

CHAPTER 1

INTRODUCTION

WHAT IS DOCTORAL EDUCATION?

- The Ph.D. Program
- The Demands of Doctoral Work
- Why Some Women Find Doctoral Work *More* Than Demanding
- How to Make It

The fundamental purpose of a doctoral program is to help you become a professional who generates ideas within an extremely specialized field. As an undergraduate, you probably spent most of your time reading and writing about established theories and research. You were required to learn existing knowledge. By contrast, doctoral study will challenge your ability to learn in a completely different way. It focuses study in one discipline, and it requires that you conduct original research and formulate your own theories. Whether explicitly stated or not, as a doctoral student you will be expected to create new knowledge.

Graduate school should also be considered an intensive training process. During the course of your doctoral work, you become an expert in your field. Many of you will learn how to become faculty members; others, professional researchers and practitioners in the private sector, the public sector, or other nonprofit organizations. The work you do now will begin to establish your credibility as an authority on your chosen subject.

The Ph.D. Program

The highest degree awarded by academic graduate programs is a doctorate. Although there are many legitimate “doctoral” degrees—such as the J.D., Juris Doctor for lawyers; Ed.D., Doctor of Education; Pharm.D., Doctor of Pharmacy; and Th.D., Doctor of Theology for religious ministers—the recognized research degree



Indira Nair

AN INTELLECTUAL HIGH

"The Ph.D. is a challenging and tough endeavor for everyone because of the exploration into uncharted places of knowledge. This is also what makes it inviting, exciting and worthwhile, because one is able to discover one's own intellectual strengths as well as the way one's curiosity develops during this time. There is no other instance in which one can feel quite the same 'intellectual high' and sense of accomplishment that one's own Ph.D. work gives, so it is important to understand and learn to navigate the process."

Indira Nair
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for the liberal arts, the sciences, and engineering is the Ph.D. (or, in some institutions, the Sc.D.).

A Ph.D. has the following basic requirements:

- Residency in an approved program of study.
- Proficiency in a prescribed body of knowledge within a specific field.
- Proven ability to perform independent investigation on a significant problem within a specific field, the evidence of which is the presentation and defense of a dissertation on an original piece of research.

Some doctoral programs incorporate a master's degree into the course of study for a Ph.D. (Some require completing a master's degree before entering the program.) A student enrolls in the program after undergraduate school, receives a master's degree in the first year or two of study, and then continues working toward the Ph.D. In many departments, however, the Ph.D. process is separate from the M.S. process, and the M.S. is not necessarily a prerequisite for the Ph.D.

The typical degree program lasts approximately four to six years and incorporates courses in your chosen field of study with research. You build on your course work and original research to write a dissertation that is presented and defended before a faculty committee. This is a much abbreviated description of what happens; greater detail is presented throughout this guide.

The Demands of Doctoral Work

You've probably already heard how tough doctoral work is—how demanding the schedule is, how long it takes, and how the workload gets heavier with each passing term. All of this is true—and then some. In fact, doctoral work may be one of the most challenging experiences of your life to date. It can also be one of the most rewarding. If you know what to expect and if you have a solid knowledge base and skills for survival, you will be better prepared to meet its challenges and reap its rewards.

You have to understand that there are few standard rules in graduate school. Requirements and expectations vary among schools, departments, and disciplines. Some institutions have no central graduate school that handles admission and administrative policies and procedures; each college, department, or program within the university may have its own requirements for admission and completion of a graduate degree. Other schools, often larger universities, have formal graduate schools with requirements for admission and graduation that apply to every graduate student. Individual departments and programs may have their own requirements in addition to the graduate school's; however, for admission and graduation, each student must meet the minimum standards.

Creating new knowledge is the most exciting thing about a Ph.D.; your Ph.D. program is designed to help you develop the skills necessary to create that knowledge. The first few terms of your program, through classes and meetings with your advisor, help you discover where your research interests lie. Your course work and qualifying exams are designed to provide you with the theory and research tools necessary to develop “ownership” of knowledge. Finally, through planning and writing a dissertation, you can begin to outline and explore research questions of your own.

Apart from academic requirements, doctoral work can also place enormous demands on your self-confidence. Graduate courses are typically much harder than undergraduate courses. Overwhelming duties like developing a research study, teaching classes, and writing and defending a dissertation can all place great stress and strain on your mental faculties. Doubting yourself and your ability to survive is perfectly natural. You may ask yourself questions like, “Can I discipline myself to write a major paper? Will I ever create something new? Do I have what it takes to make a significant contribution in my area? What do my advisors and committees think of me?” Recognizing that stress and self-doubt are a natural part of any significant experience, including graduate school, tends to help.

OBLIVIOUS AND CONFIDENT

"My graduate class was small, but about one-third of it was women. The department was very supportive, and it was a fabulous place to be a graduate student. There were some people who didn't think women belonged, but the other women graduate students and I simply avoided them. I must say that I was pretty oblivious to the attitudes of others about my being a woman in science. I guess that was a blessing because I never felt like I didn't belong or shouldn't be pursuing something that I loved. I learned early on that it's a very good ploy to act confident even when you're not because then people perceive you as confident, and that makes a big difference."

Lydia Villa-Komaroff
*Associate Vice President for Research Administration
and Professor of Neurology, Northwestern University
(Ph.D., Cell Biology, Massachusetts Institute of Technology)*

From Journeys of Women in Science and Engineering: No Universal Constants

**Why Some Women Find Doctoral Work
More Than Demanding**

There is no doubt that graduate school is extremely demanding for everyone. However, it does pose certain challenges that affect women more than men. These challenges can be more complicated for women of color, lesbians, differently abled, or economically disadvantaged women.

Graduate school is a relatively recent option for women, especially those interested in the sciences and engineering. Traditionally, white men pursued doctorates, while most women were held by societal and cultural precedent to a bachelor's degree at best. Today, many women graduate students meet "invisible barriers" within the graduate school system. Many of these barriers are also invisible to men in the environment, and they may unwittingly participate in perpetuating the system. When questioned about whether they're supportive of women in their departments, these men may answer "yes," but unknowingly they may have access to information and contacts their female counterparts do not. The barriers—and the system—are unknown to most women because of their status in the environment. In fact, many women in engineering and science departments around the country report that graduate schools still operate like an "old boys club." Whether by design or default, women may find that they are not privy to the secrets of successfully maneuvering the system, and too often they blame themselves for faults that are part of that invisible system. In some cases, women are welcomed with open arms to academic engi-

neering departments but are *still* isolated by a system that was put in place well before their arrival. Fortunately, current research on the graduate school experience for women has identified many of these invisible barriers and has presented ways to cope with them—as we hope to do in this guide.

One well-documented barrier is finances. Historically, some women in the sciences and engineering did not receive comparable financial support to men, including grants and postdoctoral positions. In the short term, women may face greater financial and professional strain. Some women have been forced to drop out of Ph.D. programs due to a lack of funding. For many women, financial burdens coupled with an absence of female colleagues and mentors can make the entire experience too difficult and too costly at a personal level. In the long term, inequities can erode the personal strength and self-confidence of female graduate students and can cause them to lose faith in the system. More recently, many colleges and universities have recognized the limited support for women in graduate school and have begun to revise their funding policies.

Women still encounter difficulties because of stereotypes that depict them as intellectually inferior, stressed-out, or wanna-be mommies, but not workers. As a result, faculty and fellow students may unconsciously gauge their views of fellow female classmates in line with limited expectations. Too often women encounter subtle forms of resistance that challenge their personal self-confidence and limit their access to university community resources such as mentoring, collaboration, and informal exchanges vital to academic success.

Although it may seem that women in doctoral programs have already made the choice of career with or without family, the lines are usually not so clear. Some are older and already have families when they begin school—and the majority of the responsibility for housework and child care remains with them. The majority of women still have to cope with greater demands on their personal time than their male colleagues. Female graduate students who also happen to be wives and mothers may encounter subtle forms of discrimination for not being “serious students” and for not being able to completely commit themselves to their graduate work 24 hours a day. They also experience more stress due to expectations at home.

How to Make It

These and other challenges make it that much harder for many women to succeed in graduate programs. As a woman in science or engineering, you’ve probably already experienced some of these problems during your undergraduate years, although many women don’t recognize them until they reach graduate school. You know how the system operates, and, obviously, your enthusiasm for your field has carried you this far. The belief in yourself and your ability to succeed, as well as your passion for learning and study, will help you make it through graduate school. When you enjoy what you do, working hard to succeed is worth it.

Women in graduate school in science and engineering today are less likely to be the pioneers they were a generation ago. Although you still face problems simi-

A RATIONAL OUTLOOK

"I wanted to do engineering because it suited me—it was very rational and I liked its exactness. I have always enjoyed problem solving, and was always intrigued and excited about reaching some sort of conclusion.

"The idea of graduate school came to me when I realized that I was a better student as an undergrad than most of the other students, and that I could probably contribute to society more by getting a Ph.D. I also realized that I had the potential to do much more than calculate the flow rate in multiple pipe systems!

"When I was an undergraduate student in Belgrade, Yugoslavia, about 30–35% of the students in the mechanical engineering program were women. I do not remember any issues of gender differences—we all felt like pretty good friends. When I entered graduate school in the United States, I continued to take a proactive approach focused on my studies. I really did not feel that being a woman was going to be to my disadvantage. That positive attitude was and is crucial to bringing my studies to completion.

"I think the fear of discrimination that is imbedded into women is exaggerated. Although some women do experience true discrimination, some women believe that being a woman is advantageous. My overall experience is somewhere halfway between to two extremes. An engineering doctoral program is demanding in its essence, and I believe that thinking that hard times are inevitable could lead to bad judgment. It is easy to confuse gender discrimination with problems such as professors or fellow students lacking people skills.

"A word of advice: be proactive, stay oriented toward achieving your career goal, and every day take a step forward."

Teodora

doctoral student, mechanical engineering

lar to those who came before you, and the situation in most graduate schools is far from perfect, it is improving. The encouraging news is that, as a woman in graduate school today, you will be able to experience and influence changes that your predecessors never imagined.

In this guide we share successful strategies developed by other students for surviving and thriving in their doctoral work. We also have included many suggestions for developing the knowledge and skills to prepare you for your life's work. Graduate school will truly test your commitment, energy, and patience. Probably no other situation in your life to date will be as overwhelming—or rewarding.