Expectations of Environmental Engineering M.S. and Ph.D. Students

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Approved by the Faculty

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Introduction

This document is designed to provide an overview of general expectations during your graduate studies at the Environmental Engineering Department at Texas A&M University-Kingsville (TAMUK). Please review the document and discuss it with your academic/research advisor and other committee members, faculty, staff and colleagues as needed.

As a graduate student, you will be spending the next few years immersed in research and study. During this time, you will learn how to perform thorough literature reviews, formulate research questions, develop technical and analytical skills to answer those questions, and learn how to communicate your results to a wide range of audiences.

To achieve these goals, you will be expected to learn with much greater independence than you have in the past. You will need to do significant background reading on your research topic, enhancing your understanding of both the broad field of study and the specific technical and analytical aspects of your research project. You will develop experimental procedures and protocols to investigate your topic in the laboratory (or field) and you will develop mathematical models to both understand the system you are investigating and to interpret your experimental results. Inherent in this independence are the requirements that you must have the ability to learn and adapt, the willingness to do what is required to complete the research, and show initiative, dependability and self-motivation.

It is important to realize that it takes a lot of work to earn a graduate degree. Your life will revolve around your research and studies, and most students spend a minimum of 50-60 hours a week working on graduate research and academics. To give you an idea of important characteristics to be a success in graduate school, the table on the following page compares mediocre students to outstanding students. Mediocre students are not good researchers and may struggle both academically and professionally. Of course, you were admitted to Graduate School at TAMUK because of your top-ranked qualifications and character references, which were reviewed by the faculty and judged to be outstanding enough to meet these high standards.

Finally, do not think graduate school is all hard work and toil. It can and should be one of the best experiences of your life. You will have opportunities that you will not find in any other setting; you will make new friends from across the globe; and you will learn, if you have not already, that you can succeed at anything if you dedicate yourself to it and stay focused.

Characteristics of Mediocre and Outstanding Students[1]

Characteristic	Mediocre Student	Outstanding Student
Work habits	Views research as a "9 to 5" job. Does not work on weekends, evenings and leaves work early Friday afternoons. Takes shortcuts on laboratory experiments because the experiment is "taking too much time." Only performs experiments at advisor's prodding.	Uses time efficiently and is willing to work beyond usual business hours, including evenings and weekends, to ensure research is completed in a timely manner and perform to highest standards. Proactively initiates experiments. Maintains the highest ethical standards of conduct.
Keeping up with current literature	Reads only journal articles provided by advisor or other students.	Actively and continuously performs literature searches to independently locate journal articles.
Research hypothesis	Content to work on research hypotheses developed by research advisor or others.	Independently and continuously formulates research hypotheses for both the student's own project and other projects not directly related to student's project.
Lab notebooks	Takes general notes, where the notebook acts more as a research diary.	Provides detailed descriptions of work done in the lab or field. Step-by-step descriptions and observations are recorded so that anyone using the notebook can completely replicate the experiment.
Writing	Only writes when forced by their advisor.	Continually writes, including maintaining updated literature review of pertinent topics, writing journal publications and reports, and developing research protocols.
Publication	Looks at publication as an afterthought to the experiments. Minor effort put forth in developing manuscripts and assumes advisor will rework mediocre manuscripts.	Realizes that publication of research results is paramount and makes considerable effort in developing and writing manuscripts. Continuously develops new publication ideas and proactively approaches advisor with potential manuscripts.
Problem solving	Comes to advisor seeking solutions to research problems.	Looks at research problems as an opportunity to grow and learn. Develops potential solutions to problems and discusses them with advisor.
Teamwork	Focuses solely on own research.	Understands that the collective output of the laboratory is a key component of the student's own success, and therefore willingly assists others in the lab with projects and lab chores. "Cooperate and Graduate" is a good motto.

[1] Adapted from a memo by Dr. R. Hughes, UMI, to his graduate students, dated 16 December 2003.

Philosophy of Advising Graduate Students

A main goal of the Program is to prepare you to be an independent thinker, who is capable of formulating research questions; to be technically capable, so you can identify research questions and develop and implement research plans to address those questions; and to be an effective communicator in disseminating your research ideas and results to the scientific community and general public. The faculty will act as mentors, collaborators and unrelenting advocates for your success, and in return they expect you to work hard, show continual progress in your research, be conscientious and strive for excellence. For the most part, our management style is hands-off, where we allow you the freedom to pursue your research without strict direction and having to tell you what to do and how to do it. Inherent in this approach is the expectation that you must be self-motivated, diligent, conscientious, and proactively initiate and conduct your research.

Faculty views on M.S. and Ph.D. degrees differ only in the amount of work required to achieve the degree and in their involvement in laying out the research problem. They are:

M.S. Thesis/Research Report is based on advanced research focusing on solving an engineering or scientific problem, with the problem and solution approach typically defined by the faculty. The thesis should involve writing and preparing one journal article for submission to a peer-reviewed journal under faculty supervision. M.S. Research Report authors should take enough pride in their achievements to at least consider a peer-reviewed journal article submission.

Ph.D. Dissertation represents a student's original and independent research that advances the field being studied, and involves the development of a dissertation which should result in 2-3 peer-reviewed research articles published in high impact journals. The Ph.D. student who will graduate in spring 2023 (or after) should have at least one paper published or accepted or under review but accepted with minor change (requires an official email/communication from the journal office) prior to defending his/her final dissertation. The research is conceived, performed, and reported by the student under faculty supervision.

The faculty truly believe that one other aspect of advising graduate students is for your faculty advisor to help you obtain the skills appropriate to your intended vocation after finishing your graduate degree. For example, if your goal is to pursue a faculty position after obtaining your Ph.D., then they will help you gain experience developing research ideas, writing proposals and papers, teaching courses, and advising students on research projects. To this end, they will have discussions with you on your career goals, where they can identify the requisite skills and design a plan for your graduate program to help develop these skills.

Expectations of Graduate Students

The faculty expect hard work, creativity, ingenuity and honesty from all students. The faculty

firmly believe that you can learn more from your failures than you do from your successes, so they also expect a willingness to pursue new ideas without fear of failure. A key requirement to join an Environmental Engineering research group is that students must be articulate and demonstrate excellent communication skills (both oral and written), as a significant portion of research involves presenting and publishing the research and results.

You will be responsible for managing and conducting your research in accordance with the highest standards of professionalism and service. This requires a responsible, independent and professional outlook on your part. The faculty also expect (and demand) that you be ethical in your approach to your research, your studies, and your interactions with fellow students and faculty. Any violation or failure to maintain the highest ethical standards is unacceptable. Examples of unethical behavior include plagiarism, cheating on coursework, and fabricating experimental data. Unethical behavior will result in immediate dismissal from research groups, and loss of assistantships, scholarships and fellowships.

If you have any questions related to ethics, you should talk them over with any of the Environmental Engineering faculty.

The faculty members have an expectation of continual progress and excellence in your research. When you set out on an experimental series, they expect that you will see it completely and thoroughly through to completion, including analyzing the data and writing up the experimental results. Publication is paramount in research – you can do the best work, but if it is not published, it is meaningless. Given this, continual progress in your research includes publication of results. After your first year, there will be an expectation for you to develop and submit at least one journal publication per year on your research. This will result in one publication for M.S. students and at least two to three publications for Ph.D. students.

Most faculty have weekly research group meetings, and all students are expected to take turns presenting their research during these group meetings. This is an excellent forum to gain experience in presenting your research and to obtain feedback from your classmates and colleagues. Most faculty also meet at least once weekly one-on-one with each of graduate student to discuss their individual research and progress, especially in the last few years prior to graduation.

For students working in the EVEN laboratories, safety is vital. When working in the lab you must wear long pants, closed-toe shoes, eye protection, and a lab coat at all times. Safety also involves keeping a neat and clean work area. Glassware must be cleaned and put away after each experiment. Solutions must be properly labeled and stored, and they must be disposed after use, and instruments and equipment must be treated with care and cleaned after each use. Cluttered, dirty work areas both pose a safety hazard and lead to poor research. Safety in the lab also includes proper use of chemicals and gases. If you are unsure about how to handle or store certain chemicals, you should discuss this with the Lab Manager or faculty. Research conducted in the field also requires the highest safety standards in truck operation, the conduct of safety meetings onsite, and proper protective gear.

For documenting experiments, faculty will assign laboratory notebooks to students and these

notebooks remain the property of the faculty. You will be expected to maintain the notebook such that anyone can read it and be able to completely replicate your experiments. This involves writing down step-by-step protocols for conducting your experiments, notes and observations during your experiments, and summarizing the results of each experiment. These notebooks are given back to the faculty at the completion of your research.

Ph.D. students are required to demonstrate the breadth and depth of their chosen field and topic area at both their proposal and dissertation defenses. Typically, this will include some form of mathematical modeling or innovative engineering analysis in at least one of their publications.

Finally, the faculty will ask that all Ph.D. students write and submit, under faculty supervision, at least one proposal to an external funding agency (e.g., National Science Foundation, U.S. EPA, others) during their tenure at TAMUK. This provides an excellent educational opportunity for developing and writing a research proposal and demonstrates to potential employers that you have the ability to develop and formulate research ideas. Writing and submitting a proposal also allows you to give future TAMUK students the same opportunity to perform research and work towards a graduate degree that was made available to you through the hard work of your predecessors.

Final Thoughts

As mentioned above, the faculty of Environmental Engineering only admit students who have the potential to be outstanding researchers and scholars. Reading this document and following the expectations outlined within will help you achieve this excellence. We highly recommend that you frequently refer to this document during the course of your research and academic career and use it for continual self-assessment and guidance, and discussion with your advisor and committee members.

Adapted from documents developed by Dr. Derrick Brown of Lehigh University.