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# So, Your Mom Wants to be a Mathematician

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## Synopsis

Despite all the stereotypes about them, mothers possess a skill set that makes them outstanding potential mathematicians. Most are organized, detail oriented, driven, determined, effective communicators; they are able to break down any concept or task into its principal components, and they can be logical and persuasive even when addressing the most formidable and unwilling audience. In short, no matter how messy, difficult, or tedious the task at hand, moms excel at getting the job done. This is my affirming story of how I left my engineering career to raise a family and returned to academia to pursue a doctoral degree in mathematics.

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Our culture sends conflicting messages about the roles of women and their options to navigate family and career. Young women learn early which are the more welcoming careers and roles; they also learn which roles are the “road less taken.” Studies explore how unequal pay, discrimination, and disparate representation in the boardroom and among college faculty have a cumulative discouraging effect: many female students decide not to pursue or persevere in their study of STEM subjects. Cultural norms and advertising inundate young women with messages about their limited options as they try to navigate their way into adulthood. This essay is a personal narrative to aid those who choose to pursue their dreams despite such obstacles. Here I tell the story of how I returned to university after raising my family, followed my passion in teaching and doing mathematics towards my current pursuit of a Ph.D. in Mathematics, and how I reclaimed my identity in the process.

**What to pack for the journey:** Tenacity, stubbornness, determination, hard work, friends, humility, a sense of humor, communication skills. It is important to mention that time, money, and a supportive family are helpful, but if you don't have these things, you can still be successful.

## **The Tunnel of Motherhood**

Emerging from the transformative process of becoming a mother can leave even the most confident woman feeling isolated, devalued, and searching for their former selves. Don't misinterpret my message, as I believe motherhood is an incredible blessing that I wish every woman who wanted to could experience. To welcome into this world a new person, to nurture, guide, teach, and watch a unique being become a free independent person is perhaps the most rewarding and important job of humanity. But it is a hard, selfless, messy, lonely, and undervalued job. And it often causes one to lose their self-centric view of the world. Eventually, when the mothering role reaches the low-maintenance phase and kids are pretty self-sufficient, many moms want to get back to their own lives and personal pursuits. Family, society, and culture are not always supportive at this point, and they can make it difficult for a mom to find herself where she started when motherhood began. It is this process that I describe as emerging from the tunnel of motherhood.

Mothers regularly make sacrifices for their children, many of which are so unconscious and pervasive that they go unnoticed and unappreciated. But each woman is also a person unto herself and should not only be defined after motherhood by her family and activities related to it. Each woman should be encouraged to pursue her own interests and to find an outlet for her talents.

In my case, I was an engineer before my four daughters came into the world within five years and I began my ten-year maternity leave. I realize many mothers don't have the option to leave the workforce and be a stay-at-home mom; for that I was privileged. As I look back on my choice to leave a thriving career however, I am disappointed about the options I had at the time. I was fortunate financially to be able to leave, yet I did not know at the time that it would have future unforeseen financial impacts. By making the decision I made, in a society that devalues the work of motherhood and measures worth by take-home pay all the while purporting to support the idea that mothers should be with their children during the time of their early years, I had entered a realm of invisibility.

I had worked for many years of my life to put myself through college and truly strived to get my degree and to work as an engineer. Yet now my technical training and applied knowledge were both irrelevant and disconnected to this new role. I felt lost and humbled. Aside from loving and caring for my family, I was not fulfilled by the typical domain of wives and mothers.

I don't aspire to launder, clean, decorate, shop, fundraise, or entertain. Cooking is fun for me only when time is not a constraint. Most of my mommy identity was defined by these things I didn't like to do nor was good at. Yet those tasks were perpetually returning to my to do list. Even if I did an awesome job at them, they would need to be repeated again soon, and my efforts would go unrecognized and unappreciated. I wish no ill will toward the many women who are fulfilled by devoting their time and talents to these activities. I don't wish to minimize or devalue any of them. I simply don't enjoy them. In fact, I am truly terrible at them, which probably explains my aversion for them.

### **Realizing I Wanted Something for Myself**

I was bored and felt I was a failure at most of the tasks I found I was responsible for, except for loving and guiding my daughters; at this I am awesome. I felt outdated, devalued, and minimized. Essentially my self-confidence was destroyed.

When asked by people if I worked, my response evolved from a simple "No," to "Yes, I do work but I don't get paid!"

Once my youngest was in school full-time, I again wanted to be valued, to do good work for fair pay, and to feel important about something besides satisfying other people's basic needs. My feelings of inadequacy and disconnection on the home front motivated me to follow my passion in science and mathematics onto a path of self-discovery.

I didn't feel I could return to work full-time as an engineer, but I wished to do something I was good at. I didn't have any mentors that were working mothers; I didn't know many women who had figured out how to balance the work and family worlds successfully. But I yearned for something long-lasting that I could feel proud of. I wanted to work on things I chose to do out of personal interest rather than drowning in tedious chores that no one else wanted to do, that somehow fell onto my to do list. I thought of my education, past experiences, and talents and how I could make them relevant after leaving the working world for so long. I finally decided to try adjunct teaching mathematics at a local community college.

## **The Joy of Teaching Mathematics**

Adjunct teaching mathematics at my local community college in a state with the lowest education achievement in the country felt to me to be important work. This was also a way for me to give back, as I was a product of the community college system myself. I also thought that since I could relate my personal experience to that of my students, I could genuinely support and encourage their success.

This small first step was pivotal for me. Teaching was pure joy. It was like drinking cool clean water. I absolutely loved teaching math and I realized I was a bit of a ham in front of the class. I especially enjoyed interacting with students and helping them overcome math anxiety and their tendency to make certain types of mistakes. I could offer meaningful real-world insight about where and how mathematics was applied, with my engineering experience. I was a role model to female students and women who were returning to college later in life.

After three semesters of teaching there, I decided to go back to school myself, to get a Master's degree in pure mathematics.

## **Juggling Cats**

Initially it was difficult for me to manage all my family, work, and school activities. This was mainly because, like many women, I still felt that my primary responsibility was to make sure that all my mom and wife tasks were taken care of, so I would almost always aim to do all that before spending time on my work and studies. If someone didn't have socks, or a lunch, their problem would take priority over my homework or the test I needed to prepare for the next day.

For so many years I was used to not really being in control of my own time. So when I needed more time for what I wanted to do, I had to become more organized and learned to put less importance on things that were not mission critical.

Still, I would feel guilty for wanting to just lock myself in my room with paper, books, and a cup of tea to work for a few hours uninterrupted. To savor the peace and solitary quiet study of mathematics. Too often the constant interruptions of children, a husband, and a household took precedence.



Many women are used to putting their priorities last. Many women are used to putting their own needs, wants, and pursuits on hold until everyone else is happy, and only then feeling free to spend time on their own pursuits. Why is this just accepted without question? This is a huge factor for many women. And it is one that may go unrecognized by those who have more opportunity for uninterrupted time to think and work.

I obviously do not have satisfactory and conclusive answers to these questions. But once I started asking them, I have found that I could reach my own resolution. To this day, I study in peace late into the night or begin very early in the morning while the house is quiet and there is less chance of interruption. I am happy to report that my children have grown, thrived, and actually have been inspired to work hard themselves by seeing my example as I study and pursue my dreams.

## **Supportive Fans**

Having an interested, supportive fan base is highly motivating. Friends, fellow moms, fellow graduate students, and a few treasured faculty mentors formed my informal support network. Unfortunately, not all adults in my family appreciated my desire to do paid work, which surprisingly proved to be very helpful as I navigated graduate school. Those who were unsupportive would at times alert me to how the rotation of the earth was approaching a complete standstill due to my efforts to pursue my higher degree. My absence from home to attend or teach classes seemed to have an almost tectonic effect on my home life. My motives, fidelity, and modesty were questioned and held suspect for this activity outside my home, and my lack of housewifery skills cited as reasons why I should not be pursuing higher things.

This level of opposition made me feel as if my achieving my dreams were a threat to the basic balance of society. Eventually I understood all the accusations and personal attacks against me were meant to break my spirit and ensure my surrender. I was not deterred. On the contrary, the negativity and intimidation I experienced from those who should have been my most fervent supporters had a cumulative and glorious effect. I became braver and more determined than ever.

As of now I am happy to report that the earth still spins on its axis. My advice for women who do not have the full support of their family behind them is to be confident, be strong, never give up, and seek supporters elsewhere. Those who try to manipulate you will themselves be deterred when they see your strength.

## **Studying Pure Mathematics**

My Bachelor's degree and early career experiences in engineering did lessen the shock of my return to college later in life. Since my background was not in pure math, I felt others considered me less mathematically rigorous, and so I worked to dispel this through my hard work. I also looked like somebody's mother. Of course that should be no surprise, for I am in fact mom to four intelligent, strong-willed daughters.

I was a bit unsure of myself at first, but quickly realized all my prior learning still resided in my brain. The paths to recall content were a bit overgrown and needed to be worn down by frequent practice until my recall was quick.

I began attending college part-time while I continued to teach math at a community college as an adjunct instructor. I quickly realized my engineering background provided me with the added appreciation of where most of the math I was studying was used in the real world. This is something many of my pure math colleagues did not have. I also discovered joy in the process of working theoretical and analytical problems in my coursework. Reworking a problem until I reached my own level of perfection upon seemingly endless pieces of loose white paper became an enjoyable pursuit. Spending time to explore the beauty and pure truth of mathematics brought me to my happy place.

### **Finding Your Way**

Beyond an appreciation for the subject matter, and getting up to speed on study skills, there are many other things one needs to be successful in pursuing a higher degree in mathematics. You must understand that no one is going to hand you everything you need, nor tell you what you need. You have to figure it out as you go, to plan, to think ahead, and to ask questions. You need to interact with fellow students and professors, pay attention to what they are doing, or not doing, and how or why they are doing it. Female students' experiences differ from that of their male counterparts. It is just the reality of studying in a discipline that typically doesn't have many women in the advanced positions. It can be discouraging unless you seek out role models and mentors for yourself.

### **Be a Mentor**

The most challenging period of my doctoral studies was when I was preparing of my comprehensive exams. The level of focus and practice I needed to devote toward exam preparing was the most challenging and isolating experience of my life. I emerged successful and determined to improve that experience for those that would follow the same journey after me. I initiated the formation of a student chapter of Association for Women in Mathematics in our department, so that other women graduate students could feel a sense of community, gain support, and hopefully experience less daunting isolation during their time in graduate study.



I initiated my local leadership role with AWM so my actions could improve upon what I saw as vacuum in the community of female graduate students: a lack of role models, mentors, and outreach activities. Undergraduate and graduate students have similar experiences and can support each other even at their various stages of study. It's encouraging to know your feelings and perspectives are shared and validated by others. Realizing that you are not the only one is an uplifting experience. Sharing strategies, failures, and successes can be helpful. In a competitive environment, it softens the blow to talk to and understand colleagues, and this in turn improves department cohesiveness.

### **Where Do All the Women Go?**

Math departments at many colleges have a male-dominated faculty, which means many departments have only one or two female full professors at best. This is in contrast to the recent trends in general college enrollment demographics which are tending toward a female majority. It is encouraging to visualize yourself reaching your goals. Yet, if your goal is math academia and you see few who share your particular demographics and have achieved success, it can be very discouraging. This dearth of role models is likely one of the reasons why few women choose to study mathematics.

Even for those that do choose to study math, it is important to ask questions such as: what are the experiences these students as they work to complete Bachelor's, Master's, or Doctoral degrees? Where do they go after graduation? What do they choose to do with their degree? Why don't more of them eventually become faculty? Once I started asking these questions, I realized that many others too must be asking the same questions.

I cannot help saying "Ok, Google, I doubt the answer is a woman's preference." The employment environment can reveal a lot. Is it welcoming, supportive, even-handed to new female faculty? Is their success emphasized as much as that of undergraduate students is these days? What are their first-year experiences like? Are there mechanisms in place to support their success? The presence of women in my department is itself inspiring. However, beyond mere presence, meaningful interaction with female students is needed. Until recently I hadn't experienced any mentoring from the women in my department though I had attended for several years. Could it be that at their level, interaction with those less experienced is not encouraged?

**Ask for the Mentor You Want.**

I initiated my own mentoring experiences and I believe that is the secret. You can't expect people to know what you need unless you ask them for it. This may seem obvious, but it is incredibly empowering.

Sometimes it helps to look for mentors on a larger scale. If your department doesn't seem to have any viable mentors, maybe the larger units within the university or within a professional organization do. You can find mentors who are outside your academic area and have great advice and valuable experiences that are very applicable in your regional and academic area. Outside my department I have met many strong successful women at various levels of professorship and leadership.

My mentoring experiences all began with me reaching out, attending a talk or event, or requesting a mentor from a mentoring network. I began by introducing myself, stating my interest in their work, or thanking for their presentation, and then asking if I could learn from their experience. These efforts were slow, as people are busy and mentoring is something that slips into lower priority levels. Eventually my initiative paid off, and I currently have two out-of-region mentors and several more locally. I'm finding that it is great to have more than one mentor, as you gain their different perspectives and expertise areas.

It is important to know that sometimes you can ask for mentorship, and your request is not well received. Not everyone will be supportive of you, but you won't find out until you ask. Seek potential mentors with whom you feel a common interest or shared perspective, and forgive them if they reject or ignore your request for mentoring. It may just be a matter of timing and have nothing to do with you personally.

**Networking is Golden**

My best advice is: "When coursework allows, attend every colloquium, talk, presentation and conference you can during your time in college, especially those that are outside your specific area of study." Each is an opportunity to expand your knowledge base, to meet others, to talk, to network, and to open doors you don't even know you want to go through yet. I waited too long to attend my first conference. I'd use the excuse that I was repeatedly told, and I repeatedly listened to: "Don't attend until you have a paper to present".

This is simply not true. You can attend just because you have interest. I finally did the opposite of what was advised. I registered to attend and present a contributed talk and I later wrote my talk that I would present. This was truly backwards, but a highly motivating and invaluable experience. I met so many welcoming, impressive, supportive, and inspiring people from other universities and at all levels of experience. I regret not attending a conference much earlier.

One reason for my delay to travel to a nearby conference was my lack of confidence, combined with a baseless fear that my family couldn't survive a few days without me. I think this is a huge factor for many mothers because we spend so much time doing everything for everyone. While this does allow us to feel needed, it also makes it difficult to do things on our own. This assumption that we are the only one qualified to do our mothering tasks is more understandable when children are very young, but today many conferences or their designated hotels provide for childcare so you could possibly just take the baby along! Furthermore if one is lucky, one's home support network should be able to accommodate some travel. Beyond the demands of family, finances could also deter women's conference attendance. But today, many departments, professional, and academic organizations do provide travel support for graduate students and early-career academics. The secret is that you have to do some homework, planning, and most importantly just ask for what you need.

### **In Closing**

I am still in the thick of research and writing my dissertation, but I am encouraged. I feel renewed after completing my comprehensive exams. I'm continuing to seek out and take advantage of networking and mentoring opportunities. I am developing my research area and growing a network of mentors and potential collaborators. I look forward to the work I have to do. I hope readers are also encouraged by my story and the advice offered to those women who need encouragement early and throughout their studies.

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