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‘A JACK-OF-ALL-TRADES AND A MASTER OF SOME OF THEM’: Successful Students in Interdisciplinary PhD Programs

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by

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Abstract: Interdisciplinarity has become a growing emphasis in U.S. higher education, and the prevalence of interdisciplinary doctoral programs is one indicator of such growth. Despite this growth, the experiences of individuals within interdisciplinary doctoral programs have been largely unexamined in the literature. This paper examines a self-designed interdisciplinary doctoral program for the two-fold purpose of better understanding students’ experiences and faculty members’ conceptualizations of what constitutes student “success.” Using the lens of socialization, findings uncovered issues related to a lack of program structure and support for those involved. Findings from the study demonstrate a need for a higher level of self-direction for these students given the increased ambiguity of the program’s structure as well as the need for external support given the lack of community.

Interdisciplinary research, teaching, and collaboration have gained increasing acceptance in institutions of higher education in the U.S. in recent decades. In tandem, federal agencies have called for more interdisciplinary thinking about the world’s problems, such as Kates et al. (2001) who remarked about “the growing recognition across many disciplines of the need for synthesis and integration” in regard to

sustainability (p. 1). The National Science Foundation (NSF) defines interdisciplinary research¹ as:

A mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice. (National Science Foundation, 2009)

The NSF has played a leading role in encouraging interdisciplinary scholarship in the U.S. through multiple funded projects to stimulate such collaboration. In particular, the Integrative Graduate Education and Research Traineeship (IGERT) program was established in 1997 to assist in supporting interdisciplinary graduate training and education (Carney, Chawla, Wiley, & Young, 2006). Interdisciplinary graduate programs have since taken root among many institutions of higher education throughout the U.S., including programs in interdisciplinary studies as well as neuroscience, environmental studies, and women’s studies, just to name a few. In addition, the Association for Integrative Studies (2008) maintains a database of master’s and doctoral programs, including those they define as “self-designed PhD programs,” and those that allow students “to develop a program that spans two or more disciplines.”

Given the growing emphasis on interdisciplinary scholarship as well as the continuing need to better understand, organize, and structure graduate programs for student success and completion, understanding the student experience in interdisciplinary graduate programs is vital (Council of Graduate Schools, 2004; Klein, 2010). Moreover, as graduate education is the training ground for future researchers and faculty, interdisciplinary graduate training is key to the continued development of interdisciplinary research in the future. Despite this growing emphasis on interdisciplinary graduate education, however, few studies have focused on the students and faculty working in them (see Holley, 2009a; Newswander & Borrego, 2009, for exceptions). Therefore, a particular need exists to identify the conditions and contexts that contribute to success in these interdisciplinary programs from the perspectives of faculty and students involved in them.

Doctoral student success can be conceptualized in many ways but is

¹ See also major definitions provided in Repko (2008), pp. 11-12.

often considered as retention of the student through the program resulting in completion of or graduation from the program (Gardner, 2009). In order to graduate or successfully complete the program, researchers have found that a key determinant is the students' socialization experience (Clark & Corcoran, 1986; Ellis, 2001; Gardner, 2007; Golde, 1998; Lovitts, 2001). Socialization can be defined as the process through which an individual learns to adopt the values, skills, attitudes, norms, and knowledge needed for membership in a given society, group, or organization (Becker, Geer, Hughes, & Strauss, 1961; Kuh & Whitt, 1988; Merton, 1957; Van Maanen, 1984). Indeed, a lack of socialization can lead to doctoral student attrition, a statistic that hovers around 50% nationwide (Council of Graduate Schools, 2004, 2008).

Given these concerns and these definitions, the purpose of this study is to examine the definitions of success provided by faculty and students in one self-designed interdisciplinary PhD program. I begin by placing the study in the context of the literature on interdisciplinarity as well as interdisciplinary graduate education. I then provide an overview of the existing literature related to doctoral student success and the guiding conceptual framework of socialization, which served as a framework through which the data were analyzed. The methods utilized in the study are then discussed, consisting of in-depth, open-ended interviews with four faculty and 10 students engaged in the self-designed interdisciplinary doctoral program at one research university in the U.S.

Literature Review

In this literature review, I discuss three overarching areas related to self-designed interdisciplinary doctoral programs. First, I discuss interdisciplinarity in general, then focus more specifically on the literature related to interdisciplinary doctoral programs. Third, I discuss the literature related to doctoral student success, connecting to the final area of socialization, which serves as the framework for the study.

Interdisciplinarity and Doctoral Education

Despite the increasing emphasis on interdisciplinarity, the obstacles surrounding interdisciplinary work are formidable. Indeed, even the definition of interdisciplinarity is elusive, with many conceptualizations in existence (e.g., Amey & Brown, 2004; Borrego & Newswander, 2010;

Holley, 2009c; Klein, 2010; Lattuca, 2001; Repko, 2008). Holley (2009c) pointed out many challenges to interdisciplinarity, including that it "requires collaboration among individuals, artifacts, and cultures that have traditionally been separated by institutional structure" (p. 29). Lattuca (2001) provided an example, saying, "Our colleges and universities, and to a lesser extent our elementary and secondary schools, teach us by word and deed that knowledge is divided into academic disciplines. The more schooling we have, the more entrenched our sense of disciplinarity can become" (p. 1). In this way, learning to do interdisciplinary work is, by its nature, difficult. For many faculty members, overcoming one's own disciplinary training and knowledge can be challenging. Scholars studying these efforts have found that few true interdisciplinary collaborations are actually successful, given the myriad obstacles facing them (Amey & Brown, 2004; Creamer, 2005). Such obstacles include language barriers among disciplines as well as epistemological differences, not to mention structural issues that permeate traditional universities such as reward systems (Holley, 2009c; Lattuca, 2001).

To overcome such obstacles to interdisciplinarity, agencies such as NSF have designated funding to encourage the growth of rigorous interdisciplinary training programs for graduate students. The idea behind these programs is that the training and understanding of research that scholars receive are generally grounded in one's graduate education (Holley, 2009c; Weidman, Twale, & Stein, 2001). Through this process of early socialization to interdisciplinarity, researchers could then begin to grasp interdisciplinary abilities and practices at the beginning of their careers. Indeed, several scholars have commented on the timing of socialization to interdisciplinarity (Amey & Brown, 2004; Metz, 2001; Strober, n.d.). Some, like Strober, have posited that early exposure to interdisciplinarity is necessary for burgeoning scholars "before they become set in their intellectual ways" (p. 21).

As a result of the growing need for interdisciplinary research and the increased attention to graduate training for this research, the proliferation of interdisciplinary graduate programs has intensified. The Association for Integrative Studies (AIS) provides a listing of 30 interdisciplinary doctoral program groupings in the U.S., including programs such as women's studies, environmental studies, materials science, and marine science, as well as those that broadly bridge two disciplines within the social sciences or the humanities. The few existing studies on graduate student experiences in interdisciplinary programs have focused on these structured PhD programs

that are interdisciplinary in nature (e.g., Holley, 2006). In other words, structured programs have a set curriculum, program, and structure within the institutional setting that also incorporate interdisciplinary elements, such as the need for coursework or committee members incorporating two or more disciplines. Many IGERT programs, for example, are designed as these structured interdisciplinary programs. Studies examining these programs have generally found students feeling disconnected from faculty and peers, having to span boundaries between areas, departments, and knowledge bases (Drezek, Olsen, & Borrego, 2008; Holley, 2009b; Newswander & Borrego, 2009).

Beyond these structured programs, an increasing number of interdisciplinary programs are those which are described as self-designed or individualized interdisciplinary PhD programs. The AIS Website lists an additional 15 programs that are described as self-designed PhD programs, or those in which students can develop a program that spans two or more disciplines. In Table 1 (on next page), I present four such programs as examples from this website.²

These self-designed programs tend to be administered under the auspices of the institution’s graduate school, offering students, as in the verbiage of Marquette University (2009), the opportunity to “work outside traditional academic boundaries and forge individualized academic programs that combine course work and research in two or more academic departments.” The majority of these programs require that students bring together two or more existing program areas. To be admitted to these programs, students are typically required to choose their committee members, design an entire program of study, plan their examination areas, and submit a dissertation prospectus—all as a requirement of admission. Many programs, like Marquette’s, caution students that such programs are not easy; indeed, they remark, “The requirements, standards, and expectations are more challenging than most doctorates.” Currently, however, no studies have empirically examined these self-designed programs or the students’ experiences within them.

² A cursory online search with the phrase “interdisciplinary Ph.D.” results in countless other programs not listed on the AIS Website, so the dated nature of this database should be noted.

Table 1
Examples of Self-Designed Interdisciplinary PhD Programs

University	Name of Self-Designed Program	Defining Characteristics
Bowling Green State University	Interdisciplinary Studies	For students already admitted to an existing program, but who wish to focus upon a program of study that does not currently exist at the institution. Student assembles committee across at least two disciplines and then works with it through duration of program.
University of Alabama	Interdisciplinary Studies PhD	For students whose needs are not filled by existing degree programs. Work in conjunction with graduate school to define program of study and assemble committee across at least two existing programs. All requirements approved prior to admission.
University of Missouri-Kansas City	Interdisciplinary PhD-Studies	Students must apply to at least two participating programs and be admitted and then work with graduate school to determine program of study and advisory committee.
University of Washington	Individual PhD Program	For “exceptionally able students” whose needs are not met by currently existing programs. Small program administered through graduate school, incorporating self-designed program spanning at least two disciplines. Student composes committee prior to admission.

Doctoral Student Success

Interdisciplinary doctoral programs have only begun to be examined in the literature. However, the larger literature on doctoral education speaks to several points regarding doctoral student success overall, which I discuss in turn below.

Only 57% of doctoral students who begin their programs graduate within 10 years (Council of Graduate Schools, 2008), a statistic that has caused much consternation among higher education administrators. To counteract such high rates of attrition, myriad studies, programs, and initiatives have emerged in the past decade. Many of these efforts have focused upon ensuring doctoral student success. However, the definition of what success means in doctoral education can vary widely, including retention rates, academic achievement, completion or graduation rates, to professional socialization, and job placement (Gardner, 2009). For example, scholars have sought to understand how factors such as advising (e.g., Baird, 1972; Schroeder & Mynatt, 1993), student characteristics (e.g., Cook & Swanson, 1978; Nettles, 1990), and particular measures such as grades and test scores (e.g., Burton & Wang, 2005; Girves & Wemmerus, 1988; Lannholm & Schrader, 1951) influence success in doctoral education. Conceptualizations of doctoral student success can be further complicated by the context in which the student is found, including departmental cultures as well as larger disciplinary and institutional contexts (Gardner, 2009).

Gardner's (2009) study of faculty members' conceptualizations of doctoral student success in seven disciplines found that faculty discussed the overarching need for doctoral students to be independent and self-directed. This need for independence and self-direction is perhaps not surprising given the purpose of the PhD: to produce original, independent research on a given topic (Council of Graduate Schools, 2005). Indeed, several scholars have commented on the tenuous journey toward independence in the doctoral program (Gardner, 2008b; Lovitts, 2005; Lovitts, 2008). The journey toward independence is often difficult for students to navigate due to the level of ambiguity involved in doctoral education (Gardner, 2007) and due to prior educational experiences seldom requiring this level of independence or self-direction (Rosen & Bates, 1967). This new educational expectation may result in many students feeling unprepared to have self-structure, self-reliance, and self-direction. For example, graduate students must transition from being consumers of knowledge in the classroom to creators of knowledge in their dissertation research (Bargar & Duncan, 1982;

Delamont, Atkinson, & Parry, 2000; Egan, 1989; Lovitts, 2001, 2005; Rosen & Bates, 1967). In this study, I utilize Gardner's (2009) understanding of doctoral student success as student persistence leading to completion of the program.

What constitutes success in interdisciplinary programs is still unknown, however. The few existing studies on structured interdisciplinary graduate programs discuss the challenges that these students face, including a lack of cohesion among the different departments' or disciplines' requirements, the language issues that arise among disciplines, and the absence of a departmental home (e.g., Holley, 2009b; Holley, 2009c). Some scholars have begun to examine how one assesses interdisciplinary expertise (Boix Mansilla & Duraising, 2007; Borrego & Cutler, 2009, 2010), as well as the different traits and skills acknowledged among interdisciplinarians (Klein, 1990; Repko, 2008). These qualities include a high tolerance of ambiguity, considerable initiative, assertiveness, a broad education, a high degree of ego strength, flexibility, resilience, high cognitive complexity, a preference for diversity, and an ability to work in teams. These qualities, according to Klein, appear across many scholars' conceptualizations of interdisciplinarians, but, as of yet, none of these qualities have been empirically examined in relation to interdisciplinary research or interdisciplinary graduate education. What is known, however, is that skills and traits that are valued within any disciplinary context are passed through the process of socialization, which most often occurs during the graduate school process (Gardner, Hayes, & Neider, 2007; Walker, Golde, Jones, Conklin Bueschel, & Hutchings, 2008; Weidman et al., 2001).

Socialization in Doctoral Education

In this section, I describe socialization as the framework for the study. Socialization is described as the "process by which individuals acquire the values, attitudes, norms, knowledge, and skills needed to perform their roles acceptably in the group or groups in which they are, or seek to be, members" (Bragg, 1976, p. 6). Socialization in graduate education is even more complex. Golde (1998) explained that graduate school socialization is a dual socialization: both to the discipline or future profession as well as to the role of graduate student. In other words, students must not only learn about what it means to be successful in their chosen profession but also what it means to be a successful graduate student. Students are socialized by various experiences and relationships in their programs, including their

peers (Sweitzer, 2009), the structure of their program (Gardner, 2007), and the disciplinary (Becher & Trowler, 2001) and institutional cultures (Kuh & Whitt, 1988) that surround them. Socialization experiences can be both purposeful and unintentional, either through explicit or implicit means (Weidman et al., 2001). Similarly, the socialization experience can often be negative for students (Clark & Corcoran, 1986; Daugherty, 1999; Ellis, 2001; Gonzalez, 2006; Margolis & Romero, 1998; Turner & Thompson, 1993), particularly for those students who may not “fit the mold” of the typical graduate student or have the traditional graduate experience (Gardner, 2008a). Regardless of one’s socialization experience, many of these socializing factors emanate from the faculty and the faculty advisor, who are the primary socializing agents for the students (Austin, 2002; Bragg, 1976; Clark & Corcoran, 1986; Weidman et al., 2001). Indeed, doctoral advisors have been shown to play a key role in student success through the relationships that develop throughout the doctoral student’s program (Bargar & Mayo-Chamberlain, 1983; Barnes, 2005; Barnes & Austin, 2009; Zhao, Golde, & McCormick, 2007).

Connecting student success and socialization, then, one is able to form a basic understanding of the issues that face students in an interdisciplinary program. To illustrate, faculty members are socialized to disciplinary norms and conventions during graduate school (Becher & Trowler, 2001). Disciplines provide an extensive history, set of norms and practices, as well as values and habits of mind (Clark, 1987). Faculty members, to gain entrée to and be successful in a given discipline, must demonstrate a level of adherence to these cultures and expectations (Austin, 2002; Becher & Trowler, 2001; Gallagher, 1986; Tierney & Rhoads, 1994). In turn, faculty members pass along these norms, values, and habits of mind to their students through the socialization process (Weidman et al., 2001). Becher and Trowler pointed out, “To be admitted to membership of a particular sector of the academic profession involves not only a sufficient level of technical proficiency in one’s intellectual trade but also a proper measure of loyalty to one’s collegial group and of adherence to its norms” (p. 47). What, then, does this mean for students in interdisciplinary programs? Who and what become the socializing mechanisms for the interdisciplinary student? How do interdisciplinary students who straddle multiple disciplines find “success”? In the next section, I present the methods for the study, in which I explored the meaning of success for doctoral students in a self-designed interdisciplinary program at one institution, getting to the heart of questions such as these.

Methods

The current study was guided by the following research questions: (1) How is success conceptualized in an interdisciplinary doctoral program? (2) What are the socializing mechanisms for interdisciplinary doctoral students? and (3) What structures and practices facilitate or hinder this success? This study was part of a larger investigation in which I sought to understand the contexts and cultures that facilitate doctoral student success in five programs at one research university, including one self-designed interdisciplinary doctoral program (IPhD). The IPhD program at Land Grant University or LGU (a pseudonym) was the only existing self-designed interdisciplinary program at the institution at the time of the study.

Institutional and Programmatic Context

In an earlier study, I determined that the completion rate of this interdisciplinary PhD. program (or IPhD) is 62%, meaning that of the students who began the program 62% had completed it within 10 years. This completion rate is slightly above the national average of 57% (Council of Graduate Schools, 2008). Among the other 40 traditional (or single disciplinary focus) doctoral programs at LGU, the IPhD program was found to have one of the top five completion rates, thereby warranting further examination through the current study. The IPhD program at LGU was established in the late 1970s in order to compete not only with more prestigious institutions that already had in place such interdisciplinary programs but also to retain local students. The administration of LGU has been working to grow its doctoral programs, using these programs to increase its research output as well as to increase its rankings through doctoral graduates. LGU is currently classified as a mid-sized research university and ranked in the third tier of national universities by *U.S. News and World Report* (U.S. News and World Report, 2009).

Much like other self-designed interdisciplinary programs (see Table 1 and Association for Integrative Studies, 2008), the IPhD program at LGU is administered through its graduate school or office of graduate studies. To gain admission into the program, students must have completed a master’s degree in a “relevant discipline” and are then required to develop a plan of study in consultation with their chosen program chair. In addition, prospective students must provide an overview of the literature related to the degree focus, a list of courses to be taken, the topics to be covered in the

candidacy examination, and the faculty members responsible for the content. In total, there are five committee members, including the committee chair, three LGU faculty members, and one member external to LGU. According to the program's coordinator, this process can take up to six months for prospective students to complete given the amount of networking and background needed to develop the program of study and form a committee. Once the application is complete, the student meets with an admissions committee, constituting faculty members from across campus, who will interview the candidate and determine admission. Once admitted, students are then required to complete the program within eight years, a policy that is extended to all doctoral students at LGU. In other words, students may spend up to six months applying to the IPhD program before the admission process is even formalized.

Taken together, the application process and structure of the IPhD program is quite different from more traditional doctoral programs in that traditional programs typically have specific, clearly outlined requirements for coursework and examinations as well as committee representation (Council of Graduate Schools, 2005).

Study Methods

In order to address the research questions, I utilized qualitative methods as they allow for (a) understanding the meaning “of the events, situations, and actions” in which participants are involved within (b) a particular context “and the influence that this context has on their actions” (Maxwell, 1996, p. 17). I aimed to understand “the physical events and behavior” of the participants, but also “how their understandings influence their behavior” (Maxwell, 1996, p. 17). Specifically, I employed several qualitative methods to better understand the participants' meanings of their experiences and the context in which these meanings were formed. First, I conducted interviews with the coordinator of the IPhD program as well as several faculty members who have served as committee chairs to IPhD students. Second, I conducted interviews with a representative sample of existing IPhD students. Finally, document analysis of existing meeting notes, program guidelines, and materials was also included.

I conducted interviews with administrators, faculty, and students in the spring of 2009. I began with an interview with the coordinator of the program, an administrator in LGU's Graduate School, in which the administrator described the requirements for the program, a brief history

of the program, and provided a list of students currently enrolled in the program (N=54). From this information, I utilized criterion-based selection (Maxwell, 1996) in order to obtain a representative participant base inclusive of student demographics within the larger program, inclusive of age, race, gender, as well as programmatic phase (coursework or dissertation). From these lists, I contacted a random selection of students via e-mail to solicit their participation in interviews. In addition to the students, the program coordinator provided a list of four faculty members who had served in the capacity of advisor to several recent IPhD students. I contacted these faculty members via e-mail for their participation in the study. After informed consent was obtained, the student interviews lasted approximately 60 to 90 minutes and focused on their experiences in the IPhD program, including the time from admission through their current status. Specifically, students were asked about their experiences in coursework, with their advisors and committees, and their overall program (see Appendix A). Interviews were conducted with students until saturation occurred (Seidman, 2006), meaning that themes and concepts were repeated. A total of 10 IPhD students were interviewed, representing multiple programmatic points in the degree program as well as multiple disciplinary foci (see Table 2), while at the same time representing the overall demographic population of students in this program based on the list provided by LGU's Graduate School. For example, the mean age of participants in the study reflected that of the overall student population in this program of 41.24 years. Similarly, gender and racial characteristics of the participants were also representative of the larger population. In all respects, therefore, the sample of student participants was representative of the overall student population in this program: older, generally mid-career, and generally partnered or married with families. I interviewed faculty for 30 to 45 minutes in regard to their beliefs about successful IPhD students and the IPhD program in general (see Appendix B). Faculty also represented a wide variety of disciplinary expertise but all were tenured (see Table 3). I also conducted document analysis of existing IPhD paperwork to determine the particular aspects of the program's history, governance structure, and policies.

Interviews were tape-recorded and transcribed verbatim and then analyzed using the constant comparative method (Glaser, 1978). I first utilized open-coding to understand the larger dynamics at work in the faculty and student perceptions of the doctoral program, resulting in a set of themes. Then, I conducted further coding to make explicit the connections between the themes that emerged and corresponded with the existing literature on

interdisciplinary graduate programs and doctoral student socialization. Finally, a third round of coding allowed for a search of concepts that tied into the emerging themes (Strauss & Corbin, 1998) from the participants' interviews.

I obtained trustworthiness of the data collected and subsequent analysis through peer debriefing (Maxwell, 1996), wherein another colleague was given access to transcripts for their analysis and verification of themes; member checking, wherein students and faculty were asked to review the themes that emerged from their interviews; as well as through triangulation of data sources (Bogdan & Biklen, 2003; Maxwell, 1996) as the current study was a part of a larger study in which multiple administrators, faculty, and students were interviewed.

Table 2
IPhD Student Participants

Participant Pseudonym	Disciplinary Foci	Gender	Age	Program Phase
Marlene	History, music, women's studies	F	53	Coursework
Jeff	Marine science, engineering	M	64	Coursework
Mark	Earth science, anthropology	M	35	Dissertation
Sharon	Nursing, research	F	56	Coursework
Linda	Education, psychology	F	58	Coursework
Philip	English, history, communication	M	45	Coursework
Sarah	Women's studies, English, communication	F	52	Dissertation
Maura	Communication, higher education, women's studies	F	28	Dissertation
Tobias	Computer science, biology	M	36	Coursework
Justin	Climate change	M	64	Coursework

Table 3
IPhD Faculty Participants

Participant Pseudonym	Discipline/Program	Gender	Total Years Experience
Betsy	Nursing	F	22
Frank	Communication	M	22
John	Public Administration	M	13
Janet	Education	F	9

Findings

Several themes emerged from the analysis of the interviews with the 10 doctoral students and four faculty members involved in the IPhD program at LGU, including (a) the structural challenges that may facilitate or impede student success in these programs, (b) the characteristics of successful students in IPhD programs, as well as the more implicit connections to (c) support, which undergirds the success of students in these programs.

Structural Challenges

A doctoral program's structure includes guidelines and procedures related to degree requirements, including the objectives of the program, requirements, course offerings, general timelines for examinations, the mechanisms and process for these examinations, research specialties offered, and the faculty responsible for each (Council of Graduate Schools, 2005, p. 6). These programmatic structures are at the same time influenced by university and graduate school structures that may include different or additional criteria for degree completion.

As explained above, entrance into the IPhD program at LGU requires intensive preparation as the student is required to form a full committee, plan the entire program of study, and complete a dissertation prospectus simply to be considered for admission. Even though students will work with a prospective chair to complete this process, students are nevertheless expected to do the bulk of this work on their own. This intensive and highly self-directed process then continued after students were enrolled in the program as students worked to make sense of the system. In fact, phrases like "cobble together" and "working without a net" were mentioned repeatedly by both faculty and students in their interviews to describe the process of

forming a committee, compiling the program of study, and understanding the requirements. Indeed, one faculty member, John, remarked upon the difficulties presented by the IPhD program:

I think the first thing to make abundantly clear to the student entering an IPhD program is that there are no handrails to hold onto. The only experience I have is my own doctoral program. There were people behind us and in front of us so we had some kind of coaching and it was very structured and it worked. Frankly, I don't know if I could handle an IPhD.

Indeed, it was the lack of structure that was most often discussed by both faculty and students alike as the most troublesome. One faculty member explained this lack of structure as problematic in terms of putting together a coherent program of study that includes the appropriate kinds of courses (i.e., a balance of content, theory, methods, minor or specialization, etc.), as well as the number and ordering of these courses. Another faculty member noted that this unstructured program of study process was often a concern for IPhD students. Students agreed that the need for coherence was an issue, especially for those students who may not be overly familiar with graduate education. For example, Maura, who was about to graduate, shared her own experience: "It was awkward, especially as a first-generation college student who did not understand this whole thing about specialization. I thought it just meant that I had to take a lot more classes or write a bigger thesis." In fact, Maura continued, "Having a larger and more bureaucratic program might have been easier than what I ended up going through here."

Another student, Sarah, also complained about the program's lack of cohesion:

I think that is the catch with the IPhD program: you don't really belong anywhere. It's very rewarding in its own way because you get to know more people and you feel like you're getting your doctorate in everything but you're also sometimes feeling a little split.

This feeling of being "split" was also apparent in students' recollections of their experiences in their coursework and comprehensive examinations. Jeff described his approach to preparing for the comprehensives:

I felt really scattered because I didn't know specifically what to study and I think largely that was me being nervous about it and knowing

that I am bridging these disciplines and how in-depth I want to go into it. There comes a point where you have to be realistic.

Another structural gap at LGU for such interdisciplinary work surrounds the lack of clear reward structure for faculty who engage in the IPhD program. Betsy, a faculty member, suggested, "There needs to be some incentive and I think the faculty who especially chair these committees ought to have it accounted for in their workload." She continued, "It is really hard to have an interdisciplinary committee when the people in the other disciplines feel no professional obligation to be responsible for anything. They just feel like it's not their problem and it's not their department and it's not their student."

Student Characteristics

A second factor that this study found to be determinative of student success was the characteristics of the students themselves. These include self-direction, maturity, and having "insider" knowledge. Specifically, faculty and students were explicitly asked to describe a "successful" IPhD student. Echoing conceptualizations from Gardner's (2009) study, both students and faculty discussed that a successful student in the IPhD must be self-directed; in fact, this quality was offered most often by participants. Contrasts existed in the faculty's and students' responses, however, in relation to how self-directedness is manifested. For example, faculty tended to discuss the quality of self-direction more in terms of the student being able to find a curricular and research focus in the program and be self-motivated enough to stay on course. In other words, faculty expressed that students might change their research focus after admission or might simply stall out during their programs or even disappear. Frank described a successful student as one who "develops or has developed a focus of what they want to do both personally and professionally." On the other hand, students talked about the need for self-direction as a quality that allowed students to "take charge" of the process or to be a self-advocate. One student, Marlene, remarked, "If you're not an advocate for yourself, then you will die," while Sharon quipped, "If you don't have a lot of personal discipline, it's not the right thing for you. You have to dog your committee. I think the hardest thing was getting a good committee together. It was like herding cats getting them to work together."

A second character quality that the study found essential to student success is maturity. Specifically, several faculty pointed out that students

who were mid-career would be those most likely to succeed in such a doctoral program, tying this quality to the need for self-direction. For example, John said:

Someone who is already mid-career...I think it doesn't work as well for students who are just starting out pre-service. They have a sense of structure and a sense of cadence. They usually have a little clearer focus about what they want to do and it's based on knowledge, not just, "Gee whiz, wouldn't it be nice to reinvent the theory of gravity."

Indeed, several students commented on finding this doctoral program as a way to link their professional and academic goals. One student, Linda, explained, "The number one strength would be the plasticity of the program. You can adapt it to your particular goals and objectives rather than having to go through something strict that might not be applicable."

While students also discussed the need for maturity, they spoke of it more often in regard to the experiences a student might have prior to beginning the program. Jeff shared:

If I had not had the opportunity to practice the skills as a master's student it may still be beneficial but I think I would have struggled more. It would not have been the right choice for me if I'd gone straight out of my undergrad.

The third characteristic of successful IPhD students, "insider" knowledge, was one primarily discussed by students rather than faculty. Specifically, students felt that unless one had been at LGU prior to beginning the IPhD program they would not be able to succeed. Marlene explained, "It is a good program but it is really only for insiders," while Tobias stated, "The most successful person I can think of is somebody who has already worked with a faculty member in graduate school."

When then asked the converse—which students are unsuccessful—the responses were also noteworthy. For faculty, it was both characteristics and skills that determined unsuccessful students in an IPhD program. In their opinion, unsuccessful IPhD students (a) were not good writers, (b) were indecisive, (c) underestimated the difficulty of the program, and those who (d) lacked a larger professional goal in the program. Students, however, explained that unsuccessful students were those who had "no one to care about them," such as faculty members, or those whose expectations did not live up to the reality of their experiences. In this vein, Maura explained:

I think the irony of the IPhD is that I think it often attracts anti-establishment kinds of people who think they can make their own rules when, in reality, you have to follow more of the establishment than the average person in order to succeed.

What was perhaps most fascinating about the participants' responses, however, was what was left unmentioned. Very few students and faculty mentioned the ability to utilize knowledge from multiple disciplines, the obvious purpose of the degree program and the key determinant in interdisciplinarity (Klein, 1990; Repko, 2008); indeed, only one faculty member and two students commented on this ability. The study found that only one faculty member included the ability to integrate disciplines among the qualities of a successful IPhD student. Janet stated:

What makes the student successful, I think, is the grounding in different disciplines, in the sense that they are not pulling things together in a superficial way, that they have some knowledge of how historians think, say, or how a scientist might approach a topic. I think that having a life background with multiple disciplinary interests is huge.

Whereas Justin, a student, commented, "You need to be able to synthesize. There's no sense in doing this if you can't because if you can't bring together these various disciplines then why are you doing it?" He continued, "You better be a jack-of-all-trades and a master of some of them."

Support

The third factor that the study found to be determinative is support. While faculty and students were not asked about support specifically in the interview protocol, issues relating to the requisite support for successful IPhD students nevertheless arose in each interview. The support described by both groups, however, varied greatly even at the same time that both faculty and students used similar words to describe it. All of the faculty interviewed expressed the need for support as advisors. One faculty member felt she needed support from the university to simply sustain her through a process she described as "a huge amount of work" that required a lot of "hoop jumping." Exasperated by a number of what she described as "high maintenance" students, Betsy shared:

Although the person whose committee I am chairing now is very bright and she's a hard worker, she is high maintenance. She wants me to meet a lot and she wants a lot of my time. Have you ever seen the movie *Alice Doesn't Live Here Anymore*? It's about a woman who has a lot of people to take care of and she just gets tired of taking care of them. I'm just tired of taking care of this doctoral student and I cannot wait for her to finish. It's kind of a painful process for her and it's definitely a painful process for me. I see the point of the IPhD and I think it's a good thing to have but it is hard. It's hard on the student, at least the few I've known, and it's hard on whoever is the chair of the committee.

Specifically, Betsy felt that the lack of community for these students was a big reason why so many IPhD students were "high maintenance" and required so much of her time. She explained:

The PhD takes a major amount of time and energy and motivation. It's difficult to have all that as one person. Some people get through their PhD program because there is a strong student cohort and they help each other through regardless of advisors, with the IPhD that may be a concern that folks will express: there is no cohort. Then it increasingly becomes the advisor's responsibility because people need some kind of social lifeline to the academic community. They need more than just themselves and more than just I can do.

Another faculty member, Frank, commented, "It really takes a whole academic community to raise a scholar and develop a scholar. Where that comes from, I think, is important to the student's success and that has to come from outside the student at times." While John said, "They have to figure out how to support themselves. They will not have any kind of social support or financial support except for what they get from an advisory committee and what they put together." It was perhaps not surprising, then, that the students often discussed finding support from those outside of the university, including support from family and co-workers. One student remarked:

My husband has been really supportive... I also think that my children have been there and they could have been very difficult to manage too. They kind of see that this is mom and this is my dream that I'm working on... My friends and my community and my church too.

Financial support also loomed largely in students' minds, which is not surprising given the importance of funding in doctoral student completion and success (Abedi & Benkin, 1987; Nettles & Millett, 2006). Much like the faculty, students expressed concern about seeking out and obtaining funding, particularly given their lack of affiliation with a specific program or department. In other words, while these students will choose three or more specific programmatic areas for their curricular foci, they will not be affiliated entirely with any one of these programs. In this way, students in the IPhD program must fend for themselves in regard to the funding that students in more traditional, mono-disciplinary programs will often receive as a condition of their admission, such as through teaching and research assistantships. Marlene complained, "I have had to pay for everything myself. I know funding is tight but they need to make sure that all graduate students have some support."

Faculty also felt that they required support from the graduate school to better advise the students they had. Betsy remarked, "It's hard for me to remember some of the steps in the process because you don't do it very often. I do it in the best way that I know and in the way that makes the most sense to me but I always feel kind of uncertain about whether or not other people are going to think I'm doing a bad job."

Students also discussed the need for a supportive community but in a slightly different fashion from the faculty members. Inasmuch as faculty discussed the need for community support for students, they tended to focus on such support as a way to remove this burden from themselves; students, however, keenly felt the lack of camaraderie to which they felt other students in more traditional programs tended to have access. Mark complained, "What I have missed out on—or what people have told me I missed out on—is a cohort and doing everything together. There is no one else. There is no one who is going through what I'm going through." Linda explained, "I am pretty much traveling through on my own."

Discussion

This study sought to understand faculty and student perceptions of success in an interdisciplinary doctoral program at one institution of higher education. What was made clear in the analysis of the interviews with the 10 students and four faculty members at LGU was that what success means and what facilitates or hinders it varied widely by constituency. Certainly, the qualities of a successful IPhD student that were discussed by the participants are those

qualities that would make any PhD student successful (Gardner, 2009) but it was the degree to which these qualities were discussed that differentiated them from any other PhD program. In other words, the extent to which self-direction was required to be successful in the IPhD program far exceeded the amount of self-direction in a traditional PhD program, according to the participants. At the same time, however, it is perhaps just as telling to point out how success was *not* defined by these individuals. For example, success was not typically described as the ability to synthesize disciplinary perspectives, which is a defining aspect of interdisciplinary research (Klein, 1990; Newell, 1994; Repko, 2008). Nor was success defined as the completion of the degree, often a general focus of many faculty (Gardner, 2009). Instead, according to the participants, success in this IPhD program centered around the student's ability to traverse the lack of structure and lack of support apparent in this program. This lack of support was obvious in the student's descriptions as well as those of the faculty. For students, the lack of support was evident in their comments related to their lack of peer support, their lack of institutional support, and their lack of structure. Faculty members similarly discussed this lack of support for their advising as well as the structure of the program. Therefore, a fascinating element that arose out of these interviews is that while some faculty discussed the "high maintenance" nature of working with IPhD students, it was these same faculty who felt they were not receiving enough support from the graduate school in regard to their advising and getting students through the "hoops" they felt the program required. Perhaps it is then that the nature of this unstructured doctoral program is "high maintenance" rather than the individuals involved in it.

In general, the issues raised by the students and faculty involved within this interdisciplinary PhD program related to a lack of communication between the graduate school and the faculty advisors, a lack of structure to support the program, and a lack of translational ability among the different disciplines. For example, a common obstacle to interdisciplinary research and collaboration is that of language (Amey & Brown, 2004; Golde & Gallagher, 1999; Holley, 2009c; Klein, 1990, 2010; Lattuca, 2001; Newell, 1994; Repko, 2008). In this interdisciplinary doctoral program, students and faculty expressed confusion over translating degree requirements across disciplines. In this case, the different language used within the respective disciplines was not only difficult to overcome from a scholarly or theoretical perspective but also from a programmatic and structural perspective. One illustration of this challenge is a topic often discussed by the students: the

comprehensive examination. How does one structure the comprehensive examination? When is it taken? How is it different from the qualifying examination? Who contributes? What is the content? What is its purpose? The answers to these questions vary greatly by disciplinary culture (Walker et al., 2008). In this way, whose job is it to translate program requirements and structures between and among disciplines? Does the responsibility fall on the student, the advisor, or the Graduate School, or all of the above?

Related, it was fascinating to see the extent to which students in this program looked to those external to the program and institution for support, including their families, partners, and co-workers. Other researchers have generally found that the role the peer plays in the doctoral socialization experience to be equally vital to that of the faculty and advisor (Gardner, 2007; Grant-Vallone & Ensher, 2000; Sweitzer, 2009; Weidman et al., 2001). In this IPhD program, however, students had no peer networks upon which to rely, a finding echoed in studies of structured interdisciplinary doctoral programs (Holley, 2006, 2009b). As a result, the faculty described an almost total dependence on the advisor as the norm, which they found frustrating. While certainly reliance on a faculty advisor is part of the doctoral experience (Weidman et al., 2001), the faculty members in this study felt the students' over-reliance on them in the IPhD program was uncharacteristic of other doctoral programs. Without a supportive network of peers found in courses, in offices, and other common venues, students in this study are not receiving the full benefit of an intellectual community that doctoral education is meant to foster (Walker et al., 2008).

The issues discussed by the faculty and students involved in the IPhD program also bring to light other concerns and questions. Importantly, the question arises related to the socialization these students receive. As socialization is a key outcome of the doctoral education experience (Austin, 2002; Baird, 1992; Bragg, 1976), and socialization is often a product of social and academic integration with faculty and peers (Weidman et al., 2001), one is left to wonder how students in this IPhD program become socialized. Socialization in structured interdisciplinary doctoral programs, such as neuroscience, occurs through the pre-determined components of these programs (Holley, 2006), such as a common set of coursework and examination experiences. But one wonders what becomes of the student in an unstructured program, such as this IPhD program. As Golde (1998) pointed out, socialization at the graduate level is a dual process: students are socialized to what it means to be both a graduate student but also a professional in their chosen field. Without regular interactions with an intellectual community of peers and faculty, as well as without a structured

curriculum that provides a cultural connection to a field, the students in this program may be required to fend for themselves for their socialization as students and their socialization to a future profession. Perhaps, it is for this reason that many of the faculty members interviewed suggested that this IPhD program is best suited for those who are already mid-career, those who are older, and those who live away from campus. At the same time, these concerns raise a cautionary flag to students who might not understand the requirements for success and socialization in such a program. First-generation students, for example, discussed their inability to understand the structure and curricula required to be successful in such a program. Given the lack of guidance to faculty advisors by LGU as well as the lack of a reward system for faculty involvement in the IPhD program, students may indeed be left to fend for themselves in this process.

Age is another variable at play in these findings and merits some discussion. In this study, both faculty and students commented about the role of “maturity” and “age” as a role in student success. While others have not found significant differences in doctoral completion rates in relation to age (except in engineering, see Nettles & Millett, 2006), the age of students in doctoral programs can be an issue of concern as it relates to competition for academic positions upon graduation (Jaschik, 2010). Moreover, students who perceive themselves to be older than their doctoral peers can also experience feelings of disconnect (Gardner, 2008a). In this study, however, it was the students who were older that were found to be more successful. Given the mean age of over 41 years of current IPhD students, perhaps this maturity is not so much a defining characteristic of a successful student but rather a normative state for all those who seek to enter the program.

In addition, it was evident that a great amount of ambiguity exists in this IPhD program. Certainly, some level of ambiguity is normal and part and parcel of doctoral education (Gardner, 2007), but one must ask how much ambiguity is too much ambiguity, and how this ambiguity impedes the socialization process and the proposed outcomes of the program. Indeed, the structure to support socialization is typically provided through a disciplinary culture and its corresponding values and norms (Golde, 2005). Without a disciplinary (or interdisciplinary) home and culture students and faculty involved in this IPhD program have been left to find their own way. And, while students and faculty alike in this program lauded the flexibility that the IPhD program offers, it is uncertain what the resulting outcomes post-graduation may be. It leaves one to wonder if flexibility in this program has overshadowed its purpose. Despite these issues, it is noteworthy that

the IPhD program experiences a 62% completion rate. Perhaps it is the resilience and characteristics of the students who enter the program rather than the program itself that have created a pathway to “success.”

Implications for Interdisciplinarity

Multiple implications exist not only for those who administer the program at LGU, but also for those students, faculty, and administrators in other self-designed interdisciplinary programs such as these. Specifically, in this time of increased budgetary restrictions and resulting program cuts in higher education, self-designed interdisciplinary programs, such as that at LGU, may be particularly attractive. Institutions of higher education may consider implementing such programs as a way to fill a looming gap in their programmatic emphases or to open their doors to a wider array of students. The implications below, while stemming from the study of LGU’s IPhD program, are therefore instructive to any other institutions with similar programs or those considering creating them.

First, LGU’s Graduate School must work toward a more comprehensive and coherent structure for administering their IPhD program. While the “freedom and flexibility” of the program were lauded by faculty and students alike, these same individuals nevertheless desired more structure to guide them through the process. Devising a handbook for students and advisors may be very helpful in this regard. This handbook could be designed by current students and faculty to allow for a comprehensive view of the issues and obstacles faced by these individuals. This handbook should be disseminated online but also at an orientation session for those entering the program as students and for faculty members serving on committees. Such an orientation session would allow for initial community building but would also allow for some clarity in the process.

Second, a support structure must be put in place for faculty and students involved in the IPhD program. Instituting at least a required one-credit course for all IPhD students on interdisciplinarity or a “pro-seminar” format would provide students a home base and a cohort of students with which to interact. Such a course would allow for frank conversations about the challenges involved in such doctoral work and assist students in thinking through the obstacles that lie before them. Moreover, a course such as this would allow for a purposeful addition of interdisciplinary thinking, conceptualization, and cohesion, as such an element is currently missing in the program. Similarly, providing some online venues for students to

interact with peers might be invaluable in this regard. Advanced students could also be assigned an incoming student mentee, thereby providing peer support. Faculty should also be provided with support for their work in the IPhD program, including a university-wide policy that would include IPhD advising in part of the tenure-promotion and review process. Faculty might also benefit from their own peer support groups, including a semi-annual luncheon sponsored by the Graduate School to allow for faculty advisors to interact and discuss common issues.

Third, the Graduate School should also sponsor regular workshops for IPhD students on topics such as interdisciplinary research, networking, or the job search. Interdisciplinary doctoral students have needs specific to their experience (Golde & Gallagher, 1999; Holley, 2006; Manathunga, Lant, & Mellick, 2006) and since they are not provided a disciplinary “home” or department, per se, providing opportunities for community and socialization are vital to long-term success.

Next, while both students and faculty alike discussed the lack of social and programmatic support for IPhD students, very little discussion surrounded the lack of support for the intellectual components of the program. Given the fact that LGU’s Graduate School currently oversees the administrative and structural components of the program, there is currently no intellectual oversight of the program or its intended outcomes or goals. LGU should engage in some overarching discussion of the outcomes and goals of the IPhD program as well as a comprehensive plan for assessment and evaluation of the program.

Finally, both students and faculty alike should be explicitly informed about the expectations for involvement in the IPhD program. Calls for more explicit guidelines are prevalent throughout the doctoral education literature as of late (Council of Graduate Schools, 2004; Lovitts, 2007; Walker et al., 2008); it is no different for students in interdisciplinary programs. In fact, given the more loosely structured nature of interdisciplinary programs, such as this one, clear expectations are even more vital to student success. Again, a handbook, orientation, and a mentoring program might be helpful in this regard. In the same vein, more research and focus must be placed on assessment in graduate education in order to better align expectations with outcomes (Boix Mansilla & Duraising, 2007; Haworth, 1996).

Future studies must continue to explore how program structure and oversight influence the doctoral socialization experience and doctoral student success in other interdisciplinary programs. In addition, future research should explore how institutional culture influences such programs

and their outcomes. Given the randomized nature of sampling in this study, future studies should also explore how particular disciplinary combinations may influence the doctoral experience as well as the experiences of faculty members in these programs. Similarly, future researchers could explore how individual differences, such as age, gender, race, or socioeconomic status, influence the experience of doctoral students in interdisciplinary programs such as these. Taken together, a greater understanding of students’ experiences in interdisciplinary programs will work toward ensuring success for them, their faculty members, and their institutions.

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References

- Abedi, J., & Benkin, E. (1987). The effects of students’ academic, financial, and demographic variables on time to the doctorate. *Research in Higher Education, 27*(1), 3-14.
- Amey, M.J., & Brown, D.F. (2004). *Breaking out of the box: Interdisciplinary collaboration and faculty work*. Greenwich, CT: Information Age.
- Association for Integrative Studies. (2008). Directory of IDS doctoral programs. Retrieved December 8, 2009, from http://www.units.muohio.edu/aisorg/Resources/doctoral_programs.shtml
- Austin, A.E. (2002). Preparing the next generation of faculty: Graduate school as socialization to the academic career. *The Journal of Higher Education, 73*, 94-121.
- Baird, L.L. (1972). The relation of graduate students’ role relations to their stage of academic career, employment, and academic success. *Organizational Behavior and Human Performance, 7*, 428-441.
- Baird, L.L. (1992). *The stages of the doctoral career: Socialization and its consequences*. Paper presented at the American Educational Research Association, San Francisco.
- Bargar, R.R., & Duncan, J.K. (1982). Cultivating creative endeavor in doctoral research. *The Journal of Higher Education, 53*, 1-31.
- Bargar, R.R., & Mayo-Chamberlain, J. (1983). Advisor and advisee issues in doctoral education. *The Journal of Higher Education, 54*, 407-432.
- Barnes, B.J. (2005). *Success in graduate school: How exemplary advisors guide their doctoral advisees*. Doctoral dissertation. Michigan State University, East Lansing, MI.

- Barnes, B.J., & Austin, A.E. (2009). The role of doctoral advisors: A look at advising from the advisor's perspective. *Innovative Higher Education*, 33, 297-315.
- Becher, T., & Trowler, P.R. (2001). *Academic tribes and territories* (2nd ed.). Philadelphia, PA: Open University Press.
- Becker, H.S., Geer, B., Hughes, E.C., & Strauss, A.L. (1961). *Boys in white: Student culture in medical school*. Chicago: The University of Chicago Press.
- Bogdan, R.C., & Biklen, S.K. (2003). *Qualitative research for education: An introduction to theories and methods*. Boston: Allyn & Bacon.
- Boix Mansilla, V., & Duraising, E.D. (2007). Targeted assessment of students' interdisciplinary work: An empirically grounded framework proposed. *Journal of Higher Education*, 78, 215-237.
- Borrego, M., & Cutler, S. (2009). *Curriculum design for interdisciplinary graduate engineering and science education: An analysis of successful IGERT proposals*. Blacksburg, VA: Virginia Polytechnic University.
- Borrego, M., & Cutler, S. (2010). Constructive alignment of interdisciplinary graduate curriculum in engineering and science: An analysis of successful IGERT proposals. *Journal of Engineering Education*, 99, 355-369.
- Borrego, M., & Newswander, L.K. (2010). Definitions of interdisciplinary research: Toward graduate-level interdisciplinary learning outcomes. *The Review of Higher Education*, 34, 61-84.
- Bragg, A.K. (1976). *The socialization process in higher education*. ERIC/Higher Education Research Report No. 7. Washington, DC: American Association of Higher Education.
- Burton, N.W., & Wang, M. (2005). *Predicting long-term success in graduate school: A collaborative validity study*. Princeton, NJ: Educational Testing Service.
- Carney, J., Chawla, D., Wiley, A., & Young, D. (2006). *Evaluation of the initial impacts of the National Science Foundation's Integrative Graduate Education and Research Traineeship program*. Arlington, VA: National Science Foundation.
- Clark, B.R. (1987). *The academic life: Small worlds, different worlds*. Princeton, NJ: Carnegie Foundation.
- Clark, S.M., & Corcoran, M. (1986). Perspectives on the professional socialization of women faculty: A case of accumulative disadvantage? *The Journal of Higher Education*, 57, 20-43.
- Cook, M.M., & Swanson, A. (1978). The interaction of student and program variables for the purpose of developing a model for predicting graduation from graduate programs over a 10-year period. *Research in Higher Education*, 8, 83-91.
- Council of Graduate Schools. (2004). *Ph.D. completion and attrition: Policy, numbers, leadership, and next steps*. Washington, DC: Council of Graduate Schools.
- Council of Graduate Schools. (2005). *The doctor of philosophy degree: A policy statement*. Washington, DC: Council of Graduate Schools.
- Council of Graduate Schools. (2008). *Ph.D. completion and attrition: Analysis of*

- baseline program data from the Ph.D. completion project*. Washington, DC: Author.
- Creamer, E.G. (2005). Insight from multiple disciplinary angles: A case study of an interdisciplinary research team. *New Directions for Teaching and Learning*, 102, 37-44.
- Daugherty, J.Y. (1999). *Integration or marginality?: The socialization of graduate students*. Doctoral dissertation, University of Illinois at Urbana-Champaign.
- Delamont, S., Atkinson, P., & Parry, O. (2000). *The doctoral experience: Success and failure in graduate school*. London: Falmer Press.
- Drezek, K.M., Olsen, D., & Borrego, M. (2008). *Crossing disciplinary borders: A new approach to preparing students for interdisciplinary research*. Paper presented at the ASEE/ISEE Frontiers in Education Conference, Saratoga Springs, NY.
- Egan, J.M. (1989). Graduate school and the self: A theoretical view of some negative effects of professional socialization. *Teaching Sociology*, 17, 200-208.
- Ellis, E.M. (2001). The impact of race and gender on graduate school socialization, satisfaction with doctoral study, and commitment to degree completion. *The Western Journal of Black Studies*, 25, 30-45.
- Gallagher, K.S. (1986). *Personal and organizational factors affecting faculty productivity: The socialization process in graduate school*. Paper presented at the Association for the Study of Higher Education, San Antonio, TX.
- Gardner, S.K. (2007). "I heard it through the grapevine": Doctoral student socialization in chemistry and history. *Higher Education*, 54, 723-740.
- Gardner, S.K. (2008a). Fitting the mold of graduate school. *Innovative Higher Education*, 33, 125-138.
- Gardner, S.K. (2008b). "What's too much and what's too little?": The process of becoming an independent researcher in doctoral education. *The Journal of Higher Education*, 79, 326-350.
- Gardner, S.K. (2009). Conceptualizing success in doctoral education: Perspectives of faculty in seven disciplines. *Review of Higher Education*, 32, 383-406.
- Gardner, S.K., Hayes, M.T., & Neider, X. (2007). The dispositions and skills of a Ph.D. in education: Perspectives of faculty and graduate students in one college of education. *Innovative Higher Education*, 31(5), 287-299.
- Girves, J.E., & Wemmerus, V. (1988). Developing models of graduate student degree progress. *Journal of Higher Education*, 59, 163-189.
- Glaser, B. (1978). *Theoretical sensitivity: Advances in the methodology of grounded theory*. Mill Valley, CA: Sociology Press.
- Golde, C.M. (1998). Beginning graduate school: Explaining first-year doctoral attrition. In M.S. Anderson (Ed.), *The experience of being in graduate school: An exploration* (pp. 55-64). San Francisco: Jossey-Bass.
- Golde, C.M. (2005). The role of the department and discipline in doctoral student attrition: Lessons from four departments. *Journal of Higher Education*, 76, 669-700.

- Golde, C.M., & Gallagher, H.A. (1999). The challenges of conducting interdisciplinary research in traditional doctoral programs. *Ecosystems*, 2, 281-285.
- Gonzalez, J.C. (2006). Academic socialization experiences of Latina doctoral students: A qualitative understanding of support systems that aid and challenges that hinder the process. *Journal of Hispanic Higher Education*, 5, 347-365.
- Grant-Vallone, E.J., & Ensher, E.A. (2000). Effects of peer mentoring on types of mentor support, program satisfaction and graduate student stress: A dyadic perspective. *Journal of College Student Development*, 41, 637-642.
- Haworth, J.G. (Ed.). (1996). *Assessing graduate and professional education: Current realities, future prospects*. San Francisco: Jossey-Bass.
- Holley, K. (2006). *The cultural construction of interdisciplinary neuroscience program*. Doctoral dissertation. University of Southern California, Los Angeles.
- Holley, K. (2009a). The challenge of an interdisciplinary curriculum: A cultural analysis of a doctoral-degree program in neuroscience. *Higher Education*, 58, 241-255.
- Holley, K. (2009b). Student experiences in PhD programs: How to do interdisciplinarity at doctoral level. *Association for Integrative Studies Newsletter*, 31(3), 1-2.
- Holley, K. (2009c). *Understanding interdisciplinary challenges and opportunities in higher education*. San Francisco: Jossey-Bass.
- Jaschik, S. (2010, April 29). An agenda for graduate education, *Inside Higher Ed*.
- Kates, R.W., Clark, W.C., Corell, R., Hall, J.M., Jaeger, C.C., Lowe, I., et al. (2001). Sustainability science. *Science*, 292, 641-642.
- Klein, J.T. (1990). *Interdisciplinarity: History, theory, and practice*. Detroit, MI: Wayne State University.
- Klein, J. T. (2010). *Creating interdisciplinary campus cultures*. San Francisco: Jossey-Bass.
- Kuh, G.D., & Whitt, E.J. (1988). *The invisible tapestry: Culture in American colleges and universities*. ASHE-ERIC Higher Education Report, No. 1. Washington, D.C.: Association for the Study of Higher Education.
- Lannholm, G.V., & Schrader, W.B. (1951). Predicting graduate school success: An evaluation of the effectiveness of the Graduate Record Examinations. Princeton, NJ: Educational Testing Service.
- Lattuca, L.R. (2001). *Creating interdisciplinarity: Interdisciplinary research and teaching among college and university faculty*. Nashville, TN: Vanderbilt University Press.
- Lovitts, B.E. (2001). *Leaving the ivory tower: The causes and consequences of departure from doctoral study*. Lanham, MD: Rowman & Littlefield.
- Lovitts, B.E. (2005). Being a good course-taker is not enough: A theoretical perspective on the transition to independent research. *Studies in Higher Education*, 30, 137-154.

- Lovitts, B.E. (2007). *Making the implicit explicit: Creating performance expectations for the dissertation*. Sterling, VA: Stylus.
- Lovitts, B.E. (2008). The transition to independent research: Who makes it, who doesn't, and why. *The Journal of Higher Education*, 79, 296-325.
- Manathunga, C., Lant, P., & Mellick, G. (2006). Imagining an interdisciplinary doctoral pedagogy. *Teaching in Higher Education*, 11, 365-379.
- Margolis, E., & Romero, M. (1998). "The department is very male, very white, very old, and very conservative": The functioning of the hidden curriculum in graduate sociology departments. *Harvard Educational Review*, 68, 1-32.
- Marquette University. (2009). Interdisciplinary Ph.D. guidelines. Retrieved December 8, 2009, from http://www.marquette.edu/grad/programs_interdis.shtml
- Maxwell, J.A. (1996). *Qualitative research design: An interactive approach*. Thousand Oaks, CA: SAGE.
- Merton, R.K. (1957). *Social theory and social structure*. New York: The Free Press.
- Metz, M.H. (2001). Intellectual border crossing in graduate education: A report from the field. *Educational Researcher*, 30(5), 12-18.
- National Science Foundation. (2009). Interdisciplinary research. Retrieved December 8, 2009, from http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503439&org=NSF&sel_org=NSF&from=fund
- Nettles, M.T. (1990). Success in doctoral programs: Experiences of minority and white students. *American Journal of Education*, 98, 494-522.
- Nettles, M.T., & Millett, C.M. (2006). *Three magic letters: Getting to Ph.D.* Baltimore: The Johns Hopkins University Press.
- Newell, W.H. (1994). Designing interdisciplinary courses. In J.T. Klein & W.G. Doty (Eds.), *Interdisciplinary studies today* (pp. 35-51). San Francisco: Jossey-Bass.
- Newswander, L.K., & Borrego, M. (2009). Engagement in two interdisciplinary graduate programs. *Higher Education*, 58, 551-562.
- Repko, A.F. (2008). *Interdisciplinary research: Process and theory*. Thousand Oaks, CA: SAGE.
- Rosen, B.C., & Bates, A.P. (1967). The structure of socialization in graduate school. *Sociological Inquiry*, 37, 71-84.
- Schroeder, D.S., & Mynatt, C.R. (1993). Female graduate students' perceptions of their interactions with male and female major professors. *The Journal of Higher Education*, 64, 555-573.
- Seidman, I. (2006). *Interviewing as qualitative research: A guide for researchers in education and the social sciences* (3rd ed.). New York: Teachers College Press.
- Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (2nd ed.). Thousand Oaks, CA: SAGE.
- Strober, M.H. (n.d.). Habits of the mind: Challenges for multidisciplinary engagement. Retrieved March 18, 2010, from <http://www.stanford.edu/~myras/challenges.pdf>

- Sweitzer, V. (2009). Towards a theory of doctoral student professional identity development: A developmental networks approach. *The Journal of Higher Education, 80*, 1-33.
- Tierney, W.G., & Rhoads, R.A. (1994). *Enhancing promotion, tenure and beyond: Faculty socialization as a cultural process*. Washington, DC: George Washington University.
- Turner, C.S.V., & Thompson, J.R. (1993). Socializing women doctoral students: Minority and majority experiences. *The Review of Higher Education, 16*, 355-370.
- U.S. News and World Report. (2009). National Universities. Retrieved January 4, 2010, from <http://colleges.usnews.rankingsandreviews.com/best-colleges/national-universities>
- Van Maanen, J. (1984). Doing new things in old ways: The chains of socialization. In J.L. Bess (Ed.), *College and university organization: Insights from the behavioral sciences* (pp. 211-247). New York: New York University Press.
- Walker, G.E., Golde, C.M., Jones, L., Conklin Bueschel, A., & Hutchings, P. (2008). *The formation of scholars: Rethinking doctoral education for the twenty-first century*. San Francisco: Jossey-Bass.
- Weidman, J.C., Twale, D.J., & Stein, E.L. (2001). *Socialization of graduate and professional students in higher education: A perilous passage?* San Francisco: Jossey-Bass.
- Zhao, C.-M., Golde, C.M., & McCormick, A.C. (2007). More than a signature: How advisor choice and advisor behaviour affect doctoral student satisfaction. *Journal of Further and Higher Education, 31*, 263-281.

Appendix A

Student Interview Protocol

1. Tell me a little bit about yourself.
2. How did you come to be a graduate student here?
3. Tell me about the admission process here. How did that go?
4. Talk to me about starting the program. What was that like?
5. When you were beginning, who or what was most helpful to you?
6. Did you receive any sort of orientation when you began your program? What are your thoughts about this?
7. Now that you've been through the process of entering the program, what suggestions would you give your department?
8. Tell me about your interaction with the faculty thus far.
9. How about your interaction with other graduate students/peers?
10. What are your thoughts about your coursework at this point?
11. Thinking about the interactions between faculty, students, and staff you have witnessed so far in the department, what things stick out in your mind?
12. What about the overall university? How do you feel about your interactions with the Graduate School so far? Any other areas of LGU that have made an impression?
13. Talk to me about your advisor and how you came to be with him or her.
14. How often do you meet with your advisor?
15. If you could give advice about advisors to a new graduate student, what would you say?
16. Tell me about your preliminary or comprehensive exam process (if applicable).
17. Tell me about how you came to choose your dissertation topic (if applicable).
18. How far are you in your dissertation research?
19. What is your biggest fear or worry regarding your dissertation/research?
20. If you could give advice to a graduate student beginning the dissertation process in this department, what would you say?
21. Have you begun the job search process yet? If so, tell me your thoughts about it and the department's or institution's role in it.

22. What things do you need to worry about getting done right now? Do you feel like you are prepared to do them?
23. What comes next for you? What are the next steps? How do you feel about those next steps?
24. Thinking over your entire program, who or what has been most helpful to you?
25. In your opinion, what makes up a successful student in this program?
26. On the flip side, have you heard about any students who have left the program? What is your understanding about this?
27. If you could give advice to a new graduate student entering the program next semester, what advice would you give?
28. So, thinking through your entire experience, how have your expectations of graduate school matched up to its reality? Is it everything you expected? What has surprised you?
29. Is there anything else you would like to add?
30. Do you have any other questions or comments?
31. Thank you so much for your time and participation in my study. If you ever have any questions, concerns, or comments, feel free to contact me.

Appendix B

Faculty Interview Protocol

1. Tell me a little bit about yourself—your background, how you came to academe, how you became a faculty member.
2. In what ways do you work with doctoral students in the program?
3. How would you describe a “successful” doctoral student in this department?
4. So, what exactly do you see as the issue or problem for students who did not complete the program? What made them “unsuccessful”?
5. In what ways do you assist graduate students in being successful?
6. In your opinion, what else could be done to assist graduate students that isn’t already being done?
7. If you had to summarize the ways that you and the program “socialize” doctoral students, how would you describe this process?
8. Do you have anything else to add about your impressions of graduate students in your department?