

**Interaction Influences on Doctoral Students' Academic Pursuits in Biomedical Research:
An Exploratory Qualitative Study**

Xiaoqing Kong¹

Devasmita Chakraverty²

Nathan Dolenc¹

Donna B. Jeffe³

Dorothy A. Andriole³

Heather D. Wathington¹

Robert H. Tai¹

¹ Curry School of Education, University of Virginia, Charlottesville, VA, USA

² Department of Chemistry, University of Nebraska, Lincoln, NE, USA

³ School of Medicine, Washington University, St. Louis, MO, USA

Paper presented at the annual conference of American Education Research Association

April, 2014, Philadelphia, Pennsylvania

Interaction Influences on Doctoral Students' Academic Pursuits in Biomedical Research: An Exploratory Qualitative Study

Abstract

This exploratory qualitative study investigated how doctoral students reported their personal and professional interactions which they believed may have facilitated or impeded their academic pursuits in biomedical research. We interviewed 19 doctoral students from eight universities during the first year of our project, and based our qualitative analytic approach on the work of Miles and Huberman (1994). The results indicated that among different sources and types of interaction, academic and emotional interactions from family and teachers in various stages were essentially associated with students' persistence in the biomedical science field. In addition, co-mentorship between peers, departmental environment, and volunteer experiences were also important factors.

Perspective and Objective

Doctoral student attrition has always been considered as a critical problem for the entire higher education system (Bowen & Rudenstine, 1992; Nettles & Millett, 2006), including the science, technology, engineering, and mathematics (STEM) fields (Lovitts, 2001). Many researchers have indicated that socialization is an important factor that may explain the attrition of students in their specializing areas (Gardner, 2008; Golde, 2000). Further, both professional and personal interactions are an essential component under the socialization umbrella. As a result, it would be beneficial for the medical workforce, including program directors, policy makers, and educational researchers to understand the effect of interaction experiences on students' academic pursuits in the doctoral programs. Hence this exploratory study investigated how doctoral students perceive the influences of their interaction experiences on their academic pursuits in biomedical sciences.

Existing literature summarized the theories of socialization and integration that may elucidate the issue of doctoral student attrition (Van Maanen, 1984; Tinto, 1993). Socialization refers to the process during which an individual comes to acquire norms, culture, skills and knowledge so as to become a member in a given organization (Van Maanen, 1984). Tinto (1993) emphasized that students' persistence in their academic pursuits, to some extent, can reflect their experiences of integrating into the social and academic life of the institution. Social integration refers to doctoral students' experiences of being situated in informal environments, such as family, friends and community; whereas academic integration mainly refers to doctoral students' experiences of being exposed to the research world and academic environment (Tinto, 1993). Social and academic integration processes are always intertwined, since graduate students' social life and work situations are often inseparable (Golde, 2000).

In STEM education, students' interaction experience is a crucial component in socialization and integration theories (Lott, Gardner, & Powers, 2010; Wilkinson & Harris, 2002). According to the integration theory, the interaction experiences can be tentatively interpreted in two parallel systems: social interaction experiences and academic interaction experiences which can also intertwine with each other. As for social interaction, research indicated that strong familial influence and encouragement were critical to students' career trajectory (Moore, 2006). As for academic interaction, many qualitative studies discussed the importance of graduate students' relationships with professors, peers and departmental staff in

terms of influencing their academic pursuits (Lempp, Cochrane, Seabrook, & Rees, 2004; Moore, 2006; Robert, Pomarico, & Nolan, 2011).

However, these studies focused on the different kinds of influences for doctoral students across different disciplines. Only a few studies examined the doctoral students' experiences in the STEM-related fields. There is paucity in research related to doctoral students' interaction experiences and the mechanisms by which the interaction influences their academic pursuits in biomedical sciences. In this study, we examined students' experiences of interacting with familial (e.g., parents, siblings, etc.) and professional (e.g., advisors, other professors, etc.) people, and how these experiences influenced the students' academic pursuit in biomedical research, if at all. Our research question was:

What did doctoral students report about their familial and professional interactions that they believe may facilitate or impede their training in biomedical research?

Data and Methods

The data in this study were part of a large-scale qualitative project, where we purposefully sampled potential medical schools and biomedical research institutions based on their location and affiliation. This study specifically focused on doctoral students' personal and professional relationships with different groups of people, and how they believed these interaction experiences may have influenced their academic pursuits. We analyzed transcripts for the semi-structured phone interviews with 19 PhD and MD/PhD students from eight medical schools who volunteered to participate during the first year of our data collection in 2011. This proposal served as the exploratory study for further research. Table 1 presents a list of specific interview questions related to this study. The demographic information of the interviewees is shown in Table 2.

We applied an analytic approach of qualitative design developed by Miles and Huberman (1994) with the assistance of the software package QSR NVivo 9, since this approach is appropriate for investigating the relationships underlying interaction experiences and for computer-assisted data analysis. At first, we generated descriptive and interpretive codes to reduce the data. Using descriptive coding, we created many specific codes indicating detailed nature of interaction experiences (e.g., "parent working in medicine"); whereas by interpretive coding, we categorized descriptive codes and developed advanced descriptors (e.g., academic influence of parental career). Then we used network display to illustrate the big categories of interaction sources and types, and matrix display to demonstrate the connections between sources and types of interaction. During verification, we explored the underlying themes, relations, and constructs of different interaction experiences.

Results and Discussion

Figure 1 represents six main sources of interaction experiences grouped into two categories: family, friends and patients, and high school and college teachers are out of graduate school; graduate advisors, departments, and graduate peers are within graduate school. The dash arrow indicates the importance of high school/college study period to students' future major selections and career choices. Meanwhile, some sources are interacting with each other. For example, students were influenced by professors, both of whom were affected by the departmental environments to some extent. Five types of students' interactions were identified and are discussed below respectively: academic interactions, emotional interactions, environment,

specific interactions, and other miscellaneous interactions. Table 3 shows the combination of sources (columns) and types (rows) of students' interaction experiences based on the data.

First, students' **academic** interaction experiences which facilitated or impeded their progress in the programs mainly came from interacting with family members, graduate advisors, and peers. As for the positive experiences with family, nine interviewees reported that they had at least one parent or sibling working in related fields, which provided them with an influential environment. Besides, teachers from all stages in their life also played an important role in interviewees' academic life.

"Well, my parents are both MD/PhD, so I was always around the hospital or like in the lab when I was growing up. It's just like something that I always knew I wanted to do, or hoped to one day be like them." (Female, Asian, MD/PhD)

However, there are examples where students reported their negative interaction experiences that could impede their academic pursuits. The main source was from the within graduate school category. Five interviewees mentioned that they did not receive as much help from their advisors as they expected which was discouraging.

"I think that kind of discouraged me from a research career. I think the people that were in that program felt like we lacked the mentorship support during those six years. I think that was more discouraging..." (Male, Hispanic, MD/PhD)

Second, almost all interviewees received **emotional** support from their family, peers, and teachers at various stages. Different people provided different kinds of emotional support. Family members encouraged the interviewees verbally and spiritually. Many interviewees reported positive experiences while receiving help from senior students and offering help to junior students. Teachers provided another type of emotional support which made interviewees feel more confident in academia.

"Our school has a support system built into a family system. When you start off, you're given a big brother or a big sister to watch out after you and make sure you're adjusting to medical school in a good way." (Male, Caucasian, MD/PhD)

Third, the **environment** created by departments was also important. Seven interviewees reported the comfortable program environment created by administrators and other professors: lab managers, program heads and other professors were very helpful in many aspects, such as taking care of logistic problems, having their questions answered, and providing verbal support.

"Other mentors and people helping out are the head of our program actually. He started up about two years ago and he's actually been tremendously helpful in terms of making sure everything's taken care of and like if I have questions, he's more than happy to talk to me." (Male, White, MD/PhD)

However, another seven interviewees talked about the departmental politics or hierarchical issues in the graduate program, which were unrelated to their academic advancement and could lead to problems or difficulties, such as delay of dissertation or graduation.

"For my PhD being long is not really anything. It was all like committee politics and wrestling with my advisor. It wasn't science. It wasn't productivity. It was all kind of more political and people issues." (Male, African-American, MD/PhD)

Fourth, some interviewees found that their previous **specific** interactions with friends and patients led them to the pursuit of biomedical sciences. Six interviewees mentioned that their volunteer experience provided them with a chance to interact with patients, which generated an initial interest in biomedical sciences.

Fifth, sometimes an unpleasant **incident** around the interviewees could change the course of their academic life. One interviewee explicitly mentioned that she was very persistent in studying biomedical sciences because of the unfair treatment to her grandmother. However, there are also some incidents which make interviewees give up their original study areas. An interviewee shared her story that her college advisor left the university at that time. Later, she could not find an appropriate advisor and thus had to change her study area in the end.

Conclusion

Academic and emotional interaction experiences closely influenced doctoral students' academic pursuits. Family was perceived as the most important source of these influences, which augments previous qualitative research by Patton (2009). Parental medicine-related careers and emotional encouragement were essentially positive experiences for interviewees in doctoral programs, which strengthens the findings of previous literature where researchers emphasized the importance of parental influence in students' undergraduate academic pursuits (Sharp, Caldwell, Graham & Ridenour, 2006; Sax, 2001). Meanwhile, teachers from various stages also played an important role in guiding students academically and offering advice on their major selections and career choices. This finding extends previous research which only focused on the graduate advisor-student relationships (Cumming, 2009). Further, peers were mostly supportive both academically and emotionally. Therefore, future research may focus on how to help improve peer relationships in graduate schools so as to build a comfortable research community for students.

Additionally, environment, specific interactions, and other miscellaneous interactions may also influence students' academic pursuits in biomedical sciences both positively and negatively. The program administrators could facilitate academic experiences of students, and should try to mitigate the effect of politics and hierarchical aspects which may distract students from their academic pursuits. This finding underscores the results in another qualitative study where the researcher discussed that the departmental politics negatively influenced the graduate students who left (Gardner, 2009). Additionally, our analyses also showed that changing advisor may cause impediments, or even drive students to leave their original study fields. Thus, departments should support students in finding a compatible new advisor under such circumstances. Lastly, volunteering experiences were helpful and effective in terms of attracting students to studying biomedical sciences, which sets a good example of the experiential education supported by Thiry, Laursen, and Hunter (2011). Researchers in future studies may be interested in examining hospital volunteer programs and how these programs attract participants to the biomedical research.

References

- Bowen, W. G., & Rudenstine, N. L. (1992). *In pursuit of the Ph.D.* Princeton: Princeton University Press.
- Cumming, J. (2009). The doctoral experience in science: Challenging the current orthodoxy. *British Educational Research Journal*, 35(6), 877-890.
- Gardner, S. K. (2008). Fitting the mold of graduate school: A qualitative study of socialization in doctoral education. *Innovative Higher Education*, 33(2), 125-138.

- Gardner, S. K. (2009). Student and faculty attributions of attrition in high and low-completing doctoral programs in the United States. *Higher Education, 58*, 97-112.
- Golde, C. M. (2000). Should I stay or should I go? Student descriptions of the doctoral attrition process. *Review of Higher Education, 23*(2), 199-227.
- Lempp, H., Cochrane, M., Seabrook, M., & Rees, J. (2004). Impact of educational preparation on medical students in transition from final year to PRHO year: a qualitative evaluation of final-year training following the introduction of a new year 5 curriculum in a London medical school. *Medical Teacher, 26*(3), 276-278.
- Lott, J., Gardner, S., & Powers, D. A. (2010). Doctoral student attrition in the STEM fields: An exploratory event history analysis. *Journal of College Student Retention: Research, Theory & Practice, 11*(2), 247-266.
- Lovitts, B. E. (2001). *Leaving the ivory tower: The causes and consequences of departure from doctoral study*. Lanham, MD: Rowman and Littlefield.
- Miles, M. B. & Huberman, A. M. (1994). *Qualitative Data Analysis*. Thousand Oaks, CA: Sage.
- Moore, J. (2006). A qualitative investigation of African American males' career trajectory in engineering: Implications for teachers, school counselors, and parents. *Teachers College Record, 108*(2), 246-266.
- Nettles, M. T., & Millett, C. M. (2006). *Three magic letters: Getting to Ph.D.* Baltimore, MD: The Johns Hopkins University Press.
- Patton, L. D. (2009). My sister's keeper: A qualitative examination of mentoring experiences among African American women in graduate and professional schools. *Journal of Higher Education (Columbus, Ohio), 80*(5), 510-537.
- Robert, T. E., Pomarico, C. A., & Nolan, M. (2011). Assessing faculty integration of adult learning needs in second-degree nursing education. *Nursing Education Perspectives, 32*(1), 14-17.
- Sax, L. J. (2001). Undergraduate science majors: Gender differences in who goes to graduate school. *Review of Higher Education, 24*(2), 153-172.
- Sharp, E., Caldwell, L. L., Graham, J. W., & Ridenour, T. A. (2006). Individual motivation and parental influence on adolescents' experiences of interest in free time: A longitudinal examination. *Journal of Youth And Adolescence, 35*(3), 340-353.
- Thiry, H., Laursen, S. L., & Hunter, A. (2011). What experiences help students become scientists? A comparative study of research and other sources of personal and professional gains for STEM undergraduates. *Journal of Higher Education, 82*(4), 357-388.

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). Chicago: University of Chicago Press.

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, NY: New York University Press.

Wilkinson, T., & Harris, P. (2002). The transition out of medical school—A qualitative study of descriptions of borderline trainee interns. *Medical Education*, *36*(5), 466-471.

Table 1

Interview Questions Analyzed in This Study

1.	When do you first remember actively considering a career in science or medicine?
2.	How did you decide to pursue a [graduate or medical] degree?
3.	What are your experiences with advising or mentoring—from professors or peers—in your program?
4.	What are your interactions with other people in your program and in your field?
5.	What are the supports or preparation you received prior to your program that helped prepare you for your program?
6.	What are the supports or preparation that you did not receive prior to your program, that you feel might have helped prepare you for your graduate program?
7.	Looking back at your own past experiences, were there one or two things that -- had they happened differently -- might have led you to choose some other educational path that did not involve obtaining a [graduate or medical] degree?

Table 2

Demographics of 19 Interviewees

Gender		Race/Ethnicity		Degree Pursued	
Female	10	African-American	3	PhD	6
Male	9	Asian	3	MD-PhD	13
		Caucasian	11		
		Hispanic	2		

Table 3

Combination of Interaction Types and Sources

Types of Interaction	Sources of Interaction					
	Out of Graduate School			Within Graduate School		
	Family	Friends/ Patients	High School/ College Teachers	Graduate Advisors	Graduate Departments	Graduate Peers
Academic Interaction	✓	--	✓	✓	--	✓
Emotional Interaction	✓	--	✓	✓	--	✓
Environment	--	--	--	--	✓	--
Specific Interaction	--	✓	--	--	--	--
Other Interaction	✓	--	✓	--	--	--

Note. Each cell represents each intersection between the corresponding sources and types of interaction. Cells with check marks indicate the cases where the corresponding sources and types of interaction experiences occur at the same time. Cells with hyphens indicate the cases where corresponding sources and types of interaction experiences do not occur at the same time.

Figure 1. Sources of interaction

