



Title	In Between Fields : Why Cross-Disciplinary Work Is Difficult for Students
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Citation	The University of Osaka – Tongji University Joint International and Interdisciplinary Forum: Toward the Integration of Society and Knowledge Official Forum Proceedings. 2026, p. 1-12
Version Type	VoR
URL	https://doi.org/10.18910/104120
rights	
Note	

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In Between Fields: Why Cross-Disciplinary Work Is Difficult for Students

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Joint International and Interdisciplinary Forum:

Toward the Integration of Society and Knowledge

Official Forum Proceedings

Abstract

This paper examines the barriers that early-career researchers encounter when conducting interdisciplinary research. Drawing on a review of existing literature and a case study based on the author's own experiences, this paper presents a hypothesis regarding one possible direction for addressing obstacles to interdisciplinary research within the University of Osaka Cross-Boundary Innovation (CBI) Program. According to the perspective developed in this paper, within each particular field of interdisciplinary research practice, not only is general "theory" insufficient, but the very "difficulties" themselves manifest in ways distinct from generality. However, it is precisely these "difficulties" that, we would suggest, hold the key to constructing field-specific methodologies of interdisciplinary activities appropriate to each particular context.

Keywords: Interdisciplinary Research, Methodology of Interdisciplinary Activities, The University of Osaka Cross-Boundary Innovation Program

Introduction

This paper examines the barriers that early-career researchers encounter when conducting interdisciplinary research. Drawing on a review of existing literature and a case study based on the author's own experiences, this paper attempts to present a hypothesis regarding one possible direction for addressing obstacles to interdisciplinary research within the University of Osaka Cross-Boundary Innovation (CBI) Program¹.

For the purposes of this paper, we define "interdisciplinary research"² as "collaborative research conducted by researchers from multiple disciplines to address thematic concerns that cannot be adequately addressed within the constraints of traditional disciplinary boundaries and its limited expertise." In recent years, interdisciplinary research has been consistently recognized as a significant issue across government, the private sector, and academia, and this recognition seems to have been further accelerated by the emergence of COVID-19 and the intensification of climate change. For instance, in a policy report released by the OECD in 2020, a central concern was how stakeholders from both public and private sectors, together with citizens, could collaborate to address urgent societal challenges (cf. OECD, 2020), such as responding to emergencies like COVID-19 and achieving sustainable development in the context of climate change. Similar reports with comparable objectives can be found everywhere.

Such "interdisciplinary research" is often perceived, particularly within disciplinary communities, not as an integral part of our research but merely as a transient thematic concern driven by contemporary trends (cf. Institute of Medicine, 2000). However, an alternative perspective is possible. As exemplified by ELSI, the implementation of findings from natural sciences into real-world society increasingly requires insights from the humanities — fields outside the natural sciences. For instance, in addressing COVID-19, it is well-documented that analyses utilizing phenomenological qualitative research, a variant of philosophical approach, have been employed alongside sociology, pharmacology, and medicine (cf. Miura et al., 2021).

From the perspective of the humanities, the emergence of generative AI and its advancing capabilities demand a significant reconsideration of the research questions posed by the humanities, which interrogate the modalities of human "thought"—much as transformative technologies have consistently done throughout history. In this sense, interdisciplinary research

¹ I wish to delimit the scope of this paper in advance. This paper is written under a narrowly circumscribed research interest: namely, "how interdisciplinary research becomes possible within the CBI Program." The methodological approach adopted in this paper—combining "general insights from interdisciplinary research" with "a case study based on my own experience"—is justified only within the bounds of this delimitation.

² In this paper, it is not possible to address the distinctions between such terms as "interdisciplinary", "cross-disciplinary," and "cross-boundary." Regarding the differential typologies of interdisciplinary research, Repko (2011) provide detailed analysis.

is an important theme for researchers, whether considered in terms of addressing societal challenges or advancing disciplinary inquiry itself.

Yet a straightforward question emerges here: "Then, how?" Although all stakeholders across government, industry, and academia seek interdisciplinary research, and despite its significance for researchers, it is evident that interdisciplinary research fails to meet the growing demand to address societal challenges in both quality and quantity. Within philosophy, my field of specialization, most early-career researchers—understood here as graduate students ranging from the master's to doctoral levels—do not appear to demonstrate sufficiently high-quality outcomes in interdisciplinary research. Moreover, and more problematically, even among early-career researchers affiliated with the University of Osaka CBI Program which "specializes" in interdisciplinary research in a sense, the situation appears to be equally challenging. This reality suggests a need for further methodological refinement of interdisciplinary research and its implementation.

What accounts for this situation? What obstacles impede early-career researchers from conducting interdisciplinary research? How might "interdisciplinary research" be modeled in order to transcend these barriers, within the CBI Program? These questions constitute the central inquiries that this paper addresses below.

Challenges in Interdisciplinary Research: Review of Previous Studies

In fact, research aimed at identifying the various difficulties or obstacles inherent in interdisciplinary research has been conducted in multiple ways to date. Here, I would like to introduce some of the existing literature that appears particularly relevant to early-career researchers—understood as graduate students from the master's to doctoral levels—and thereby attempt to establish the framework of the problem that this paper engages with. While an extensive body of meta-level reflections on interdisciplinary research exists, I argue that the main elements of these discussions can be condensed into a single conclusion: namely, that conducting interdisciplinary research is extraordinarily difficult when one follows the trajectory of a normal academic career path.

First, there exists a simple issue of competency. According to research by Daniel et al. (2022), early-career researchers engaged in interdisciplinary work frequently lack general methodological frameworks and adequate training. The interdisciplinary research, by definition, requires both learning that transcends disciplinary specialization and the acquisition of its associated techniques, but human resources are finite. Even when accounting for mutual development, attaining competency in two academic domains to a comparable level of

expertise is not easily achieved. This constitutes, in particular, a significant barrier to interdisciplinary research at the career stage when scholars are embarking upon an academic trajectory—we will return to this point shortly.

Second, there exists the problem of evaluation. Kniffin et al. (2017) demonstrate that doctoral students engaged in interdisciplinary research face fewer career advancement opportunities and promotion prospects, compared to those conducting single-discipline research. Exemplified by the Grants-in-Aid for Scientific Research (Kakenhi), the current evaluation system in Japanese academia fundamentally adopts a model wherein researchers evaluate researchers, according to which faculty members are hired (From the perspective of reproduction, this is to some degree inevitable). Interdisciplinary researches, which by their nature do not fit neatly within traditional disciplinary boundaries, may fail to receive recognition as major scholarly achievements within such evaluation system, despite recognition of their societal necessity.

Related to the second problem, there exists a third problem concerning institutional structures (or their absence). Sano points out that despite the prevalence of interdisciplinary practices and theoretical reflection on them, "the participants in these discussions rarely reference one another, and there exist neither institutional frameworks to aggregate, accumulate, and systematize these discussions—such as professional associations or academic journals—nor mechanisms for doing so" (Sano 2023, 128). The absence of such institutional structures (or their insufficient development) undoubtedly obscures the career trajectories for early-career researchers who wish to pursue interdisciplinary research. This absence—particularly manifested in the lack of archival repositories for the accumulation of records—practically impedes the structuring of interdisciplinary research. (We shall return to this theme of archive in the conclusion.)

While there are undoubtedly many other related factors, it is already clear that we cannot fault even the most talented and prudent students for returning to research in disciplinary fields that already possess these structural supports, given at least the elements identified here. In fact, in response to a lot of challenges, Berkes et al. (2024) demonstrate that early-career interdisciplinary researchers tend to reduce their interdisciplinary work and return to their original disciplinary fields. These challenges are consistently severe, particularly for early-career researchers. As the acceptance rate for JSPS fellowships—one of the few income sources available to doctoral students in Japan—declines year upon year, competition for applications intensifies relentlessly. From the perspective of advancing interdisciplinary research, it is even more troubling that the compatibility between this funding mechanism, which is evaluated within the subdivisions of Kakenhi, and interdisciplinary research is fundamentally poor.

Thus, career pressure systematically obstructs early-career researchers from pursuing interdisciplinary trajectories. This dynamic results in the loss of motivated and prospective early-career researchers at precisely the stage when academic inquiry is nascent—a moment when specialization has not yet become highly differentiated and when crossing disciplinary boundaries remains relatively accessible. This attrition of promising researchers is surely not unrelated to the insufficient advancement of interdisciplinary research noted in the introduction.

In this sense, it becomes evident that the "textbook practice" of interdisciplinary research—practices based on methodologies already proven to be "correct"—cannot be directly implemented, due to diverse challenges that confront early-career researchers engaged in actual research. To address these challenges, various approaches have been attempted in multiple ways, including, for instance, the systematization of interdisciplinary research methodologies, the establishment of academic societies in composite fields, and enhanced research funding support.

However, we must recall our guiding question. Our inquiry is: "How does interdisciplinary research become possible *within the University of Osaka, within CBI Program?*" The significance of this delimitation should not be underestimated. In practical contexts where institution-specific design constitutes the central concern, theoretical discussions that possess generality—and which, precisely because of this, risk becoming abstract—are necessary but manifestly insufficient. What is crucial is the reciprocal engagement between theory and practice. Here, departing from the existing literature, I wish to introduce some interdisciplinary practices I have undertaken thus far and examine the challenges inherent within them. Only by comparing these findings against the existing scholarship can theoretically and practically useful ideas emerge.

A Case Study of Interdisciplinary Research in CBI Program: My Case

How, then, do these difficulties manifest themselves in more concrete forms, particularly within our specific institutional context—namely, the University of Osaka CBI Program? In this section, taking the preceding discussion as a guide, I wish to clarify some difficulties of Interdisciplinary activities in CBI more explicitly by reflecting upon my own experience of conducting interdisciplinary research.

I have thus far engaged in interdisciplinary activities within several projects and communities. The central one is, needless to say, the University of Osaka CBI Program. This program³ that

³ For detailed information on the program's contents, see Zhang et al. (2025).

composed by various graduate schools and it selected up to approximately twelve students, and they engage in "Cross-Boundary" activities primarily centered on PBL (Project-Based Learning), over a five-year period spanning from the master's to doctoral levels under the slogan of "Integration of Society and Knowledge."

In particular, within that program, I wish to focus on "group project support" as one of its multifaceted activities. The reason for this focus is that "group project support" represents one of the few systematically structured opportunities within the CBI Program for engaging in interdisciplinary activities—namely, opportunities wherein multiple students can freely select their themes and implement their activity plans with considerable budgetary discretion.

Since I joined the CBI Program in autumn 2023, I have led two interdisciplinary research projects utilizing this support system in fiscal years 2024 and 2025, while also engaging in interdisciplinary research aimed at problem-solving for challenges posed by a private enterprise, within PBL-type seminars incorporated into the program (with regard to the latter, considerations of legal rights preclude discussion here). Below I wish to provide an overview of my activities within group project support, as a kind of ethnographic data and to analyze their structural features.

First, what I conducted in 2024 was a project titled "*Philosophy of mahjong*" (Constructing a New Philosophical Theory of Games through Deep Reinforcement Learning AI Development: A Science-Humanities Fusion Approach Using Japanese Mahjong as a Case Study). This research took the board game mahjong as its primary subject and aimed to construct a theoretical foundation of philosophy concerning the relationship between humans and AI in contemporary society through: (1) interdisciplinary activities involving researchers specializing in philosophy, mathematical probability theory, game development, and information engineering; (2) the development of a mahjong game and deep reinforcement learning AI of mahjong; and (3) the construction of a philosophical theory of games guided by these developments. While this project achieved several outcomes—including three workshops with invited external speakers, multiple research presentations, and co-authored publications (cf. Nakatani et al., 2025)—it also clarified several challenges (discussed below).

Second, the research project conducted in 2025 concern interdisciplinarity itself ("Construction of the Methodology of Interdisciplinarity within CBI Program and its Implementation: Guided by Theoretical and Practical Investigations"). It aimed to theoretically formulate a methodology of interdisciplinary research optimized for the University of Osaka CBI Program and to implement this framework into the program itself. This theorization was guided by theoretical investigations centered on literature review and practical investigations centered on empirical

field research (such as some interdisciplinary activities at Hokkaido University and Kyoto University). As the project is currently ongoing, it is not possible to assess its ultimate success or failure. However, through activities such as workshops and the organization of "The Doors to the Cross-Boundary," considerable progress appears to have been achieved in this project as well⁴.

Upon reflecting on these two years of experience and analyzing their structural features, what becomes evident is that both the content of "interdisciplinary research" practiced in each project, and the difficulties encountered in them differ substantially. Below, I wish to examine these cases from a more comprehensive perspective.

The first case ("Philosophy of mahjong") is, in a certain sense, a failure case. Likely due to several factors (and they emerge as difficulties in the project)—namely, "the top-down theme of the project" (the concept of "Philosophy of Mahjong" originated from my personal idea), "the mismatch between the required skill sets and each participant's disciplinary expertise" (executing implementation-level work outside the narrow specializations of ourselves proved difficult for us at that time), and "the substantial burden of organizing multiple events" (inviting external speakers contributed to contextual framing, but we were unable to effectively integrate their contributions into our project)—compared to the high caliber of collaborative members, this project was unable to achieve sufficiently strong outcomes.

The second case ("the Methodology of Interdisciplinarity within CBI Program") was designed with these difficulties in mind. We minimized the event requiring organization and took "interdisciplinary" itself—a subject of shared concern across the CBI Program to varying degrees—as its central theme. Furthermore, I divided the collaborative members into three working groups (Theory, Fieldwork, and Implementation) and proceeded with activities in ways aligned as closely as possible with each member's particular interests. The rationale for this division and the principle of mutual non-interference was that each participant could concentrate their limited resources within their areas of projects. The abstract problem formulation of "interdisciplinary" also functioned as a framework enabling such division⁵.

Thus, even when their institutional circumstances of both cases are equal, the systems and methods through which "interdisciplinary research" unfolds in both cases differ substantially. It is evident that such case studies and their analyses are highly personal and subjective, with

⁴ This paper itself constitutes part of the activity of this project.

⁵ In fact, the activities of the three groups differed to such an extent that each could be considered a distinct research activity. Had members devoted their resources to mutual understanding, it would have been difficult to advance the project as it stands now.

limited sample sizes ($n=2!$), and therefore rigorous argumentation cannot be developed⁶. However, the fact that such marked differences exist even in activities conducted with common leadership within an identical institutional context is extremely noteworthy. If we recall that in research activities within a particular discipline, differences in research themes do not necessarily entail methodological differences, this apparent difference—which at first glance seems natural—is indeed remarkable⁷.

On the one hand, this demonstrates the profound difficulty of the "textbook practice" of interdisciplinary research, as we saw in the preceding section. Specifically, even when holding constant crucial variables such as leadership and the institutional system, the research itself remains subject to substantial influence from an (endless) list of non-generalizable contextual factors: research themes, attributes of research members, relational dynamics between the leader and members, the varying degrees of motivation members bring to the research theme, and concurrent projects in which they are engaged. The complexity of the functions defining how interdisciplinary practice goes on must be clearly mushrooming exponentially, and this, much like the discussion in the preceding section, demonstrates that the "textbook practice" of interdisciplinary research is fundamentally difficult.

However, on the other hand, what is particularly noteworthy for us is that marked differences from "textbook difficulties" are also clearly evident. In fact, grounding our discussion in these concrete practices appears to permit us to suggest a certain hypothesis: might the difficulties typically raised concerning interdisciplinary research—such as "competency," "evaluation," and "institutional structures"—play only a secondary role in the practice of interdisciplinary research within the CBI Program? Rather, might the fundamental difficulty be not these general obstacles, but rather from the inability to appropriately mediate relationships among various actors as they manifest in particular ways specific to "interdisciplinary activities within the CBI Program"?

This can be reformulated in more generalized terms as follows: **Is it not necessary to understand what "interdisciplinary research" signifies by grasping the specific "difficulties" that emerge within a given field in the particular ways unique to that specific location, institution, interpersonal relationships, and so forth, and then to develop the requisite methodologies for that specific context?** Of course, insofar as students in the

⁶ Properly conducted research would likely require more rigorous and quantitative analysis; however, such work cannot be undertaken here. Ideally, science anthropological or philosophy of science research on interdisciplinary research would be necessary. I hope to address this theme in the near future.

⁷ For instance, in the discipline of Modern French philosophy research, my field of specialization, the choice of research subject does not fundamentally require marked methodological differences.

CBI Program are themselves part of academia, they (we) also cannot escape the difficulties that existing scholarship have identified concerning competency, evaluation, and institutional structures (particularly for individuals who invest significant effort in interdisciplinary activities alongside disciplinary research, such as myself). However, what manifested itself to me in these interdisciplinary activities in a more acute manner were *distinct difficulties*—namely, issues of motivation and burden-sharing—and planning to facilitate smooth project progression necessitated the construction of approaches that circumvented these challenges.

When considered against the conventional approach that generally regards the methodology of interdisciplinary research as "a model that *enables* one to conduct interdisciplinary research correctly," this appears to me to represent a Copernican turn in the theory of interdisciplinary research. A shift from "understanding the structures of success of interdisciplinary research" to "understanding the structures of failure of interdisciplinary research." Whether this hypothesis proves valid, and what implications it might carry, remain insufficiently clear at this stage. My future task lies in verifying this hypothesis through actual interdisciplinary research practice, and should it prove unsuccessful, in grasping the structural features of such failure.

Conclusion: In Between Fields

The purpose of this paper has been to examine the obstacles that early-career researchers encounter when conducting interdisciplinary research, drawing on both a review of existing literature and a case study based on my own experience, and thereby to present a possible approach for theorizing the methodologies of interdisciplinary research within the University of Osaka Cross-Boundary Innovation Program. According to the perspective developed in this paper, within each particular field of interdisciplinary research practice, not only is general "theory" insufficient, but the very "difficulties" themselves manifest in ways distinct from generality. However, it is precisely these "difficulties" that, we would suggest, hold the key to constructing field-specific methodologies of interdisciplinary activities appropriate to each particular context.

My argument is obviously still developing and remains at the stage of hypothesis presentation. From my current perspective, it should be possible to use traditional theories of interdisciplinary research in a different, reverse manner—instrumentally—in order to derive "methodology" from "difficulty." In other words, to extract field-specific responses to challenges by using traditional methodologies of interdisciplinary research, not as correct method, but to discover difficulties. There should exist some techniques for discovering and extracting this particularity method from the discussions of predecessors that we have critiqued as "textbook." My present interests are directed toward this problematic.

In this context, one important topic would be the "archive." In general, when it comes to doing comparative experiments, the fundamental rule is to hold certain parameters constant while varying the parameters one wishes to compare. Records from the field and its history serve as an effective instrument for relativizing one's own interdisciplinary activities between particularity and generality, and thereby for understanding what one's own "difficulties" actually consist of and which actors are responsible for them. Subsequently, the record of these "difficulties" becomes instrumental for those who encounter such difficulties in the future⁸. Moreover, the documentation of the historicity inherent in that field should reveal its malleability.

These arguments remain hypothetical and require further verification and refinement. In any case, this work must be conducted in the field, and perpetually, between fields. It is undeniable that the theorization of interdisciplinary research must be undertaken as a form of thinking that operates in the space between generality and universality. And it goes without saying that what this paper has undertaken constitutes, in itself, one practice toward such theorization.

Acknowledgements

This paper was supported by the Japan Society for the Promotion of Science (JSPS) Grant-in-Aid for Scientific Research (KAKENHI) Grant Number JP25KJ1726, The Nippon Foundation HUMAI Program (B), and the University of Osaka Cross-Boundary Innovation Program Group Project Support.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

In the writing process, I used Perplexity and DeepL to assist with surveying prior research and translating my manuscript into English. However, I personally verified the content of the prior research and reviewed the English grammar.

⁸ In a certain sense, this approach resembles the recent trend toward "sharing negative data," which has gained significance alongside the application of artificial intelligence. However, what is important here is that; in any case, *the methodology of interdisciplinary research must be reinvented in particular ways*. Avoiding past "difficulties" constitutes merely a secondary methodology toward that purpose. Past success cases do not guarantee one's own success.

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