Transitioning to Careers in Higher Education

Reflections from Recent Ph.D.s in Mathematics Education

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Each year a new group of doctoral students complete their Ph.D.s in mathematics and mathematics education, and many of them begin a career in higher education. While Ph.D.s in mathematics going into higher education will enter an academic home in mathematics departments, Ph.D.s in mathematics education may have their tenure homes in mathematics departments or in colleges/schools of education. Research shows that over one-half of the new Ph.D.s in mathematics education take an appointment in a mathematics department [1,2]. Golde and Walker [3] have argued the need to monitor the progress of new Ph.D.s in their positions in higher education and use this information to strengthen doctoral preparation. Important aspects to be monitored are the challenges that lie ahead for these new Ph.D.s as they begin careers in higher education. Some of these challenges, such as quickly becoming familiar with institutional program requirements, being able to offer competent advisement to students where different course titles/numbers are involved, teaching new courses, and expectations for early evidence of scholarly productivity, have been articulated elsewhere [4, 5, 6].

The current study was completed in order to learn more about the types of work expected from new graduates in mathematics education and the challenges they face in their new positions in higher education. This study was also designed to examine ways their early experiences might be used to reshape and improve doctoral programs in mathematics education and thereby benefit future doctoral students with aspirations for entering careers in higher education. All fourteen recent graduates invited to participate in the study responded to the request. These students earned Ph.D.s in mathematics education from Michigan State University, University of Missouri, or Western Michigan University and have taken positions in institutions of higher education during the last three years. Each of these students was associated with the Center for the Study of Mathematics Curriculum supported by the National Science Foundation as one of the Centers for Learning and Teaching (http://www.mathcurriculumcenter.org/).

The survey asked these new mathematics educators to describe their current positions, the
challenges they have been facing, and the support they have received from their institution. They were also asked to reflect on the interview process as well as their current position, and to offer advice to present and future doctoral students considering a career in higher education.

**About the New Faculty Members**

These fourteen recent graduates took their new jobs in thirteen different states. Four of them completed a mathematics education doctoral program in a mathematics department. The other ten were in mathematics education programs in colleges of education. Ten of the fourteen new faculty members were employed by institutions that award doctorates in mathematics education, and four were employed in institutions awarding bachelor’s or master’s degrees. Thirteen were employed in public institutions. A mathematics department was the academic home of eight new faculty members, while six worked in colleges/departments of education, including one that had a joint appointment in education and mathematics.

**Teaching, Research, Service**

The new faculty described their positions in predictable ways. In most positions they were expected to engage in some combination of research, teaching, and service, typically a 40-40-20 allocation of their time. Some found themselves

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
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<tbody>
<tr>
<td>Mathematics in Elementary School</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics for Elementary Teachers I</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics for Elementary Teachers II</td>
<td>3</td>
</tr>
<tr>
<td>Teaching Mathematics in the Middle School and High School</td>
<td>3</td>
</tr>
<tr>
<td>Teaching Mathematics in Secondary School</td>
<td>3</td>
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<tr>
<td>Mathematics Methods for Early Childhood (PreK-4)</td>
<td>3</td>
</tr>
<tr>
<td>Integrated Teaching: Mathematics Methods for Elementary Teachers</td>
<td>3</td>
</tr>
<tr>
<td>Theory of Mathematics and Science Instruction</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics Curriculum (graduate course credit)</td>
<td>3</td>
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</tbody>
</table>

**Table 1. Titles of courses taught during first-year appointment in colleges/schools of education**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>Intermediate Algebra</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to the Foundations of Mathematics I</td>
<td>3</td>
</tr>
<tr>
<td>Mathematical Reasoning</td>
<td>3</td>
</tr>
<tr>
<td>Survey of Mathematical Structures II</td>
<td>3</td>
</tr>
<tr>
<td>Pre-calculus for Middle and High School Mathematics Teachers</td>
<td>4</td>
</tr>
<tr>
<td>Business Calculus</td>
<td>3</td>
</tr>
<tr>
<td>Fundamentals of Calculus</td>
<td>3</td>
</tr>
<tr>
<td>Algebraic Reasoning for Elementary Teachers</td>
<td>4</td>
</tr>
<tr>
<td>Mathematics for Elementary Teachers I</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics for Elementary Teaching</td>
<td>4</td>
</tr>
<tr>
<td>Number Theory for Elementary and Middle School Mathematics Teachers</td>
<td>4</td>
</tr>
<tr>
<td>Foundations of Middle School Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics for Middle Grade Teachers II</td>
<td>3</td>
</tr>
<tr>
<td>Geometry for Middle Grade Teachers</td>
<td>3</td>
</tr>
<tr>
<td>Methods for Teaching Mathematics K-8</td>
<td>3</td>
</tr>
</tbody>
</table>

**Table 2. Titles of courses taught during first-year appointment in departments of mathematics**
incorporated into established working groups of faculty members, while others were the sole mathematics educator in their institutions. Some were immediately involved in externally funded projects, while others were encouraged to begin exploring ways of obtaining external funds. The positions held a wide range of opportunities for research, teaching, and service.

In terms of research, this meant that some were stepping into a research agenda “already in progress” and for others, this meant freedom to determine their own agendas—which may or may not include collaborative projects. Only one respondent replied that they had not yet set a research agenda. Internal research support took different forms, including mini-grants, travel support, reduced teaching or service loads, and even encouragement to take mini-sabbaticals pretenure.

With respect to teaching, the new faculty taught a wide array of course offerings. Tables 1 and 2 show the range of course titles these new faculty members reported teaching during the 2008–09 academic year. It is worth noting that Tables 1 and 2 also show that some methods courses are taught in mathematics departments (e.g., Methods for Teaching Mathematics K–8) and some mathematics content courses are taught in education (e.g., Mathematics for Elementary Teachers I and II). From the course titles, it is not possible to differentiate the range of topics that is addressed in these courses. However, given the variety of course titles shown in Tables 1 and 2, it is safe to say that regardless of whether their academic home is in education or in a mathematics department, new graduates in mathematics education need to be ready to teach a wide range of courses.

Tables 1 and 2 also show the number of credit hours for each course. The teaching loads were similar in colleges/schools of education and mathematics departments: typically the teaching load was two to three courses each semester. Every faculty member had multiple course preparations, and nearly everyone reported they were teaching courses new to them. Consequently, they spent a large amount of time preparing for and teaching their classes. They also reported that examining homework assignments and developing/grading tests was requiring much more time than they had anticipated.

In several institutions, the teaching load was twelve semester hours for the year, and, depending on the courses taught, this load could be reached by teaching four 3-semester-hour courses, or three 4-credit-hour courses. While the total hours of teaching are identical, these options may result in different workloads.

In terms of service, some new graduates had opportunities to engage immediately with school/university partnerships, including lab schools and funded professional development projects. There were also differences in advising responsibilities and in terms of assigned committee work. Many reported having reduced service loads in the first year to encourage research productivity, and they expected these responsibilities to grow in subsequent years.

Learning from the Experience of These New Faculty Members

The new faculty members were asked to address a set of common questions:

- What was your biggest adjustment taking a faculty position?
- What advice would you give to current doctoral students in the program?
- What is your advice about pursuing a job?
- If you were interviewing for a job again, what questions would you ask?

A review of their responses suggests they experienced similar challenges that were independent of their academic homes. Whether they were teaching in mathematics departments or colleges/schools of education, many of the same issues and challenges were identified, and their answers often offered very similar ideas. Therefore, the following discussion pools their responses and highlights key issues that were identified.

What Was Your Biggest Adjustment Taking a Faculty Position?

The challenges noted by the respondents fell into the following three broad categories.

- Learning the system(s). Learning the system involved different types of activity: meeting people and getting to know particular programs and courses. Meeting people in new departments, colleges, and universities is a time-consuming yet significant task, particularly as new Ph.D.s learn about the relationship of their own work to the ongoing work being done at their new institution. Understanding alternative course numbering systems, getting to know what courses are offered and required by different programs of study, and finding out how major and minor programs fit within the broader educational goal of the university are also challenging, particularly if new Ph.D.s are asked to take on advising responsibilities in their first year. The importance of gaining and understanding this knowledge was cogently expressed by one new faculty member who said, “I have to make sure that I give accurate information to people who need to student teach or graduate.”

- Ph.D.s in mathematics education have the added challenge of learning about the local and state K–12 systems. Standards for K–12 mathematics education vary significantly by state [7]. Taking a position across state lines means that new Ph.D.s must adapt quickly as they are introduced to

1 Responses provided here are not necessarily exact quotes, but they do reflect the nature of the feedback from these new faculty members.
local districts and teachers, particularly if they are joining professional development or research programs already in progress, or if they have aspirations of initiating programs in K–12 schools.

Teaching. Respondents indicated that teaching has been a nice change from having research as the sole focus in their doctoral program. With this new change came new challenges. Several respondents indicated that teaching college students is very different from teaching middle or high school students (most of the fourteen graduates had previously taught in K–12 schools). They remarked that they had less control over the study habits of college students than in their K–12 experience. One graduate said, “I had to figure out how to give my students assignments that involved a significant amount of formative feedback without being overwhelmed by grading.” Since teaching evaluations are regularly done in all courses and are entered into the annual review, it puts added stress on these new faculty members to make the adjustments to college teaching quickly.

Time Management and Prioritizing. A common response from the new faculty was that time management was a continuing challenge. One graduate remarked, “I have a lot of freedom in what I do and when I do it. Yet I must juggle teaching, writing, committees, and service.” This freedom is different from what most experienced in graduate programs. “I was happy to follow the lead of the faculty [as a doctoral student] as they set priorities for my work. Now I am on my own in choosing which avenues to pursue, and it has been a necessary challenge to say ‘no’ to some opportunities and ‘yes’ to others.”

While they are negotiating the short-term balance between time for research, teaching, and service, most of the new Ph.D.s are also responsible for developing a long-term research agenda. While it is an essential foundation for academic productivity, respondents indicated that long-range planning was relegated to the back burner given the immediate pressures associated with teaching. This is not surprising considering that teaching is evaluated more immediately than research.

What Advice Would You Give to Current Doctoral Students as They Continue Their Programs?
The recent graduates were asked to provide advice to current doctoral students regarding what they could do now in their program of study to best capitalize on the opportunities provided to them. Below are four key pieces of advice gleaned from the new faculty.

Take advantage of opportunities in research and teaching. Respondents suggested that new doctoral students look for opportunities to get involved with mentors and research projects. “Take full advantage of the opportunities to work closely with faculty members engaged in research. Even if the work is outside of the expectations of your position, work on projects that are of interest to you or that give you opportunities to pick up new skills.” Pointing to the variety of courses mathematics education Ph.D.s are asked to teach, they suggested developing a portfolio of diverse teaching experiences. “Teaching a few different courses (both content and methods courses for teachers) helped a lot for preparing for my teaching at my new job.” Another said, “Learn to teach an elementary mathematics content and methods course. Every job out there (nearly so) is going to have you teach one.”

Work hard and engage in scholarly writing. Along with taking advantage of the proximity of research opportunities, respondents suggested developing good writing habits early and writing as much as possible. “Try to publish an article and make a presentation in the first couple of years of your doctoral program. It gives you valuable experience and it strengthens your vita—which you should already be starting to work on. Even when your proposals are not successful, you learn some do’s and don’ts that will help you in the future.” They also advised that finding time for writing in the first year of a position is difficult, even without a dissertation to finish. As one new faculty advised, “Don’t leave ABD if you can help it.”

Network with others and be open to mentoring. Some of the new faculty advised developing both personal and professional relationships with young faculty and other graduate students, particularly those with similar research interests. These relationships provide both support and often unforeseen opportunities for research collaboration down the road. Respondents advised, “Don’t be shy. Don’t be afraid to ask senior faculty members for help and advice.” In their own experience, there is much to be learned from faculty members about teaching: “Pay attention to how faculty members deal with their students as you may encounter similar situations.” This also goes for research: “Learn from faculty about how the process of grant writing, data collection, etc., works.” In developing relationships with faculty, advice included looking beyond home institutions. “Make a list of your ‘dream-team’ group of researchers with whom you’d like to connect, and work toward developing those relationships.” Similarly, developing relationships with graduate students from other campuses can lead to helpful dissertation support and even peer-editing partnerships.

Develop a tool kit of resources. In addition to cultivating the resource of professional relationships, respondents valued having a well-organized tool kit of resources to help hit the ground running in their new positions. For teaching, they recommended that new students “gather materials and course information (e.g., syllabi, books, DVDs, curriculum materials, videos, URLs, and lesson plans) so they have something to start with when
designing or developing their own classes.” As for research, they iterated that the main goal is to keep all that has been read, written, and discussed in graduate school in a useful and well-organized database. They recommend leveraging technology such as Delicious (http://delicious.com), Zotero (http://zotero.com), Endnote (http://www.endnote.com/), and Refworks (http://refworks.com) for saving, maintaining, categorizing, and noting useful resources.

**What Is Your Advice to Current Doctoral Students about Pursuing a Job in Higher Education?**

In addition to advising current doctoral students about their present experiences, the new faculty provided advice regarding the current students’ future transition to the professoriate. Below are several pieces of advice the new faculty members offered.

*Prepare your vita.* Your vita provides a thumbnail sketch of your academic history and work experience. Start it early and keep it current so you can provide a copy on request. Ask experienced faculty members to review your vita and offer suggestions. Several new faculty members reported they have already been asked for a copy of their vita to attach to a proposal that was being prepared. One commented, “I needed to include my vita on an internal travel request for funds. Parts of my vita are also posted on the departmental website, and I am supposed to keep it updated.”

*Find a place that is a good fit for you.* Learn about the institutions to which you are applying. In order to ensure a “good fit,” seek answers to questions such as, “Is this position a new or replacement position? If it is a replacement, why did the person leave?” Understand and compare your qualifications to the job requirements. Be realistic in what you are, what you know, and what you can do. Do you want to be an active researcher? Are you interested in pursuing scholarly activity via publications? Are you most interested in teaching? Carefully consider your own limits for stress and pressure. One new faculty member commented, “Do what makes you happy, not what gives you the most status or what you think others expect of you. This is your life and your job.”

*Choose an institution that offers a productive working environment.* Common among the graduates was the importance of feeling valued and supported in their new employment. As one respondent said, “Finding a place where you feel like there are people that you would really enjoy working with is critical. If you can’t be supported in ways that help you do the work you want to do, don’t go there.”

*Keep ties with your alma mater.* The new graduates urged current doctoral students to keep avenues open with their professors and research collaborators. These faculty members know you well. They are proud of their graduates and want them to be successful in their new positions. Respondents cited the value of keeping connected to former faculty members as they initiated their careers: “Don’t be afraid to ask them for advice and help as you prepare for and begin your career in higher education.”

*Face reality.* Many respondents alluded to the dramatic change that has confronted them. Their status changed with their new job, going from graduate student to an assistant professor. This transition has now moved them from the top of one heap to the bottom of another (assistant professor). One new graduate summarized the situation as, “I am now the new kid on the block, and the clock is ticking as I begin my path toward tenure!”

**If You Were Interviewing for Another Job, What Question Would You Be Sure to Ask?**

Finally, the new faculty members were asked to examine their experiences in searching for employment and provide questions they would want to ask in future interviews. Below are several categories of questions offered by these recent graduates.

*What are my job expectations?* Some new faculty offered questions related to the expectations of their new position. Examples of these types of questions included: “What is the mentoring process for new faculty members?” “What is the advising load?” “What are the specific expectations for service?” “Is summer school teaching required?” “What are the summer school pay options?” “How often is it [summer school teaching] available?” “Are there expectations to be a faculty advisor to student groups? If so, which groups, and what does this entail?” Those who proposed these questions recommended seeking as much specific information as could be obtained. One new faculty said that in her interviewing experience, although she asked about the teaching load, specific expectations for service, and if pressure exists to secure external funds, she did not ask about advising, and was subsequently surprised to learn that she would be advising sixty undergraduates.

**What is the culture of the department?** Several new faculty members suggested further inquiries into the philosophy and vision of the department as it relates to mathematics education and their professional development. Examples of these questions include: “What does it mean when someone says, ‘Mathematicians and mathematics education professors at this institution get along really well’?” “What is the likelihood of hiring additional mathematics educators at this institution?” “What is the start-up package to support research and professional growth of new faculty members?”

**What are the research interests of the other mathematics education faculty?** Several new faculty posed questions related to how they would fit in with other faculty in the department. Examples of these types of questions included: “What are the
research interests of other members of the department?" “How do these interests mesh with my own interests?” “Are these individuals actively involved in research, or are they merely ‘interested?’ “Will my research agenda be valued?”

Why, exactly, do you want to hire me? New faculty suggested learning exactly why they were offered a position at a particular institution. These faculty wanted to know, “Why me over other candidates?” “What is it that you see me offering that would benefit your program?” These questions were necessitated by their experiences during their first year, where it seemed that “lots of people or groups in the department ‘want a piece of me’.” The new faculty in these positions recommended that new hires find a clear vision for the purpose of their position.

Closing
As evidenced by the reports from these new faculty members, there are a considerable number of important experiences doctoral students in mathematics education need as part of their graduate work in order to be prepared for their future career in higher education. From research to service opportunities, from teaching to other day-to-day tasks, the role of a new professor can be exhilarating, fulfilling, and overwhelming all at once. It is therefore vitally important that those preparing future faculty as well as those who are hiring freshman faculty are cognizant of these issues in order to assist these individuals in making this difficult transition.

For over a decade there has been a severe shortage of doctorates in mathematics education [1,2]. Given this shortage and recruitment costs, it is important for institutions of higher education to not only recruit high-quality candidates that fit their institution, but once candidates have been recruited, the institutions need to support new hires in order to help them be productive and become contributing members of the faculty. It is expensive for institutions, both in terms of financial and human resources, to advertise for positions, organize search committees, review applications, conduct preliminary interviews, verify recommendations, and bring candidates to campus, as well as provide competitive salaries and start-up packages. Therefore, it is imperative that institutions do everything possible to assist and support new faculty members in learning the tricks of their new trade and in becoming successful in their new careers.

New hires in institutions of higher education have valuable experiences that can be useful to institutions planning to search for and retain new faculty members as well as current doctoral students who are preparing for careers in higher education. It is our hope that this discussion provides information useful to both groups, so that when each new faculty member is brought on board he or she will prove to be a good match with a particular institution of higher education. With strong support, faculty members will then be launched on successful careers, and departments/colleges will have acquired a valuable new faculty member who will make positive contributions to the work of the institution for many years to come.

References