How Interdisciplinarians Work

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ABSTRACT

This paper reports on a study of what interdisciplinarians do. Data was gathered by conducting semi-structured interviews with self-identified interdisciplinarians. Several themes emerged from this project. First, the principal approach to research by interdisciplinarians was broadly exploratory and messy contrary to the linear step-by-step approach often promoted. Most interdisciplinarians in this project paid little homage to disciplines or disciplinary structures and often explored disparate knowledge domains including domains outside the normal purview of academe. The role of mentorship and community was crucial for many in the development of the participants' identity and skills and despite best intentions, many conveyed a gap between what they do and what they teach. Closing this gap should improve IDS teaching and learning.

INTRODUCTION

Interdisciplinarity is now a staple of post-secondary education. The complex realities of the contemporary world are demanding approaches and solutions that push beyond established academic boundaries and require cooperation and collaboration from a diversity of perspectives (Repko, Szostak, & Buchberger, 2017). Working beyond boundaries is, arguably, a relatively new approach to knowledge within the academy and scholars have set about to develop a framework that can both depict and guide interdisciplinary work and interdisciplinary teaching and learning by extension.

This paper reports on a project that was motivated by the first-hand experiences of two faculty in a large Interdisciplinary Studies (IDS) program. Upon taking full-time positions, the co-investigators of this project began to notice a gap between the prescriptions of the generally accepted textbooks for this program and their own interdisciplinary research experiences and practices. This gap prompted interest in how other interdisciplinarians work and what an IDS curriculum should entail. In short, this gap was found to be present in the experiences of most of the participants in this study.

BACKGROUND

Two ideas resonate throughout the interdisciplinary studies literature: (a) complexity is at the heart of interdisciplinarity, and (b) an epistemology of complexity is predicated on non-reductionist methodologies and integrative insights. These ideas are rooted, at least in part, in the theoretical framework of interdisciplinary studies (IDS) laid out by William Newell (2001). In this paper, Newell proposed complexity theory— a systems theory of adaption and change that emerged in various branches of the natural sciences—as explanation and justification of an interdisciplinary approach. Newell's work was met with much fanfare, and indeed, much dissent and subsequent revision (Welch, 2018). More recently, ironically, the debate over the years has distilled or reduced Newell's framework to the adage that "complexity necessitates interdisciplinarity." Nonetheless, Newell's paper continues to be cited often as providing theoretical support of interdisciplinarity and its impact, particularly on the interdisciplinary research process developed more explicitly in subsequent IDS textbooks: " [Newell] has provided a rationale for the importance of interdisciplinary inquiry, granting it relevance in research and application to any number of contemporary problems," (Welch, 2018). It is this process, as developed, that has compelled exploration of how interdisciplinarians work and how they train their students.

Complexity is a somewhat nebulous term with little scholarly consensus around its precise definition. Moreover, there are numerous similar or arguably synonymous terms that appear with regularity (e.g., systems thinking, cybernetics, chaos theory, and complex adaptive systems). Although there are doctrinal differences amongst them, one might think of the aforementioned set of terms as a set of variations on a theme. Very generally, complexity refers to phenomena that can be characterized as dynamic non-linear systems consisting of multiple interacting parts that self-organize into patterns with emergent properties (Newell, 2001). Contemporary issues such as climate change, globalization, and social media all fall into this category. Interdisciplinarity is particularly relevant in investigating such issues because it suggests one pull resources from different knowledge domains as necessitated by the issue at hand.

Within the context of IDS there has been discussion as to whether complexity characterizes the phenomena under investigation or, rather, the process of investigation itself (Mackey, 2001; McMurtry, 2011). Much of the literature focuses largely on the complexity of the phenomena with interdisciplinary best practices elucidated in linear step-by-step directives, charts, and manuals (Szostak, 2012). McMurtry (2011), however, suggests that a complex problem requires a complex process wherein the research approach mimics the non-linear complexity of the issue under investigation. Focusing on the context of education, McMurty writes that, "both the student learning we study and our own research may be understood as complex processes interlinked with many other sorts of complex phenomena" (2011, p. 22). Given that complex phenomena are produced through interaction of multiple elements, a holistic approach seems warranted as merely breaking the phenomena apart (i.e., reducing it) destroys the very object of interest— the relationships— thus it would fail to provide insights regarding the relational structure of the phenomena. Thus, dissection is not an appropriate methodological approach; rather, one must engage with the complex system in a non-reductionist epistemological framework. In this context, interdisciplinarity then may best be understood as a complexity interface.

Understanding the interdisciplinary process as itself a complex system in which the researcher interacts with a diversity of resources in a dynamic non-linear fashion from which new insights emerge is a rich conceptualization of the interdisciplinary process, and despite the subsequent debates, fits well in the complexity framework Newell outlined (Woodill, 2016). Such an approach eschews the reductionist method of preset processes, and instead turns toward a more creative approach that prioritizes prototyping and trial and error methodologies that are more consistent with a sustainable knowledge enterprise pertinent to contemporary realities (Frodeman, 2014).

This approach to complexity seems at odds with the linear, reductionist prescriptions found in current IDS textbooks and other IDS methodological literature (e.g., Repko et al.'s (2017) twelve research steps that were developed from Newell's original work). While this application of complexity to the process of interdisciplinary research cycles through theoretical debate, little work has been done to ascertain whether or not this theoretical framework is consistent with what interdisciplinarians actually do— the central question of this research.

RESEARCH METHOD

Due to the exploratory nature of this study, a qualitative and inductive approach were adopted. The primary goal was to get professional interdisciplinary researchers talking about how they develop and implement their own research and so a set of questions for semi-structured phone interviews was developed (Bernard, 2012) with that goal in mind (Table 1).

Respondents were solicited from a list of presenters at the 2015, 2016, and 2017 conferences of the Association of Interdisciplinary Studies. Each interview was transcribed and analyzed. A subset of three transcripts were analyzed independently by each author and themes central to the interview and/or of interest within the context of the study were identified. The authors then met to compare findings and develop a common set of themes which were used to inform analysis of the following subset of transcripts. This process was continued, adding or conflating themes as necessary, until all of the transcripts were analyzed. At this point, the authors reviewed all the transcripts again with particular focus on the identified themes (see Results).

Participants

There were 102 people contacted for interviews, and 21 interviews were conducted for a response rate of 21%. The interviews lasted an average of 27 minutes. Study respondents were overwhelmingly from humanities and social science fields, with only one respondent representing a STEM discipline. Several themes arose and are described in turn.

RESULTS
Theme 1: Exploratory Disposition

How participants formed their own research questions was of particular interest. As stated earlier, the common perception presented in Repko et al. (2017) is a linear, though iterative, process in which a researcher develops a question, identifies relevant disciplines, and then searches for

useful sources within those disciplines. This was indeed the case with several participants; however, most participants followed a much less structured path, and describe a process in which the research question is quite vague or fuzzy at the outset of the literature review and becomes more refined as the literature review progresses.

Consider the following three participant descriptions of how they develop their research questions: 1) "I just had a sort of topical interest and as I started looking into sources, it [the research question] emerged," 2) "Most research projects for me don't start in those neat, organized, 'here's the question, here is the this, the that' kind of structures. They more amorphous... Maybe I notice a general interest in something," 3) "I had an idea of what I wanted this project to be, and then it fleshed itself out by discovering different motives. I learned by examining other literatures other research methodologies or other similar work in the area."

Several participants cited key insights into their research questions as coming from unexpected sources, such as a book next to the book they were looking for, or a casual chat with a colleague from a seemingly unrelated field or a eureka moment while mowing one's lawn. Participant 6 suggested, "We all pretend we're totally structured, and we follow the step like this. But in reality, that's simply not the case. Sometimes we just stumble upon things. And sometimes it's just luck."

With such examples of insights into a study coming from unlikely places or experiences, invoking concepts such as serendipity or luck seems only natural; however, in acknowledging the skills of the researchers interviewed, it may be useful to consider Hyde's (1998) concept of smart luck—a luck that "adds craft to accident" (p. 139). In other words, smart luck arises from a combination of a fortunate event and a "responsive intelligence" (p. 140) capable of putting that good fortune to use. From this context, consider Participant 14's description of how they consciously foster what one might call smart luck:

I'll draw on the stuff that is in my cerebral repository to make these connections that I didn't see before. Now granted I'm not that smart, so sometimes that works better than others, but really it is sort of like, I'm going to sock that one away and then maybe it's going to be useful down the line. And a lot of time, it sort of serendipitously happens like that.

Or consider Participant 4's description of the proper approach to developing a research question: "You have to maintain that open mindedness. And so you can't you can't take too much of a rational, defined, logical approach or else you're structuring what you're looking for before you found it." These participants can be seen as describing their ways to foster smart luck. Hyde

(1998) explains, "With smart luck, the mind is prepared for what it isn't prepared for; It has a kind of openness, holding its ideas lightly" (p. 140). Note the tension (or perhaps "dance" is a better word) between openness and one's previously held ideas. Applying this idea to research, a researcher may be better served by not holding rigidly to preconceived questions.

Participant 15 provided a sense of how the open, exploratory approach described by many of the participants may overlap with Repko et al.'s (2017) research steps:

> Research done well—especially at the lit review stage—is a constant back and forth process. You've got the 'this is what I want to learn about' and then you dig into the fields that touch on the subject, and then they inform you and they let you know, 'oh, you didn't even think about this part,' and you go back to your research question and reshape it and then go back and read literature.

Repko et al. (2017) present their research steps as an iterative process, but the difference here is perhaps a greater emphasis on the iterations and the depth of the changes that may result. Participant 3 provided a similar description in the language of complexity: "As you move into the research that is a kind of a feedback loop that you can redefine and reshape your research question as you proceed with the literature review." In this case, the feedback loop is between the research question and the literature. Participant 4 seemed to suggest a more personal feedback loop between the researcher and the system being studied:

> You want to be engaged in the thing that you're studying and the decisions that you make, and so a lot of that is an emotional and intuitive experience as opposed to something that's more logical and linear. The beginning stages of the research process in interdisciplinary studies are non-linear.

In short, there is a common theme here of interdisciplinary researchers actively fostering exposure to unexpected events (e.g., insights and ideas from unexpected sources) and allowing those events to shape their approach to their research in new ways. Hyde (1998) says, "the mind that has smart luck makes meaning from unlikely coincidences and juxtapositions" (p. 141). Notice the parallel here between Hyde's depiction of smart luck as existing in the mind and Participant 15's depiction of relevance:

> To pretend that relevance exists in a book or in an author or in a field is faulty. Relevance is made; it doesn't exist outside. So what I do is read things, encounter people's thinking, and see if I can make relevance with it because that's where a relevance exists. If I can make intellectual use of something, that's what makes it relevant. If I try to think 'Well this is relevant; that's not relevant' beforehand, I'm limiting myself.

Participant 20 presented this approach to interdisciplinary research as essential to its value:

It's only by developing, pulling together research materials, and trying to follow novel threads in those initial research materials that we start finding ways of revising and making more original and thus more impactful research statements than started [the research project].

Theme 2: Little Concern with Disciplinary Boundaries

The exploratory disposition of the research process as represented in the responses of a number of respondents correlates with the pronounced lack of concern with disciplinary boundaries that permeated the findings. This lack of concern challenges the prescriptive methodology of starting from a disciplinary perspective and developing competency in that discipline.

Regardless of the starting point, Frodeman (2014) suggests that interdisciplinarity "is about the most anti-modern of ideas, the notion of limit" (p. 3), and this view seems to capture a bulk of the practices of the interdisciplinarians in this research. One overarching sentiment that seems to drive a lack of concern with disciplinary boundaries is the topic-driven nature of the interdisciplinary approach and the lack of resources in a single discipline to address the issue of concern. This was repeated consistently throughout the research. For example, Participant 1 explained:

I guess you know it just comes back to kind of this idea that there's a particular problem or issue that needs to be worked on. I think I moved very fast towards the idea that no one discipline could really adequately handle the problems or issues that I was interested in.

Similarly, Participant 14 explained:

Well, let [me] think about this one for a second. I guess that the traditional canon of English Studies failed to account for the complexity that I was seeing out there and the questions that I was asking. And so, I'm sure that a lot of people are going to say this, but [taking] what's useful from wherever and not [being] bounded within a particular disciplinary construct was the thing that drew me into it in the first place.

When asked what prompted the participant's turn to interdisciplinary work, Participant 8 replied:

I'm studying mental health issues with ministry families and how that plays a role in their working environment, in their family environment, and then how does spirituality or religiosity play a role in that as well? So, you know…that's really interdisciplinary because I'm looking at all of these disparate areas that wouldn't fall in to one academic discipline.

That interdisciplinarity is prompted by a topic or question(s) not addressed by a single discipline is well-established in the literature. Where respondents seem to depart from the literature, however, is in claiming a home discipline or a disciplinary foundation as a starting place in their interdisciplinary approach. Indeed, one might characterize the interdisciplinary methodology amongst these respondents as consisting of a substantial lack of reverence for disciplinary boundaries in general. This lack of reverence, so to speak, is apparent in several sub-themes that arose.

One of these sub-themes is a litany of disciplinary lenses utilized in their interdisciplinary project(s). This was appreaent in numerous responses. Participant 8 explained, "So, religious studies, psychology, marriage and family therapy, human development, family studies, organizational leadership." Participant 10 said, "I drew from communication studies doing empirical work, I drew from sociology doing sociological analysis of artifacts. I used rhetoric and composition; I've studied narrative studies. And I studied the literary criticism by doing Burkean analysis of the situations." Participant 14 added, "Anthropology, composition and rhetoric, and a smattering of things… which included, like, sociology, media studies, I can't remember the other two things." Participant 19 said, "So, I'm connecting anthropology of the senses, I'm connecting psychology, I'm connecting material culture studies. This also winds up connecting with some issues in the history of religions." Participant 7 explained, "I think most broadly would be astronomy/astrophysics, earth sciences, you know, geology or earth sciences, planetary sciences, and then bio sciences, because astrobiology is looking for life, and so integrated in bio sciences is chemistry, [you know we're getting into organic] those three and every subset you can possibly imagine."

This apparent tendency to draw from a wide array of knowledge domains fits well with the exploratory disposition that seems to characterize at least the initial stages of the interdisciplinary approach as described by the interdisciplinarians interviewed. It does not seem reasonable, however, to assume that the scholars would develop expertise in each of the areas listed. There are simply too many. Indeed, many of the respondents reported that they followed leads from reference lists of relevant sources as a primary path of discovery. Although they may not have the same insider knowledge as a trained disciplinary scholar of a particular discipline, they were able to muster sufficient competency in relation to their topic so as to make decisions as to which insights to include and which to exclude. This finding fits Newell's earlier assertion that "a general feel for the perspective of the discipline," and "sufficient command of its relevant portions" is necessary for interdisciplinary work (as cited in Welch, 2018, p. 205).

Beyond reciting a litany of included areas of study, another manifestation of a lack of concern with disciplinary boundaries appears in a conceptualization of the disciplines referred to by respondents. What counts as a discipline is inconsistent amongst respondents, and furthermore, numerous respondents conceive of their disciplinary areas as being always and already interdisciplinary. "Well, my original field is in economics, was economic history, which is a little interdisciplinary itself," explained Participant 1. Participant 10 said, "Broadly speaking, I identify as a rhetoric and composition scholar, but I guess I'm also quick to acknowledge that rhetoric is always already an inter-discipline." Participant 14 suggested that they are "sort of an outlier because I teach a lot of classes within, strictly within, the confines of the discipline of composition and rhetoric. But, I also teach interdisciplinary humanities courses too." Participant 18 explained:

> It was in literature and literature is a synoptic discipline, so it already has a broad scope… one of the things that's really important to recognize is that the discipline of literary studies, or English study, has changed profoundly and is much more interdisciplinary today. So, calling it just a discipline is very limiting.

These conceptualizations portray disciplinary boundaries as porous and shifting conveys a type of skepticism in or disregard for the disciplinary structure itself, even if not explicitly stated.

While the lack of regard for disciplinary boundaries permeates much of the responses, at times this disregard was much more explicit. Participant 9, for example, in reference to the politics of disciplinary domains commented that "most cultures will have an element of hegemony associated with them. What are the hegemony threats that are perceived, either real or unreal, that the discipline has?" Participant 19 was even more direct: "My first principle is not [disciplinary]. I think disciplines are historical, cultural, economic, and political artifacts. I think they badly reflect and largely distort the world they're supposed to help us live wisely in."

These sentiments regarding disciplines reflect a broad debate taking place within IDS regarding the relationship of IDS to traditional disciplines and the structure of IDS by extension (Welch, 2018). On one hand, IDS has developed as a challenge to modernity, pushing boundaries even beyond traditional academic structures and challenging disciplinary virtues of conformity and codification (Frodeman, 2014). On the other hand, however, IDS remains under the institutional umbrella, and the disciplining of interdisciplinarity is both beneficial and necessary for academic legitimacy, institutional visibility, and epistemic effectiveness (Repko, 2006; Bammer, 2013). In other words, this faction of the debate sees it as an imperative for IDS to transact in the norms and nomenclature of academe while another

faction seeks to carve a space defined by its resistance to the impositions of disciplinary structures that their exclusionary demands. Though pragmatic for explanation, the field is not so neatly divided. Despite this debate, these finding lend support to side of the debate that positions IDS as rightfully ambiguous and outside of the disciplinary structure while not intentionally seeking to eradicate the disciplinary structure writ large.

Theme 3: Mentorship and Community

That there is little reverence afforded to disciplinary boundaries is not to suggest a lack of interest in or importance of an academic community. Indeed, several respondents highlighted the crucial role of mentors, flexible academic programs, and the broader interdisciplinary community in the development of their interdisciplinary identity. This influence is of considerable importance as it ultimately continued to shape the way they conducted their research throughout their interdisciplinary careers. This influence was presented in several forms and resulted in different outcomes among the researchers in the sample.

Perhaps the most elemental form of influence from the IDS community presented had to do with respondents' knowledge that such a community even exists. This idea is exemplified well by the following quote from Participant 1: "I think it crystallized knowing that there was a group of people that actually thought about what it meant to be interdisciplinary kind of forced me to think a lot more about what that meant." Participant 1 explained that while they always approached their research in a somewhat interdisciplinary way because of the nature of their home discipline, they did not self-identify as an interdisciplinary researcher until they became aware of a community of scholars utilizing similar methodologies and that there was a place for them to meet and philosophize in the form of interdisciplinary conferences. Finding this community led Participant 1 to develop an interdisciplinary identity and encouraged them to ponder interdisciplinarity as they grew as a researcher. This explanation suggests that mere knowledge of the IDS community, be it disciplined or not, has the potential to influence the methodologies that a researcher chooses to incorporate within their research.

An additional impact that respondents credited to the influence of the IDS community was the freedom that the community affords in conducting research. This sense of freedom was well explained by Participant 14: "I give my advisors credit. They were cool with it in ways that some probably were not, and they encouraged me to get people on my committee who were thinking outside of Comp/Rhet or English studies." Participant 14 explained

that in the early stages of their research career they were encouraged by advisors to include committee members that went beyond traditional disciplinary boundaries, which contributed to their interdisciplinary approach to conducting research. The IDS community encourages and supports boundary pushing, which allowed Participant 14 to pursue their graduate work outside disciplinary restriction. This, in turn, influenced their approach to research and furthered community engagement. The critical role of the community is apparently a crucial component in opening the space for the exploratory disposition to manifest.

Disciplinarity is rooted in the peer-review process, and it might seem, at first glance, that IDS is poised to develop along the same vein, giving credence to the disciplining interdisciplinary ambitions of scholars so motivated. Interdisciplinarity differs, however, in its content-agnostic framework. Participant 18 explained it in bumper-sticker parlance: "Interdisciplinarians do it in any field." What seems to bind the interdisciplinary studies community is not a specific set of concepts or methods, but a propensity to challenge the status quo if only to the extent of ignoring it. In this sense, the IDS affiliates might be better understood as a support network rather than a distinct discipline or field of knowledge. This understanding fits with the how respondents conceptualize the IDS community. Participant 9, for example, states: "Our institution is a member of AIS. There are many North American institutions or institutions around the world. So that gives me an international feel for what the issues, what the concerns, are with interdisciplinarians." Participant 10 explained:

I have been thinking about interdisciplinarity from about the time that I was twelve years old. My father was a professor of Interdisciplinary Studies, and I sat in the back during his seminar quite a bit. So, as I went through college and did work, the notion of the academic disciplinary silos was already rather more broken down for me than perhaps for some of my peers.

That the IDS community serves more as a support system rather than a disciplinary unit is further evidenced by the frustrations expressed by numerous respondents with the publication process. Understandably, the content-agnostic quality of IDS provides few tools for assessing specific content of interdisciplinary projects despite numerous attempts to develop tools to assess the interdisciplinarity of a given project. Mansilla (2006), for example, conducts empirical research on approaches to interdisciplinary inquiry and identifies the epistemological frameworks professional interdisciplinarians utilize for the validation of insights produced. While this work is surely invaluable for assessing interdisciplinarity, it offers little in the form of tools for content assessment. The problem is exacerbated by attempts

to publish interdisciplinary work in disciplinary publications. Participant 4 explains that: "Unfortunately, there are many publication outlets that are just downright suspicious of interdisciplinary methods," and that:

> I feel like what I have to do often is over explain the interdisciplinary approach to knowledge to let people who are not familiar with it understand why it's important and how it's working and what it's doing. But, a lot of time that gets negative feedback. I think sometimes there are comments I've heard it's like: "Oh this paper is all over the place." Well, it's all over the place because it's an interdisciplinary paper. So…you have to you have to tailor it to your audience to an extent. And so, if you're, you know, an outsider trying to get into a journal that has very specific parameters, a lot of times, frankly, their reaction to you is somewhat xenophobic.

Framing one's work to appeal to a specific academic audience was a common theme amongst respondents. Participant 3 explained:

> You know when I'm writing for a literary journal, I have one methodology top of mind and if I'm pitching something to an interdisciplinary journal my methodology is different. So, I do wear different hats according to my audience. I may be a bit of an aberration there.

If IDS was succeeding in the quest to become an established discipline, it seems unlikely that IDS practitioners should be still struggling to such an extent for place and legitimacy within traditional academic fields. Participant 16 recited an experience that seems to epitomize this problem. They explained their research in detail and their long history of participation in a specific academic area and with a specific academic journal. The respondent explained that "I have been very involved in the organization and I had read submissions for years for them, for the editors, and they sent it to three readers, which is unusual. Anyway, [it was] ultimately rejected."

Seemingly, IDS has not become a buffer against academic disciplinary politics nor produced a viable set of translation tools through which interdisciplinary practitioners can reliably convey novel concepts and ideas to established knowledge domains, despite the saturation of academe with demands for interdisciplinary research, programs, and curriculum development. This state of affairs is likely indicative of the challenge IDS poses to the status quo, not just in terms of its challenge to disciplines, but in terms of its challenge to approaches to knowledge more generally. Thus, it does not seem that disciplining interdisciplinarity has been effective and, therefore, is not the best approach for developing the field of IDS. The discrepancy between the teaching and practicing of interdisciplinarity that motivated this project may be indicative of a broader discrepancy between the theory and practices of interdisciplinarity more broadly. Rather than

assimilating IDS to the disciplinary structure, this discrepancy can inspire an even broader challenge to that structure that gives space to the power and promise of IDS as something truly new and different.

Theme 4: Discrepancy Between What Interdisciplinarians Do and What They Teach

The discrepancy between doing interdisciplinary work and teaching interdisciplinarity was frequently discussed by participants, though to various degrees. In 2006, Mansilla noted something similar. Mansilla and colleagues were "concerned with the chasm between the demand to prepare our youth to address complex matters of cultural and environmental survival on the one hand and the lack of empirically based guidelines for interdisciplinary instruction on the other" (p. 2). The discrepancy between doing and teaching interdisciplinarity uncovered in the findings of this project was widespread, though to various degrees.

The seeming messiness of the interdisciplinary approach, at least in the initial stages, that many respondents described might account for some of this discrepancy. One respondent, after characterizing their own methodology as exploratory with open-ended research questions and cultivated serendipitous exploration, rejects the possibility of cultivating such an experience for students. Talking about one project specifically, Participant 3 explained:

> I'm not defining the research question, which flies in the face of everything I teach in the classroom...You gotta' think if you don't formulate a research question in the undergraduate classroom then you can end up going down all kinds of rabbit holes.

Participant 6 explained:

> Sometimes, when you teach that to students, you know, how to do interdisciplinary research…it can be helpful to teach them in a very structured way. But, it also has its disadvantages because they will realize, once they do their own project, that it's not as clear cut as we present it to them.

When asked about their typical approach to literature searches, Participant 1 replied: "Probably a lot less organized than I advise people to do." Messiness is not a traditionally accepted virtue of the classroom and traditionally a marker of a lack of academic rigor.

Some of this discrepancy is likely a product of a broader discrepancy between the demands of an institution steeped in reductionist traditions of institutional assessments, timelines, and publishing norms. Participant 9

summarized the issue in explaining the institutional demands for evidence and proof of effectiveness:

> So, at my particular program, every five years I have an outside five year review of our Interdisciplinary Studies program, and what we do is we set goals based upon any identified limitations or weaknesses with a five year plan not only to address those limitations or weaknesses but also to move the program forward in the mainstream interdisciplinary studies.

These demands seem to force IDS programs into the very structure many of its adherents seek to eschew. The demand for reductionism is reinforced in publishing norms. Again, the apparent messiness of the process does not ascend to traditional virtues of academic rigor, and thus methods need to be conveyed in the step-by-step way. This of course creates an illusion as to how interdisciplinarity proceeds that then facilitates an explanation and justification for translating this illusion into pedagogy. Participant 6 stated:

> I think afterwards you can turn it into a step-by-step process. But, when you write it down, obviously, you have to write it down or present it in a very structured academic way. But, I think the inner process, your own research process, is way messier than what you actually put on the page. Because, then, afterwards, you structure accordingly, and that structure has something to do with the rules of your discipline.

> The reductionist demands of academe are, perhaps inextricably, embedded in the stringent time constraints of the institutional approach to education. Thus, this discrepancy, despite best intentions of interdisciplinary instructors, functions as a barrier to bridging the gap between what interdisciplinarians do and what they teach their students to do. Consider Participant 2's explanation:

> I'm usually trying to allow and facilitate the kind of process I'm describing for the students. It's just that usually there's more of a time constraint. And there's also the curricular and outcome type constraints, that when you put those all together, we don't get to do as much exploration probably as I normally would like them to do, just because we're moving fast. The semester moves so quickly.

So, the question is, what should the interdisciplinary studies students be taught? Given that interdisciplinarity has arisen logically from and in answer a Western epistemological framework (Welch, 2009), its apparent propensity to cut across the grain of institutions still largely structured on the Western framework is hardly surprising. In this context, the step-by-step process presented by Repko et al. (2017) can be seen as a guard rail for students, helping them to avoid getting lost in their own research and keeping them on pace to produce a final product in a timely manner. But, is protecting students from the messiness interdisciplinary research in this way the best way to help

them mature as researchers? Respondent 3 spoke of avoiding rabbit holes, but perhaps it is exactly the rabbit holes that facilitate the interdisciplinarity espoused by our participants.

IMPLICATIONS

From the sample of this project, there appears to be little consistency in what interdisciplinarians do, unless one considers this inconsistency as the consistency. The idea of the interdisciplinary process as itself an unfolding complex system in which the researcher interacts with a diversity of resources in a dynamic non-linear fashion from which new insights emerge is an apt characterization of the process and supports the complexity framing of interdisciplinarity, at least as a viable heuristic device if not a whole representation. It is with the linearity of the process derived therefrom that these findings conflict.

Repko et al. (2017) describe a cognitive toolkit—a set of intellectual capacities, skills, values, and traits including such things as empathy, humility, tolerance of ambiguity, and intellectual courage. While there seems to be little consistency in methods amongst the respondents in this project, one might argue that there is a great deal of consistency in the manifestation of these capacities. Repko et al. (2017) suggest that "repeated exposure to interdisciplinary studies fosters the development of…perspective taking, critical thinking, and integration," (p. 92), which are the key competencies of interdisciplinarity. This assertion creates a bit of a dilemma, however, because it suggests both that IDS fosters these cognitive tools while at the same time these cognitive tools are necessary for IDS. While carefully crafted courses taught by professors from two specific disciplines appear to increase students' integrative thinking and fosters greater student engagement (Abbott & Nantz, 2012), core courses in numerous IDS programs, such as the ones the investigators are charged with, boast a roster of students from areas of study that run the gamut of disciplinary areas. Furthermore, starting from a specific discipline or set of specific disciplinary perspectives does not align with what interdisciplinarians seem to do. So, where do instructors start?

In their quest to align their teaching and research practices, Participant 20 explained that their objective in their class is to cultivate an "exploratory disposition." The heart of interdisciplinarity, as supported by the interviews in this project, might be characterized as a deep disregard for boundaries. Thus, positioning interdisciplinarity as a highly creative endeavor that affords practitioners the capacity to mobilize and develop insights and ideas from an unscripted set of sources. Montouri (2005) recommends the adoption of the conceptualization of scholarship as a creative process: creative

inquiry. Montouri writes that: "Creative Inquiry involves the cultivation of a fundamental attitude to the world that actively embraces uncertainty, pluralism, and complexity," (2012, p. 66). From an IDS perspective, this makes a great deal of sense and supports some key insights that have emerged from this project.

What does this mean for teaching? There are three points gleaned from this research that might serve as orientating points. First, so long as the pedagogical approach of IDS remains focused on conveying a specific method or approach grounded in the disciplinary structure, the gap the investigators noted and that motivated this study has little chance of being closed. It seems that it would be more profitable to focus undergraduate education on cultivating the cognitive toolkit as the foundation for creative inquiry or interdisciplinarity. Second, there is a need to create within the interdisciplinary classrooms a supportive environment that allows for the messiness that characterizes the exploratory journey. Third, in order to facilitate such an environment, a re-fashioning of what higher education looks like will be necessary. In this re-imagining, the challenge is to develop an educational environment that cultivates and supports the complexity of the interdisciplinary approach. Such an environment would adjudicate process rather than product and prioritize engagement over achievement. Some strides to this end have been made (Shandas & Brown, 2016) and while some critical of interdisciplinary studies suggest a complete dissolution of the disciplinary structure (see Frodeman, 2014; Forman, 2012), such assertions are not warranted from the findings in this study. What is warranted is the need for a space within the academe but outside of the disciplines that fosters and supports interdisciplinary knowledge-making, both critical and instrumental in terms of teaching and learning.

Closing this gap has several widespread implications. That IDS poses a challenge to disciplinary approaches to knowledge is well established but developing this challenge to its full power and promise may be hampered by the efforts to reproduce IDS in the disciplinary image. In its challenge to traditional approaches to knowledge, IDS embodies a challenge to traditional approaches to teaching and learning that requires a shift from product to process, engagement to achievement, and disciplining to fostering. Bridging the gap between what an interdisciplinarian does and what they teach would bring the immense power and promise of interdisciplinary studies into full relief.

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