

Joint Appointments and the Professoriate: Two Houses but no Home?

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Abstract Interdisciplinary work within higher education has increased significantly over past decades (Amey 2004; Creamer and Lattuca 2005). However, the professional implications of interdisciplinary research and instruction for the faculty members who engage in such academic work remain unclear. This study of science educators who hold appointments in two academic departments begins to address this empirical gap. The outcomes provide insight into the factors that influence the professional lives of these faculty members. The knowledge gained from the study will provide mentors, colleagues, and administrators insight into the challenges facing academics undertaking this work. Further, this research seeks to inform policy makers in regard to how tenure and promotion is determined for jointly appointed faculty in science education and other interdisciplinary fields.

Key words joint appointments · interdisciplinarity · science education faculty

Interdisciplinary work within higher education has increased significantly over past decades (Amey 2004; Creamer and Lattuca 2005). However, the professional implications of interdisciplinary research and instruction for the faculty members who engage in such academic work remain unclear. We are particularly interested in the tensions faced by faculty members who seek to advance their scholarship and careers while negotiating

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professional uncertainties and differing agendas with colleagues from various academic units who may not understand or value the work of interdisciplinarity. For instance, the National Academy of Sciences (2004) indicated that faculty members engaged in interdisciplinary academic work are often expected to do equal work in both their home departments and those departments associated with interdisciplinary activities. This “double duty” requires these faculty members to negotiate the varying and possibly competing demands of otherwise distinct departments.

In this study we considered the tensions of interdisciplinary work through an exploration of faculty members who are jointly appointed in education and science. Through this exploration we draw specific insights into the implications of joint appointments for science educators and suggest broader implications of such appointment types on the professoriate in general. We make a subtle distinction between interdisciplinary research and joint appointments. This distinction suggests faculty in any field may do interdisciplinary work that spans and shares the discourse of more than one academic discipline. Joint appointments, however, represent formalized, interdisciplinary arrangements that provide an empirical platform on which to explore the tensions associated with interdisciplinary academic work. Because so little is known about faculty with joint appointments, we relied on the related research addressing interdisciplinary scholarship to frame our study. Further, just as Boyer (1990) did, we expanded the interdisciplinary concept beyond research to include instructional and service activities.

Related Literature and Conceptual Framework

Lattuca’s work (2001, 2003) introduced the centrality of interdisciplinarity in academe and the importance of empirical scholarship related to this issue. In doing so, Lattuca defined interdisciplinarity in a broad context that considered faculty experiences from a variety of institutional types and areas of teaching and research. Also, Lattuca indicated interdisciplinary faculty members bridge more than one discipline in their academic work; and, as they pose questions, they find answers either in the gaps or intersections between the disciplines. In other words, the value of academic work that is interdisciplinary is found in the connections made between otherwise disconnected principles and fundamentals. Funding agencies, such as the National Science Foundation, have intentionally sought out proposals to create centers and programs that focus on interdisciplinary work, further supporting the centrality of this type of scholarship (Lattuca 2001). Yet, as Lattuca (2001) found, “[t]here is still a striking absence of empirical work that examines interdisciplinarity *across* academic contexts (p. 19, emphasis in original).” Our study helps address this empirical gap.

Faculty members who engage in interdisciplinary research activities require an academic environment that is resourceful, supportive, and collaborative (National Academy of Sciences 2004). In Lattuca’s 2003 study, professors engaged in interdisciplinary work reported an overall sense of lacking a collegial home and, consequently, an overall reduction of morale and confidence. This lack of confidence was reinforced by academic policies, both institutionally and within the norms of faculty work more broadly, which differentiated interdisciplinary scholarship from scholarship rooted in discipline-specific discovery (Boyer 1990; Lattuca 2001).

Research has shown that distinct, discipline-based, academic cultures strongly influence the professional lives of faculty members (Bailey 1977; Becher 1989, 1994; Biglan 1973; Clark 1970; Mars 2007; Ylijoki 2000). More specifically, Bailey and Becher described individual disciplines as *academic tribes* that subscribe to unique sets of norms and values directly linked to fields of study and scholarly agendas and practices. Interdisciplinary faculty

members and, in particular, those who hold joint appointments are often forced to negotiate their professional position between “two tribes” with different cultures. Therefore, interdisciplinary scholars who occupy roles that are inherently structured around two (or more) professional sets of norms and values face uncertainties that emerge at the intersections of otherwise disconnected academic cultures. These uncertainties sometimes act as disincentives to academics who might otherwise engage in interdisciplinary work. For example, Boardman and Ponomariov (2007) reported that tenure-seeking assistant professors are highly reluctant to engage in interdisciplinary research collaboration. Similarly, Tobin (2007) argued that lack of clarity about the tenure and promotion process in the field of science education is highly common. Indeed, faculty members at all levels may be concerned that interdisciplinary work will result in feelings of detachment from the more distinct and traditional disciplinary communities within which they have been professionally socialized.

Professional prestige and legitimacy are significant forces that shape the professional lives of faculty members. In researching the importance of accumulated social and human capital (e.g., the senior faculty) to academic departments, Burris (2004) highlighted the value of prestige and legitimacy to fields of study within colleges and universities. Further, Merton (1973) argued that the legitimacy and quality of academic fields of study are determined by universally accepted criteria. Other research has demonstrated the positive correlation between faculty productivity and the degree of recognition a department receives within its institution and, more broadly, within its discipline-specific professional community (Lattuca 2001, 2003). In regard to the present study, the degree to which jointly appointed science education faculty contribute to the prestige and legitimacy of either the colleges of science or education is not well understood. However, this ambiguity has been identified as a deterrent to professors interested in engaging in interdisciplinary fields (Boardman and Ponomariov 2007; Kuratko 2005; Mars 2007; Tobin 2007). For example, entrepreneurship education programs, an expanding interdisciplinary field of study, have struggled to recruit and retain highly qualified faculty members partially due to disciplinary ambiguities and associated risks (Kuratko 2005; Mars 2007).

The bodies of literature specific to interdisciplinarity, academic culture, and prestige and legitimacy framed our conceptual approach and our focus on the identification and understanding of the professional challenges faced by those faculty members with joint appointments in science education. Specifically, we asked the following research questions.

- How are joint appointments in the field of science education generally structured? What are the emergent implications of such structures on the professional activities of the faculty members holding such appointments?
- How are jointly appointed faculty members in science education professionally socialized? How do this socialization and related experiences influence the professional satisfaction of these faculty members?
- How does holding a joint appointment influence the professional identity of faculty members in science education?

Methods of the Study

Disciplinary Selection

Based on the established position of science education as a field and our assumption that joint appointments in this field are not uncommon, we identified science education to be a

suitable interdisciplinary field to anchor our study. We drew on data from faculty members who were both tenure-seeking and tenured and worked in both large research-intensive institutions and more regional, instructionally focused colleges and universities. This sampling allowed us to examine a variety of perspectives.

As previously mentioned, science education is an established field of study, with formalized degree programs at both the undergraduate and graduate levels. Professional associations specific to postsecondary science education have been established and sustained, which is one measure of a formalized profession (Wilensky 1964). The field has at least two well-established professional associations: the Association for Science Teacher Education (ASTE) and the National Association for Research in Science Teaching (NARST). Also, there is a recognized body of scholarship specific to science education with no less than 25 peer reviewed journals including such titles as *The Journal of Science Teacher Education*, *The Journal of Research in Science Education*, and *Research in Science Education*. As such, these characteristics of a profession demonstrate the credibility of science education as a field worthy of exploration for the purposes of our study.

Sampling and Data Collection

Our study occurred in two phases, both of which had been approved by our Institutional Review Board. First, we administered an on-line survey. Second, we conducted semi-structured interviews. Details for the data gathering processes are provided following our description of the sample. We solicited survey participants through invitations to persons who had attended a forum on joint appointments at the 2006 ASTE conference, and we sent e-mail announcements over the faculty listserv for both ASTE and NARST. Forty participants completed our survey. The survey was descriptive in nature and provided us with useful background data about the characteristics of this group of faculty members. We implemented the survey using a convenience sampling method, which, according to Schonlau, Fricker, and Elliott (2001), allows for developing initial arguments for understanding the specifics about underdeveloped areas. Further, convenience sampling is a purposeful and efficient means of gathering valuable exploratory data (Merriam 1998). While we were unable to determine the exact number of jointly appointed science educators in the U.S., despite queries to ASTE and NARST, our interview participants estimated between 100 to 150 such faculty may hold tenured or tenure-track joint appointments in science education. We also learned from interview participants, who represented 12 campuses, that there was an average of 2.75 jointly appointed science educators on each of their campuses—with the range of such appointments numbering between one and eight.

In the second data gathering phase of the study, semi-structured interviews were used to gather *thick description* (Geertz 1973) about faculty members holding joint appointments in science education. To identify interviewees, we asked each person who completed our survey to participate in a follow up qualitative interview. The majority of interviews were conducted at the 2006 ASTE national meeting. Participants who were interested in being interviewed but were unable to attend the national meeting were interviewed via telephone. We also asked interviewees for names and contact information for other potential participants (i.e., snowball sampling). Through our participant selection, faculty members who work at a variety of institution types and hold a variety of academic ranks agreed to an interview. In total, 16 faculty members, from 12 different institutions, participated in this portion of our study. The interviews allowed us to analyze the experiences and retell the stories of how participants understood their professional lives as jointly appointed academics. Specifically, we asked participants to reflect on why they chose to pursue a

joint appointment, what prepared them for their current position, and what challenges and benefits exist in the positions they hold.

Data Analysis

The survey data were analyzed using appropriate descriptive statistical methods; specifically we conducted frequency distributions and percentages for the reported data. For the qualitative data analysis, open, axial, and selective coding were used to discover emerging themes (Strauss and Corbin 1990). Field notes taken during the interviews facilitated the development of the categories and concepts through open coding. From the initial codes, the data were analyzed through axial coding, where subcategories began to form. Finally, the researchers used selective coding to refine the codes to make meaning out of the convergence and divergence of the emergent themes. Integration of a constant-comparative approach (Glaser and Strauss 1967) and independent data analysis supported the notion of trustworthiness (Lincoln and Guba 1985). Lastly, findings from the survey of phase one were triangulated with the qualitative findings to strengthen the dependability and trustworthiness of the findings. Our study is exploratory, and neither of the methodological approaches used are intended to be generalizable. However, by enhancing the trustworthiness and dependability through triangulation and the use of independent coders to develop themes, we hope readers will find our conclusions transferable to other interdisciplinary and jointly appointed contexts and experiences. Next, we present the descriptive data and the salient themes emerging from our qualitative data along with a discussion of our findings in the context of each of our research questions.

Findings and Discussion

Professional Structures and Implications of Faculty Joint Appointments

Our first set of research questions was (a) how joint appointments in the field of science education are structured and (b) what the emergent implications of such structures are for the professional activities of the faculty members holding such appointments. The descriptive data gathered through the survey provided us with insight into the professional and disciplinary activities of faculty members with joint appointments in science and education. The 40 survey respondents were relatively heterogeneous with two exceptions—race/ethnicity and tenure/non-tenured status; 39 of the 40 respondents identified as Caucasian/non-Hispanic, and 37 of the 40 respondents indicated a status of tenure or tenure-eligible. More than half (62.5%) of the respondents worked at doctoral-granting institutions. Upon further investigation of institutional type, we found a slight majority (57%) of the respondents worked at state regional institutions. Table I provides a comprehensive overview of the demographic and characteristic data of the survey sample. The interview demographics, a subset of the survey data, are also provided.

From our survey data, 8 respondents indicated their appointments were split 50/50 between education and science. The remaining 32 respondents reported a variety of breakdowns in their appointment status that included the following ratios: 95:5, 75:25, 66:33, 60:40, and 51:49. However, when disaggregating either the survey data or analyzing the variation in the interview data, the appointment percentages did not translate into dramatically different work life experiences among our participants, except as it related to expectations for promotion and tenure. This is to say that the way appointments were split

Table I Participant Demographics

Survey sample (<i>n</i> =40)					
Gender	Female: 21	Male: 19			
Race/ethnicity	Caucasian, Non-Hispanic: 39	African American/Black: 1			
Tenure/tenure track status	Yes: 37	No: 3			
Rank	Assistant: 12	Associate: 14	Professor: 11	N/A: 3	
Doctoral degree	Yes: 39	No: 1			
Institutional classification	Doctoral granting: 25	Master's college or university: 15			
Joint appointment structure	Primary education: 21	Primary science: 7	50/50 Split: 8	Other: 4	
Interview sample (<i>n</i> =16)					
Gender	Female: 11	Male: 5			
Race/ethnicity	Caucasian, Non-Hispanic: 16	African American/Black: 0			
Tenure/tenure track status	Yes: 16	No: 0			
Rank	Assistant: 9	Associate: 5	Professor: 2	N/A: 0	
Doctoral degree	Yes: 16	No: 0			
Institutional classification	Doctoral granting: 11	Master's College or University: 5			
Joint appointment structure	Primary education: 7	Primary Science: 7	50/50 Split: 2	Other: 0	

did not significantly influence how these jointly appointed faculty members engaged in their daily professional lives beyond the very important aspects associated with preparing for tenure and promotion.

The professional interests of the science educators were categorized as follows: (a) immediate professional goals following graduate school, (b) the topic of doctoral dissertation (if applicable), and (c) professional organization membership. The results were mixed. Only 37.5 % of the respondents reported a science education faculty position as an immediate goal following graduate school. This result is surprising considering the fact that 79.5% of respondents reported having pursued a dissertation topic related to science education and 82.5% reported primary professional affiliations with organizations specific to science education. Table II provides an overview of the data specific to participant responses to survey items related to professional identity.

Four categories were defined within the professional activities of these jointly appointed educators: (a) the distribution of time spent pursuing funding specific to one disciplinary field over the other; (b) the ability to split research interests between science, education, and science education; (c) preference for teaching courses in one disciplinary field over the other; and (d) publication activity. With regard to the distribution of the pursuit of discipline/field-specific research funding, 77.5% of the survey respondents reported spending more time pursuing education-based funding over science-based funding while only 15% reported spending more time pursuing science-based funding over education-

Table II Professional Identity

Survey sample (<i>n</i> =40)	Strongly agree	Agree	Disagree	Strongly disagree	N/A
Joint appointment: immediate post-graduate goal	7	8	15	10	0
Science education topic of doctoral dissertation	31	2	0	6	1
Primary affiliation with professional organization specific to science education	19	14	5	0	2

based funding. Next, 82.5% reported enjoying the flexibility to split research interests between science, education, and science education. The results related to discipline-specific instructional preference were similar, with 95% reporting confidence in the ability to teach education-based courses and 87.5% reporting confidence in the ability to teach science-based courses. The publication activities were highly skewed, with 92.3% identifying high publication activity in science education journals and 74.3% indicating high publication activity in education journals. Conversely, only 20% of the respondents reported high publication activity in journals devoted only to science. Table III provides an overview of the data specific to survey items about professional activities.

In terms of teaching assignments, only two of our survey participants taught traditional bench science, with labs. Instead, our jointly appointed science educators were teaching introductory courses in science to non-majors. Teaching these sorts of courses tended to be different from the course assignments for colleagues with traditional appointments who taught exclusively in science. The jointly appointed science educators also tended to teach upper-level and graduate courses in science teaching methods in education. This is similar to their education colleagues, but the mix of courses makes their professional expertise unique. Moreover, our interview participants indicated they often serve as a resource to scientists in their science departments for pedagogical issues related to teaching science, again differentiating their roles from other scientists and other educators. Thus, the structural pattern of teaching assignments for the jointly appointed faculty members was oriented more toward education and less toward science.

Issues of tenure and promotion dominated the discussions of the risks and rewards of holding a science education joint appointment. In fact, the issue of promotion and tenure was consistently raised by all of our interviewees as a pivotal point in their academic success. This salient sub-theme gave us insight into some of the risks and rewards of holding joint appointments in science education. For the nine pre-tenured interview participants, ambiguity and uncertainty dominated the promotion and tenure process. This led to concerns about how they will be perceived by committees and external reviewers who are anchored in more traditional academic cultures. The following comment illustrated this qualitative finding:

Both colleges need to be clearer. I need to be more conscious of what I need to do or what they want me to do for that 25%. That needs to be spelled out a little bit more. I would ask to have that clarified. I might even have a list of journals, something concrete written down, instead of just vague. “Oh yeah, you’re the link between the two departments.” Well, yeah, but what do I do?

Table III Professional Activities

Survey sample (n=40)					
	Strongly agree	Agree	Disagree	Strongly disagree	N/A
Spend more time pursuing education related funding	20	11	8	1	0
Spend more time pursuing science related funding	2	4	18	16	0
Ability to determine research focus between science, education, & science education	15	8	6	1	0
Most comfortable teaching education	29	9	1	0	1
Most comfortable teaching science	18	17	5	0	0

Another interviewee described the risk his predecessor took to blaze the tenure trail for jointly appointed faculty members.

My predecessor really educated them and expended a lot of personal political capital to do it. So I can come in now, and these people are pretty sharp about my work. It wasn't my doing; it was someone who precedes me. It was costly for her, and I am ever beholden.

Even for those with colleagues who had paved the way towards tenure and promotion there was still a great deal of concern about whether or not they would be taken seriously by their colleagues in both departments. Similarly those jointly appointed faculty members who had been the first to go through tenure and promotion at their institutions noted their uncertainty in how the process would be conducted and, of course, what the results would be.

Further, the processes for promotion and tenure decisions differed greatly from institution to institution, partially due to the variety of configurations of joint appointments and the different institutional types. The processes ranged from candidates having to receive formal approval of their dossiers in both departments and colleges to the primary department (the one with the 50+% commitment) receiving letters of support or denial from the secondary department that were then considered in the decision of the primary department. One participant explained this as follows: "They [my secondary appointment] will be sending support for my case when I go up for tenure, so they will have a separate review process in which they go to decide my case."

Self-advocacy was recognized as an extremely important quality to develop in order to be tenured and promoted. A pre-tenured interviewee remarked: "I need to be able to communicate to the promotion committee the differences in my field versus the natural sciences. When I go up, I need to organize my thoughts." Another who was not initially jointly appointed had already received her tenure in the College of Education. However, when a joint appointment became available, she was offered a position split between the College of Education and the College of Arts and Sciences. This shift in appointment led her to feel she had to promote herself and build bridges within the College of Education, which had tenured her, before she felt she could become a full professor; and she said:

I went through my first tenure and promotion quickly and fairly easily, I think it was a quick process, and I've actually slowed down quite a bit; I'm in my 13th year. I didn't go up when I should have because I think the College of Education thought I'd left them. I felt I needed to build some bridges after I took my joint appointment. I thought, okay, I'm just going to slow this down, make sure they understand. The way the contract reads is I still go up for my final promotion through the College of Education.

Moreover, even those who did not have to be externally reviewed as part of the tenure and promotion review felt it was vital to find national peers to legitimate and help position their work in a larger context. Voluntarily seeking external letters points again to the need for self-advocacy, particularly because such an activity is sometimes above and beyond the institutional expectations for advancement. While joint appointments may be part of the larger profession of science education, these positions have formed an interdisciplinary sub-profession with distinct and unique structural arrangements and associated risks and rewards.

Socialization and Satisfaction

The second set of questions we asked was (a) how jointly appointed faculty members in science education are professionally socialized and (b) how this socialization and related

experiences influence the professional satisfaction of these faculty members. The decision to pursue a joint appointment in science and education was considered using the following indicators: (a) graduate advisor support of pursuing a career as a science educator, (b) the degree to which colleagues from science and from education understand the work of science educators, and (c) the degree to which science educators interact with colleagues from science and those from education. Twenty-seven of the survey respondents (67.5%) reported having the support of their graduate advisor to pursue a joint appointment. Regarding the social environment in terms of colleagues’ understanding of their joint appointments and interaction with those colleagues, 72.5% reported that their education colleagues understand their work as science educators. However, only 42.5% reported their science colleagues understand their work. Despite these findings, respondents reported a near equal amount of interaction with both science colleagues and education colleagues. Specifically, 72.5% reported frequent to regular contact with science colleagues while 77.5% reported frequent to regular contact with education colleagues. These data enabled us to identify risks and rewards linked to holding a joint (and therefore interdisciplinary) appointment, which we discuss further in the next section. Table IV provides an overview of these data.

Our interview data revealed a tension associated with the professional identity of persons holding joint appointments. Interestingly, these tensions originate more through colleagues and mentors than through internal uncertainties and self-doubts. Specifically, interviewees commonly reported having reservations regarding joint appointments due to the advice of others. The messages received from others were often cautionary and anchored in the belief that joint appointments lacked both legitimacy within the academy and, consequently, professional stability. One interviewee indicated a colleague had advised her not to pursue a joint appointment because “science education research was not considered real research.” Similarly, another interviewee reported that her doctoral advisor had cautioned her that she would be “lonesome” in a jointly appointed position and that her peers on both sides of the appointment “would not speak her language.” Another explained how her dissertation chair had advised her to “be wary of joint appointments... be sure to explain your research... if they [scientists] discount it, you do not want to work there.” These and other similar comments revealed a socialization process that was centered on doubt rather than on the confidence of trusted mentors and colleagues, most of whom did not hold joint appointments and were, therefore, anchored in the norms and values of a more traditional academic culture.

Table IV Professional Socialization

Survey sample (n=40)					
	Strongly agree	Agree	Disagree	Strongly disagree	N/A
Graduate advisor encouraged career in science education	18	9	5	7	1
Colleagues in education understand the work of science educators	13	20	7	0	0
Colleagues in science understand the work of science educators	4	13	19	4	0
	Frequently	Regularly	Often	Rarely	N/A
Interaction with education colleagues	16	13	6	5	0
Interaction with science colleagues	18	13	6	2	1

Our quantitative survey data suggest a reasonably high minority (37.5%) of science education faculty members had purposefully sought jointly appointed positions. Interestingly, however, none of the interviewees indicated having such clear and purposeful goals, which is a limitation of our qualitative data. Instead, they reported accepting joint appointments for reasons that included geographical location and family circumstances; lack of awareness and understanding of the implications of joint appointments; and other extraneous, if not serendipitous, circumstances. One participant stated: “I wasn’t sure when I was first hired... I had no idea what this [joint appointment] was going to be like... I didn’t think about it until a year into it.” Similarly, another said: “I figured I would give anything a try; if it [the joint appointment] didn’t work out, it didn’t work out.” Other reasons for accepting the joint appointment included being invited to apply by the institution, pursuing the opportunity based on wanting to be employed by a particular institution, and the fact that the joint appointment was the only offer on the table. In short, the qualitative data revealed a primary theme of ambivalence toward joint appointments. Another trend in the qualitative data related to the career decision-making processes was coincidence. This is to say circumstances (e.g., geographic location) trumped other aspects that are sometimes considered in a national search for a faculty position (e.g., institutional prestige, salary), making a job one might not have otherwise considered a viable professional option.

Interviewees expressed the feeling that, during their hiring process and subsequent employment, there was little consistency and clarity specific to their joint appointment. Indeed, few of the interviewees were clear on which departments held ultimate authority over their positions; and they were even less clear on how decisions as important as tenure and promotion would be executed between their two departments. This ambiguity resulted in feelings of isolation, lack of support, and the need to struggle for a sense of professional legitimacy. One interviewee’s statement captures the recurrent theme of isolation and discomfort: “How am I treated by the College of Education? With suspicion, and I think they have forgotten that I am one of them.” Such comments were repeated throughout the interviews, and they suggest that a lack of structural and organizational clarity caused some participants to become skeptical about the collegiality of peers on either disciplinary side of their appointments. Evidence in the survey data showed that 35% of the respondents did not feel as though they were treated as equals by education colleagues, and 42.5% reported similar feelings related to their science colleagues. This finding further reinforces their skepticism. Thus, despite identifying more heavily with education as a disciplinary anchor, our sample reported little professional security from either of the departments that house their positions.

The overall trend of professional uncertainty and discomfort encouraged many of our interviewees to advocate actively for themselves and the legitimacy of science education as an interdisciplinary field. In other words, they were paving their own paths as jointly appointed science education professors. This advocacy often took the form of educating peers in both departments on the type of work they do and providing the same peer network with instructional support and guidance. Illustrating, again, the theme of uncertainty and discomfort, one interviewee stated, “I don’t expect them to understand what I do... I think both departments expect that my research will cut across physics and education.” Another said of her colleagues in science, “They don’t understand what research in education is. I think they’re looking for some direction and guidance, and they underestimate what you really need to be a really good science educator.” In speaking of a lack of understanding of education research on the part of scientists, an interviewee explained, “They’re not nasty about it, but they’re just willing to point out that they are not familiar with our field.” In certain cases, participants were so dissatisfied with their experiences that they were seeking new professional opportunities that did not include a jointly appointed position.

However, the majority of those with whom we spoke were engaged in proactive strategies for finding continuity and comfort in their dual roles. Said differently, these faculty members were becoming advocates for their growing interdisciplinary field and emerging academic profession.

Professional Identity

Our final research question asked how holding a joint appointment influences the professional identity of faculty members in science education. In the general understanding of professional identity, we noted an emphasis on education rather than science. The survey data indicated that 92.5% of the respondents considered science education to be an interdisciplinary field and that 90% believed their institutions of employment also considered science education to be an interdisciplinary field. Interestingly, within the same sample there was a heavy emphasis upon education as a disciplinary anchor. For example, 77.5% reported spending more time pursuing funding related to education than to science. Thus, a disconnect exists between the respondents who considered their work to be interdisciplinary but also primarily identified with education and those who considered themselves exclusively interdisciplinary.

From our survey we also learned that 87.5% of our respondents identified their primary professional affiliation as science education, and all but one of our participants said they would not actively seek a joint appointment again if they had that opportunity. However, only two participants focused on engaging in activities exclusive to science education, rather than their joint appointment. This finding suggests that joint appointments within science education are resulting in a corresponding professionalized sub-field. However, this finding must be put in context as our participants were mostly pre-tenured faculty (56.25%); and their professional success depends significantly on their ability to navigate and negotiate their joint appointments. Our findings may have been different if we had talked to a more diverse group in terms of academic rank, including more full professors and more non-tenure track faculty.

Similar to our survey findings, the interviewees also pointed to professional organizations for science educators as the primary source of support for their work. Several participants remarked that for the last 2 years a panel had been organized at the annual ASTE conference specifically to discuss the challenges and rewards of being a jointly appointed science educator. That panel had been critical to creating a network of jointly appointed faculty members, which provided members with opportunities to discuss strategies about how to navigate their positions and to collaborate on scholarly projects. One participant commented that the panel is a great first step, but “it is important to have others [colleagues in joint appointments]. I also think that it would be nice across the country to form a little group of joint appointment people, just form a little network. I think that would really help.” Another participant echoed the desire to professionalize. She said:

And we as a profession need to think this through and start to build in policies and procedures that make sense. Now people like myself can serve on a committee to look at other people who are up for a joint appointment. I think it's a matter of time in some ways, but at the same time we have to be proactive in thinking about what our ultimate goal is and how we're going to get there.

Thus, a sub-culture specific to joint appointments has emerged within the science education professional organization.

Another example of the professionalization of jointly appointed science educators is the emergence of distinct science education centers on college and university campuses. These “quasi-departments” help to provide a foundation for those with joint appointments. One participant explained as follows:

We all [jointly appointed faculty] have departmental responsibilities in addition to what we invent as a science education quasi-department. So we are like masochists, we have biology committees coming out our ears, and everyone has departmental committee responsibilities; and then we heap upon ourselves additional committee responsibilities by inventing another department, meeting and then carving out sub-committees, and agendas. And so, yeah, we’re a little crazy that way.

Faculty members from two other institutions described the growth of such centers as a way to coordinate research activities among those doing interdisciplinary work. The centers provide professional development funding, help to negotiate contracts for new jointly appointed science education faculty members, and serve as advocates for the pre-tenured faculty. In addition, these centers function as hubs for research activity.

The success of jointly appointed science education faculty members in obtaining external research dollars was the most visible and valuable aspect of the professionalization of joint appointments. Whether through a center or individually, participants remarked over and over again how they were sought out by bench scientists and educators to contribute to major grant proposals for agencies such as the National Science Foundation and National Institutes of Health. Jointly appointed faculty members have already established connections, albeit loosely in many cases with bench scientists; thus, as funding agencies look more and more to interdisciplinary grant work, these science educators are natural choices for inclusion on grants. The head of one of the centers explained how she and her jointly appointed colleagues are regarded on campus as distinct from both bench scientists and other educators:

The grants are much bigger in the sciences. They’re almost unheard of in education; that’s why they [my education colleagues] think I’m wonderful. We’ve run on about half a million dollars on grants and contracts a year, and that’s more money than everybody in the College of Education combined brings in. Scientists, they wouldn’t even show up on the radar screen with that amount of money.

Given the critical and growing role of external funding in higher education, involvement in interdisciplinary grant projects is a highly strategic approach to professionalizing the joint appointment sub-field of science education.

The interviewees described a professional existence that was located within a developing and often tenuous space positioned between the distinct academic cultures of science and education. Most also felt their positions allowed them to do interesting interdisciplinary teaching and scholarship. Additionally, having a joint appointment provided them with unique and informative perspectives on academic work more broadly. One participant explained it as follows.

Other departments have different ways of doing things that may or may not be more beneficial. It kind of gives you this broader perspective that this isn’t how life is; it’s how life is created in your little corner of campus. I think that has been helpful. I see real pluses; and, when I get to tenure, I think I’ll be much more positive.

Another faculty member reflected on the skills he had developed because of the nature of his appointment:

One aspect of the position I like, that is challenging, is what linguists call code switching. It's the challenge of the job and it's also the nature of the job; it's being able to go to an education meeting and go to a science meeting and being comfortable talking to both people. Part of the way that the job is structured for me is that, in part, I'm supposed to be mediator between the departments.

Of course, their experiences do not come without challenges, including the lack of a true "home."

Conclusion

In our exploratory study we learned that jointly appointed science educators felt an extra burden to be both a bridge between two academic cultures and an advocate for every aspect of their professional work. That is, these jointly appointed faculty members have two houses, but no home. They are compelled to pave their own path in order to justify the work that they do, particularly when it comes to their colleagues, and more crucially, the tenure and promotion processes. Further, they are their own advocates for demands on their time and for the value of their scholarship. This self-advocacy has implications for academic success. These additional responsibilities are time-consuming and stressful, and the consequences are significant and greater than those in more traditional professorships. Perhaps it is because of the stress of self-advocacy, coupled with the lack of clarity and the cautionary advice from mentors and colleagues about joint appointments, that led all but one of our interview participants to say without any hesitation they would not consider another joint appointment in the future.

Finally, our study contributes to the literature that addresses interdisciplinarity. The findings provide an initial answer to Latucca's (2001) question of whether departmental and institutional reward systems remain as barriers to interdisciplinary work. Our response to this question is *yes*. The cultures created by jointly appointed science educators are unique and often supersede the disciplinary cultures of science and education separately, validating the emergence of new academic cultures created by joint appointments and interdisciplinary work. As a result, we urge departments, colleges, and universities to be mindful of jointly appointed faculty when policy decisions are made, particularly when those policies guide faculty socialization, professional satisfaction, job responsibilities, and promotion and tenure.

As we mentioned, our study is only exploratory, but it does provide thick description about the experiences of jointly appointed science educators. It may have implications for other faculty members who hold joint appointments outside of science and education, but it would be premature to say that with certainty. Further, like all qualitative work, our study is not intended to be generalizable; rather it is intended to delve more deeply into the rich experiences of faculty lives and provide meaning to those experiences. As such, we hope to inspire further investigation about the nature of faculty work for those who hold joint appointments. Longitudinal or tenure-course, other qualitative and/or large quantitative studies, and mixed-methods studies should be considered. As interdisciplinarity remains a constant and in many ways an innovative characteristic of academe, one highly valued by external funding agencies, higher education must be fully prepared to find homes for and

support and socialize interdisciplinary faculty members in all fields and disciplines, including those who hold appointments in more than one academic home.

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