2. Acquisition of disciplinary knowledge and culture. Research that crosses disciplinary boundaries can either be tackled using a *multidisciplinary* approach (where specialists in different disciplines conduct self-contained research with little cross-fertilization) or an *interdisciplinary* approach (where researchers from different disciplines collaborate in a tightly integrated approach). While I have attempted the former, I have had greater success using the latter approach. I have found myself taking the lead in acquiring the knowledge and research methods of other disciplines using approaches that include (1) offering to co-teach a course with a disciplinary expert, (2) inviting disciplinary experts to be co-PIs on a proposal, and (3) inviting experts to be co-authors on publications.

Each of the above approaches presented significant challenges, but resulted in substantial rewards. For example, because I had no background in information science, teaching a course in search and retrieval required a disproportionately large number of hours for reading and preparing lectures each week. In addition, I was perpetually anxious of being asked questions in class that I could not answer. However, because the course required weekly coordination meetings, there were regular and close interactions with the disciplinary expert. These meetings enabled discussions that transcended the course material leading to rapid insights into the discipline's research and publication culture. Similarly, co-authoring articles with disciplinary experts led to a rapid understanding of existing references, and relevant theories, and led to visibility in different disciplines.

3. Cultivation of a collaborative attitude. While research questions and disciplinary knowledge are crucial, I found that successful interdisciplinary research required the cultivation of an appropriate collaborative attitude. Such an attitude included (1) establishing a student-teacher relationship with senior researchers in the discipline, (2) developing high tolerance for being confused, rejected, or personally rebuffed, and (3) expressing respect for a research culture which might not be the same that one is used to. For example, the tight controls that are possible in psychology experiments are impractical for classroom experiments. Such differences in research methodology can lead to unnecessary arguments if there is not an adequate appreciation of different research contexts and cultures. However, such differences can also uncover opportunities to bring in new methods from other disciplines. A trusting and learning collaborative attitude greatly facilitates such insights.

Conclusion

Although I had a desire to address real-world problems through interdisciplinary research, I often found myself ill-equipped in grappling with many issues related to (1) selecting and scoping research questions, (2) rapidly acquiring knowledge in a new discipline, and (3) cultivating an attitude which enables trusting and respectful collaborations. These experiences suggest that untenured researchers could benefit from explicit mentoring (such as providing exemplars to make transparent the process and attitude important for interdisciplinary research), incentives (such as extra credit to teach courses in unfamiliar disciplines with experts), and having realistic time expectations when reviewing performance. Such approaches could motivate more untenured researchers to conduct successful interdisciplinary research, with the ultimate goal of helping them solve complex real-world problems.

References

- Cummings, J.N., and Kiesler, S. (in press). Collaborative research across disciplinary and institutional boundaries. *Social Studies of Science*.
- Metzger, N., and Zare, R. N. (1999). Interdisciplinary research: From belief to reality. *Science*, 283:5402, 642-643.
- Rhoten, D., and Parker, A. (2004). Risks and rewards of an interdisciplinary research path. *Science*, 306:5704, 2046.