Thinking of Graduate School?

Perspectives from the CEE Editorial Team and Publications Board

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Each year in the first pages of the *Chemical Engineering Education* Graduate Guide, we provide an article aimed at the main users of the "CEE Grad Guide" – students thinking about going to graduate school. In the 2021 edition, I have engaged the members of the journal's Editorial Team and the Publications Board on six questions that, I hope, will help provide you with a perspective on things to think about when considering graduate school. You can find the names and affiliations of our Editorial Team and Publications Board in the masthead of the journal (front inside cover of any issue). Where applicable, I have provided verbatim quotes and attribution. The aggregation of opinions to find central themes for the response to each question was my own work, and I do hope you value the variety of perspectives provided.

What inspired you to go to grad school?

Inspiration takes many forms. Taryn Bayles focused on the "*opportunity to strengthen my understanding of chemical engineering*" as a main reason to go to graduate school. On the other hand, Lisa Bullard described a variety of experiences she had during her undergraduate career and beyond as "*pruning the tree of available options*" which, ultimately, led her to graduate school and a career as a professor.

Of course, to become a faculty member in chemical engineering, a doctoral degree is required. For Laura Ford (and several other respondents), the decision was practical, writing, "*To become a professor, I needed to go to graduate school*."

Most of the respondents noted undergraduate research experiences were a catalyst towards the decision to go to graduate school. Others did not see a strong fit between themselves and industry, based on their co-op or internship experiences, with a few making this realization *after* graduating with their BS and already on the job.

However, not all respondents had undergraduate research experience prior to entering graduate school. Thus, you should not be dissuaded at all from pursuing a graduate degree if you were not involved in research during your BS degree.

What is the best piece of advice you received when considering graduate school?

The consensus seemed to be that graduate school was not easy, but it provided additional career options beyond that of a BS degree. Indeed, graduate school should not necessarily be a backup plan if you cannot find an industry job, but rather it should be treated as a genuine and valuable pathway.

Adrienne Minerick commented that the best advice she received was "*to go directly to graduate school and then move into industry,*" as opposed to the other way around. The pathway of BS degree, industry, and then graduate school, while viable and utilized, is not typical. Once you get used to making money and having free time, going back to a student lifestyle can be a challenging transition. However, those who do not consider graduate school right after their BS degree may find that they are a more competitive and well-prepared graduate school applicant with a few years of industry experience.

The key takeaway in most of the advice provided seems to be that graduate school opens doors to a different career than what an undergraduate degree might allow – this is especially so for those who earn a PhD rather than an MS degree.

How is selecting graduate school different than selecting an undergraduate school?

The response from almost all of those who answered this question tended to identify "focus" as the key difference. As an undergraduate, you likely considered (and, ultimately, utilized) a variety of on-campus opportunities available and advertised to undergraduate students, such as student organizations and campus athletic and cultural events. In graduate school, on the other hand, you are focused on your studies within your department and are advised in your research by (normally) a single faculty mentor. Indeed, the selection of a graduate school may hinge on the specific type of research that occurs within that department (and the CEE Grad Guide can help with that).

Other factors that impact the choice of graduate school may include proximity to family, cost of living in that area, and desire to work with a specific professor. Dan Burkey had another perspective, however. His upbringing and undergraduate experience were largely rural, and he looked at graduate school as an "*opportunity to live in a city and experience something different*" (in this case, the city was Boston).

Some schools will have recruiting visits for prospective graduate students, so applying early may allow for those opportunities. Additionally, many schools provide stipends (especially early on) to become a teaching assistant, which often is accompanied by a tuition waiver. These may be important considerations when selecting a graduate school to attend.

Describe your initial impression of graduate school before or when you started and how it changed over time.

Troy Vogel called the start of graduate school "*Year 5 of undergraduate,*" which underscored the emphasis on coursework during that first year. However, things changed for many of our respondents after that first year. For example, Polly Piergiovanni called the subsequent years of graduate school (after the first) "*very collaborative*" and Justin Shaffer described the middle stages of graduate school as ramping up "*quickly to a peak*." Matthew Cooper identified a shift after his first few years of graduate school that made him think deeply about the course material with a focus on "*gaining conceptual understanding in the field*," rather than just focusing on a grade.

Writing becomes both a big priority and a milestone in graduate school as well. Carlos Rinaldi-Ramos mentioned that his first journal paper, written during his third year in graduate school, became a "*huge confidence booster*" after questioning his progress during the first two years.

It is important to note a crucial distinction between undergraduate school and graduate school. As an undergraduate, a semester course load would typically be 12 credit hours at a minimum, though some students could get near (or above) 20 credit hours. At the graduate level, it would be atypical to have more than 12 credit hours of courses in a semester, especially as coursework credit hours decline and research credit hours increase as one progresses in their degree. Indeed, graduate school in chemical engineering is typically front-loaded with courses, while the mid/end stages of a graduate program, especially at the PhD level, are focused on your research project and preparing archival journal publications.

How was graduate school different from your undergraduate experience?

Two themes stood out from the answers our respondents provided: (1) the focus on research and (2) independence. Of course, graduate school has an emphasis on research, and this creates a contrast with the many courses you are required to take and complete at the undergraduate level. The independence theme was an area several respondents reflected on in a positive way, allowing them "*to learn as much as I wanted,*" according to Joe Holles and "*the flexibility and responsibility to learn on my own,*" commented Allison Godwin. In addition to research and independence, Cheryl Bodnar mentioned that time management skills are crucial in graduate school since you have to "*manage your coursework, work on your research project, and serve as a teaching assistant (depending on your program).*"

There are, of course, several crucial differences between graduate school and one's undergraduate experience, not the least of which is cost. A few respondents commented on having to work while attending school as undergraduate student. On the other hand, in graduate school, you can often earn a stipend (through becoming a teaching assistant or a research assistant) and have your tuition waived as well, depending on the school.

How has graduate school changed, if in any way, since you were in school as a student?

As time has progressed, graduate programs typically require fewer courses now than in the past. Additionally, as John Falconer has pointed out, "*Computers have made a dramatic difference in what can be done*." For example, what might have been an MS thesis project a few decades ago might now be considered an undergraduate research project owing to what computers allow researchers to explore.

A few of our respondents commented on how much more prepared students are now for graduate school, relative to the past. This largely has to do with the undergraduate research experiences students have now, which makes both their resumes and their ability to contribute right away (from a research perspective) superior to students twenty years ago.

Finally, another important aspect mentioned was that programs now are more sensitive to mental wellness challenges of students than they were even five years ago. Even with this increased sensitivity, however, there is likely much more than can be done in this area in the future. ❐