The National Academies of
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Overview of Student and Faculty Focus Group Findings

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Context for *Overview of Student and Faculty Focus Group Findings*

The Committee on Revitalizing Graduate STEM Education for the 21st Century contracted Research Triangle International (RTI) to conduct a set of focus groups and provide an analysis of findings as one part of the execution of the landscape analysis described in the Statement of Task (below). Under the contract, RTI completed a series of focus groups focused on the promising practices and policies that support graduate students and the barriers and challenges that exist within the current system to identify critical issues and levers for change. The proposal included a provision for pairs of focus groups at several sites, one with graduate students and one with faculty. Given the different roles these groups have in the graduate education system, segmenting the groups allowed for the development of separate, distinct focus group guides tailored for the different roles. RTI completed eleven focus groups (six with students and five with faculty). The following constitute the proposed responsibilities, tasks, and deliverables from RTI International:

- Work with NASEM staff to refine participant parameters and recruit participants from institutions at each site
- Obtain IRB exemption or approval for the study from both RTI and NASEM
- Work with NASEM staff to agree on research questions to frame the focus groups. NASEM staff will serve as liaison to Committee members as needed for input.
- Agree on two focus group guides based on the research questions and NASEM staff input.
- Facilitation and notetaking for two focus groups in each of 5 sites.
- Analyze focus group data.
- Write up focus group methods and results into a report.
- Revise the written report based on internal review, NASEM staff, and study committee input.
- Attend committee meetings (May 22-23 in North Carolina where RTI's attendance will be virtual, and a meeting in December in Washington, DC) and present preliminary focus group results in-person at the December meeting.

The committee used the multiple presentations of the focus group preliminary findings and final analysis as one of many evidence-gathering activities to inform the development of the report. The committee acknowledged the qualitative nature of the research and analysis and reference the material appropriately in their deliberations.

Statement of Task

An ad hoc committee, under the auspices of BHEW (Board on Higher Education and Workforce) and COSEPUP (Committee on Science, Engineering, and Public Policy), and liaising with GUIRR (Government-University-Industry Research Roundtable) and TAC (Teacher Advisory Council), will lead a study of STEM graduate-level education in the U.S., revisiting and updating a similar COSEPUP study completed 20 years ago.

Specific tasks will include:
- Conduct a systems analysis of graduate education, with the aim of identifying policies, programs and practices that could better meet the diverse education and career needs of graduate students in coming years (at both the master's and Ph.D. levels—understanding the commonalities and distinctions between the two levels), and also aimed at identifying deficiencies and gaps in the system that could improve graduate education programs.
- Identify strategies to improve the alignment of graduate education courses, curricula, labs and fellowship/traineeship experiences for students with the needs of prospective employers--and the reality of the workforce landscape--which include not only colleges and universities but also industry, government at all levels, non-profit organizations, and others. A key task will be to learn from employers

how graduate education can continue to evolve to anticipate future workforce needs.

- Identify possible changes to federal and state programs and funding priorities and structures that would better reflect the research and training needs of graduate students.
- Identify policies and effective practices that provide students and faculty with information about career paths for graduates holding master's and Ph.D. degrees and provide ongoing and high quality counseling and mentoring for graduate students.
- Identify the implications of the increasingly international nature of graduate education and career pathways, reflecting both the numbers of foreign students who enroll in U.S. graduate schools and the increasing global migration of U.S. STEM graduates.
- Investigate the many new initiatives and models that are influencing graduate education, including MOOCs, other digital learning programs, increasing numbers of alternative providers of master's and Ph.D. degrees, and opportunities to secure credentials through multiple sources.
- Create a set of national goals for graduate STEM education that can be used by research universities, Congress, federal agencies, state governments and the private sector to guide graduate level programs, policies and investments over the next decade, and ensure that this "blueprint" for graduate education reform is revisited and updated on a periodic basis to reflect changing realities.

The products of this study will be an interim report and a final report that is widely disseminated for analysis and adoption of new programs, policies, and practices that enhance STEM graduate education. This may include dissemination activities on campuses, at professional society meetings and in other venues to share the report's findings and recommendations and to engage stakeholders in discussions around implementing new strategies, programs and models.

Revitalizing Graduate STEM Education for the 21st Century

Overview of Student and Faculty Focus Group Findings

Preliminary Summary

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Executive Summary

- RTI International conducted six student and five faculty focus groups. Institutions included South Dakota State University, The University of Northern Colorado, Texas A&M University Corpus Christi, Texas A&M University Kingsville, and Florida A&M University. A student focus group was also conducted at the American Indian Science and Engineering Society conference.
- The purpose of the focus groups was to better understand the science, technology, engineering, and mathematics (STEM) graduate education experience for students and faculty to identify policies, programs, and practices that could better meet the educational and career goals of graduate students.
- RTI administered a student and faculty background questionnaire after each focus group to collect demographic data on participants.

Student Demographics

- Most students were female (55%), White (68%), and pursuing master's degrees (60%).

Faculty Demographics

- Most faculty were male (58%), White (65%), tenured (73%), and had taught previously at one or more institutions (69%).

Select Preliminary Findings

Students

- Students' primary reason for selecting their graduate programs was funding.
- Most students cited relationships with advisors as a major strength of their graduate programs as well as practical experience and the sense of community.
- Students thought balancing demands outside of school with graduate requirements was a barrier to accomplishing goals. The most frequent recommendation to improve graduate education was to provide better funding to students.

Faculty

- Faculty reported that their own graduate programs had prepared them well for their positions; however, lack of grant writing or publishing experience left them initially disadvantaged in their careers.
- Most faculty indicated that their primary responsibility as an advisor was career advising. Many faculty echoed students' concern about inadequate funding and/or resources for students (e.g., access to lab equipment, funding for conference attendance).

Introduction

In this summary document, we provide an overview of the focus groups we conducted as part of the "Revitalizing Graduate STEM Education for the 21st Century" study led by the National Academies of Science, Engineering, and Medicine (NASEM). The primary purpose of the focus groups was to better understand the science, technology, engineering, and mathematics (STEM) graduate education experience for students and faculty in an effort to identify policies, programs, and practices that could better meet the educational and career goals of graduate students.

First, we present an overview of the institutions included in the study and an overview of methods, then follow with a summary of themes pulled from the student and faculty focus groups. Preliminary findings are presented thematically and supported by representative illustrative quotes where possible. Aggregate data from the student and faculty questionnaires are presented where applicable. The intent of the questionnaire was to provide NASEM with some demographic information about the focus group participants. It should be noted that not all questions on the focus group protocol were asked of every participant at every focus group, and not all participants responded to every question that was asked.

Institutions

- The five institutions were South Dakota State University, The University of Northern Colorado, Texas A&M University Corpus Christi, Texas A&M University Kingsville, and Florida A&M University.

- The national association was the American Indian Science and Engineering Society (AISES). The Indigenous Research and STEM director from the University of Montana recruited students at the AISES conference, sending an invitation to all 20 graduate students with Sloan Foundation Scholarships.

- The universities were selected based on both relationships with the graduate deans and differences in their student diversity. Texas A&M Corpus Christi and Kingsville are Hispanic-serving institutions, and Florida A&M University is designated a historically black university. The University of Northern Colorado is a medium-sized institution (enrollment of 12,000 students) with diverse STEM programs located in the Colorado plains.

Table 1. Number of student focus group participants and questionnaire response rate

Institution	# of Focus Group Participants
South Dakota State University	6
University of Montana (AISES)	2
University of Arizona (AISES)	1
Montana Tech (AISES)	2
University of Alaska-Anchorage (AISES)	2
Montana State University (AISES)	4
Purdue University (AISES)	1
University of Northern Colorado	9
Texas A&M Corpus Christi	4
Texas A&M Kingsville	8
Florida A&M University	1
Response rates for all student questionnaires	**100%**

Table 2. Number of faculty focus group participants and questionnaire response rate

Institution	# of Focus Group Participants
South Dakota State University	5
University of Northern Colorado	7
Texas A&M Corpus Christi	6
Texas A&M Kingsville	6
Florida A&M University	2
Response rates for all faculty questionnaires	**100%**

Overview of Methods

- At each of the universities, RTI International established contact with the graduate dean and provided draft communication to distribute to the relevant student and faculty population.

- The deans and associate deans recruited students and faculty through email and in person, emphasizing variety in years of experience, engagement, and programs.

- The recruitment communication included language that affirmed that these focus groups were intended to collect feedback from students and faculty with a broad set of experiences in graduate education and who come from a diversity of backgrounds. For students, there was explicit language that the focus groups were open

to students at all stages in their programs and not limited to students with high academic performance or who had significant program engagement. This verbiage was to encourage participation from students across the intended spectrum. The announcement for students also noted an incentive for their participation ($15 gift card). For faculty, there was explicit language that the focus groups were not limited to tenure-track faculty and were open to faculty of all career stages. For both groups, there was an emphasis on privacy and confidentiality related to their participation in the study.

- Prior to the start of the focus group, RTI staff provided each participant with a consent form. All participants consented. RTI collected the forms and proceeded with the protocol. The consent form noted that individual responses would not be reported and that participants' input would be aggregated into larger thematic statements. In the event an individual participant made a particularly noteworthy remark, the attribution for that statement would be more specific: "graduate student" or "faculty." All participants agreed to keep information confidential and to be recorded.

- All students who participated received a $15 gift card.

Figure 1. Select student demographic data (*N* = 40)
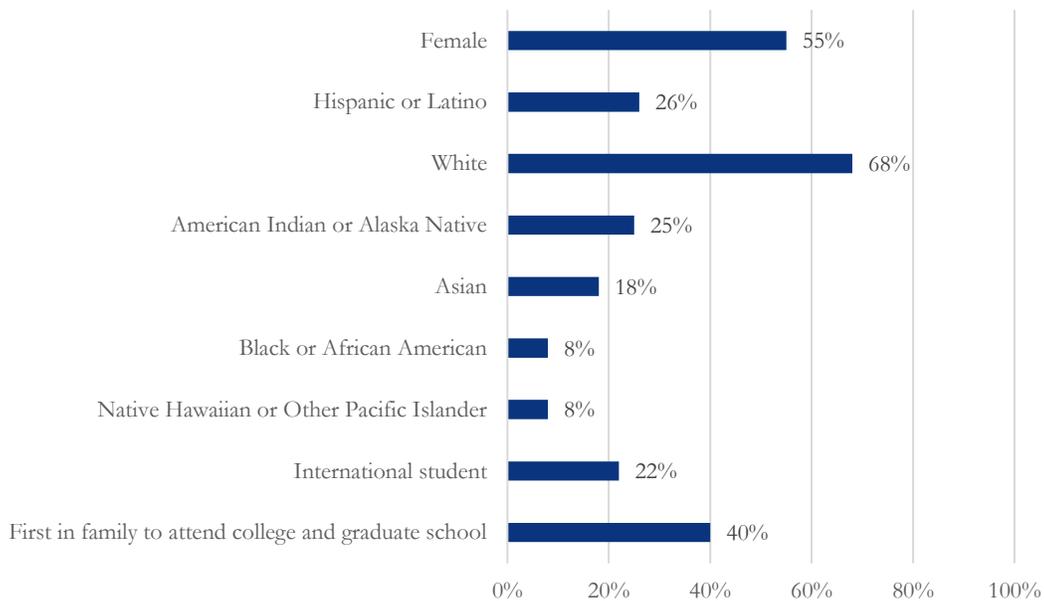
Notes: Respondents could select more than one race.

- The majority of students represented in the focus groups were female (55%) and White (68%).

- Pursuing master's: 60%; pursuing doctorate: 40% (data not shown).

Figure 2. Graduate program disciplines (*N* = 40)
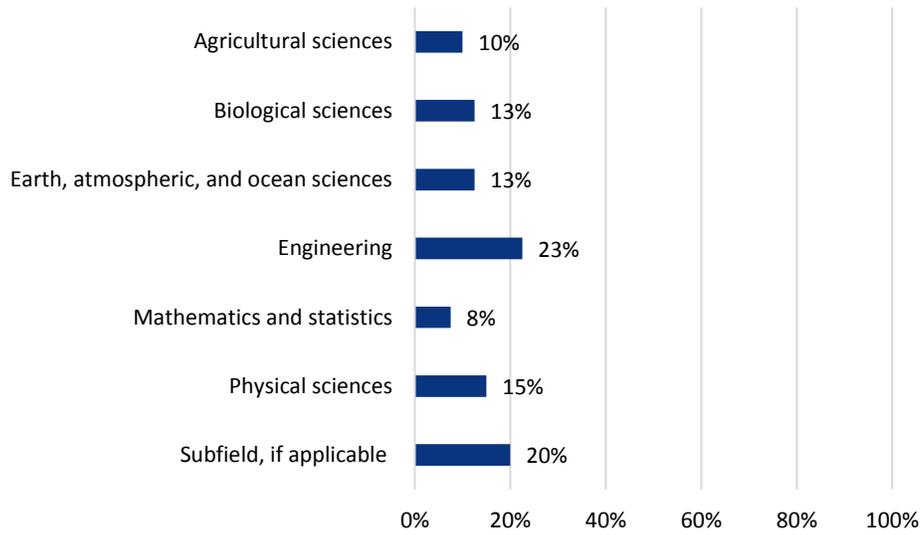
- Students wrote in the following subfields: Fisheries and Mariculture; Environmental Engineering; Exercise Science; Kinesiology; Project Management; and Water Resource Policy

Figure 3. Select faculty demographic data (*N* = 26)
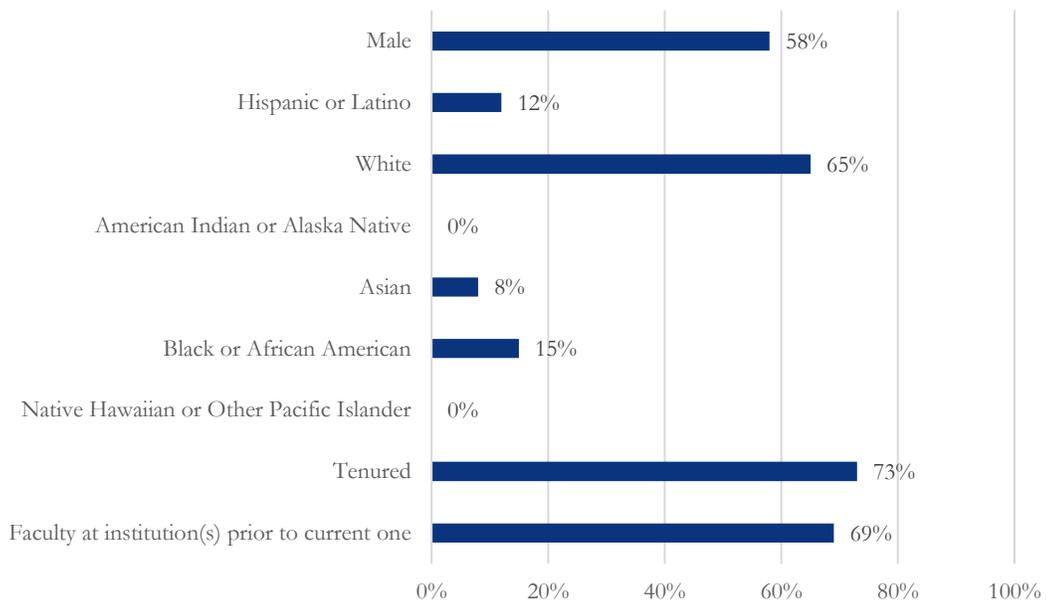
Note: respondents could select more than one race.

- The majority of faculty members represented in the focus groups were male (58%), White (65%), tenured (73%), and had been faculty at one or more institutions prior to their current positions (69%).

**Figure 4. Faculty disciplines represented (*N* = 26)**
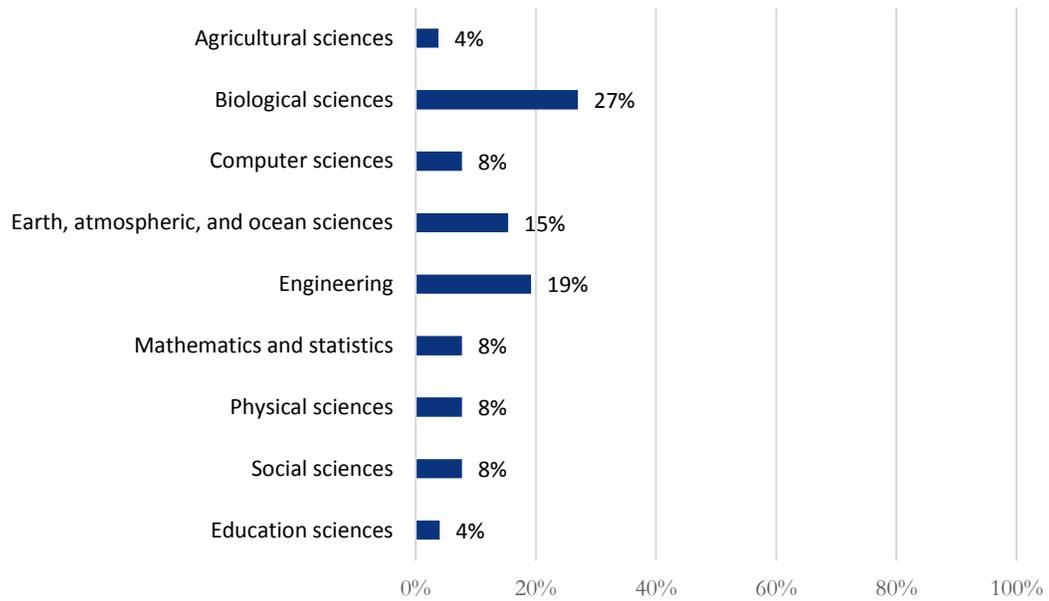
Overview of Preliminary Findings From Student Focus Groups

Reasons for Selecting Current Graduate Program

- Of the students who responded to this question, three indicated that they had selected their particular programs because of the **funding provided**.
  - *Personally, I could not pay for grad school unless ... For me, it was a choice purely because I got funding, and it would not have been an option had I not received funding, so I feel really bad for students, especially in STEM. That's just not right, not to have funding.*
  - *I think [funding] is the struggle for everyone. The reason I'm at grad school was a significant decision factor in where [I received funding].*
- Other reasons included the **practical experience** required as part of the program, the student's specific research **interest alignment with faculty**, and the ability to work with a **specific advisor** (1 mention each).
  - Practical experience*: Something useful in my program is that we're actually required to get an internship with a company before we can graduate, which, regardless of whether you start working for them after you graduate or not, it's still really helpful to have that internship experience under your belt before you can graduate and actually start applying for jobs.*
  - Research interests: *The reason I chose this university for it and for my PhD program was because of the particular research that was available here that was not available at RPI. For me, that was experimental plasma physics, so that was one of the primary reasons.*

Figure 5. Length of time in program (*N* = 40)
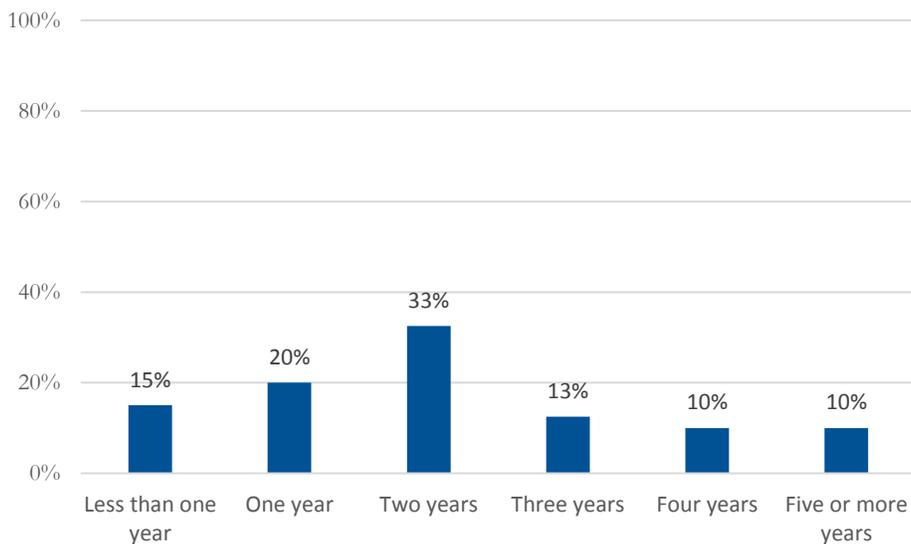
- The majority of students (58%) had been in their program 2 years or less.

Students' Goals for Graduate School Experience

- The majority of students who responded to this question indicated that their primary goal for graduate school was to become a **strong researcher** (12 mentions) and get the necessary **research experience** to be proficient in their jobs when they graduate (9 mentions).
  - *From what I expected, I was looking to get hands on work and training to get to the level where I could physically conduct real scientific research on my own, and sort of be trained as an official physicist. From there I can branch off and go to a variety of different avenues if I so choose, if I choose go to the academic research route, I can pursue that with confidence that I have a foundation for being able to do that, which undergraduate doesn't quite give you. You only get the surface level.*
- For some students, the most important reason to become a skilled researcher was to bring their proficiency "back home" to **improve their communities** (6 mentions). For many of these students, second to their goal of making a positive impact in their communities was being able to **complete the program in a timely manner** and return home as quickly as possible (5 mentions).
  - *For me, I want to learn a skill set that I can bring back to Hawaii and apply it to the Hawaii coastal systems. Because I left Hawaii so that I could go back to Hawaii and work there. They don't like to hire within at the university, so if I can come back with a different skill set, a new perspective, then hopefully I can make changes. I'm trying to learn as much as I can here to see how they do it?*

- o *One thing kind of similar to what everyone else was saying, I wanted my program to be relatively short because I feel like when I'm in graduate school, I'm only improving myself and the goal is go back home and improve the entire community so that's why the time to graduation was really important to me. Yeah. It's not really going that direction right now, but we can talk about that later. That was my goal for the experience, was to be short.*

- Five students specifically indicated that their goal for graduate school was to become prepared for a **job in academia**, while three specifically mentioned a desire to **not go into academia**.
  - o *And my goal to come back to graduate school after 20 years of work was to become a full time university professor, I was a lecturer before, for 13 years, I realized that was the activity I was enjoying the most, and I decided I want to become a full time professor and the advice was to get my PhD and ... in specific, the research I'm doing, I think it has a lot of potential…*
  - o *My school, or my department has I guess a PhD program direction with the ecology department. They have a combined program that's an option, but I don't plan on pursuing my PhD. I want to get back home to help my community, yeah. I want to be helping people as soon as possible, and I don't really have a desire to teach or do like academic research.*

- When asked whether their graduate programs were doing a better job of preparing them for an academic or nonacademic job, a larger number of students (6 mentions) thought that **academic preparation was better**, and two students spoke specifically about the perceived benefits of being a doctoral student as opposed to a master's student.
  - o *I would say it's difficult to really judge that. It's very easy to say it prepares mostly for academic, because that's the setting you're already in, so the experience you have is that if in another academic setting, it would be the same thing, just different place, different people, different stuff. It's essentially the same system, so you're already in that system so you already understand this is what academic research is like. You know, you see what your professor does every day. You know they go to class, they do this, they have research, they have committee meetings, yada, yada, yada.*
  - o *For me, you don't get the opportunity to teach or take on any role like that if you're wanting to pursue a Doctoral degree, and I feel like that's a pretty big component if you're gonna go on to your PhD. I'm also thinking about joining academia later, but we missed some of those experiences that I think help you as a candidate for admissions and also just to know, is teaching or academia something that I want to be a part of my life? And I think that's definitely missing a lot at the Master's level for people that, at least in our side of things, that are wanting to go on further.*

- Many students indirectly spoke about which aspects of their graduate programs were preparing them for life after graduation during conversations about strengths and areas for improvement in their graduate school experience.

Strengths of Graduate Program

- The majority of focus group participants cited their **relationship with their advisors** as one of the major strengths of the graduate programs (10 mentions).
  - *One student talked about the investment an advisor made in getting acquainted: I would say that what's helping me and my advisor connect is that she actually came and visited my home and my family and spent time with my nieces and nephews and they were crawling all over her and she just got to see where I come from and spend time with my grandpa, which was really important. She didn't have to do that, so it mattered.*
  - *I think if there are any barriers, they're pretty minimal. Like, I was compared to raising a kid outside of graduate school, like you women are incredible. But yeah, I mean, I've mostly had a very, if not only a positive experience throughout graduate school so far and a lot of that is just credited to having a really awesome advisor who's very understanding of who I am as an individual and has very little understanding of where I come from, but we've talked enough about my career goals and what I want out of the program, but she's very awesome about keeping me directed in that…*
- Students also mentioned the **practical experience** (both teaching and in the lab) as a major strength of their programs (8 mentions), followed closely by the **sense of community** they had as graduate students (7 mentions).
  - Four students particularly appreciated their hands-on experiences in the lab: *I think for me the best part of the program is the chance that I have with my particular professor, and the lab that we work in. It has allowed me to really get hands on, one on one experience with him since it's a small program anyways, and I'm the only graduate student of my professor. I get the full attention, so to speak. Also, that means I get a lot of responsibility to have to do everything in the experiment, and so there's no one else really working on the experiment except us two. That gives me the chance to get familiar with all of the aspects of scientific research, whether it's building the experiment, conducting the data research, calibrating things, getting the data, analyzing the data, understanding the principles, and then fixing thing when they break and all that. That can be challenging, but it can also be rewarding after if you can get through it.*

- o Other students highlighted teaching experience as a strength: *I think, just to kind of reiterate what was already said, that the institution itself kind of prides itself and focuses on teaching us how to be effective instructors. That's one of the reasons that I chose to come to this institution, is the focus on having the graduate students teach, so that we can better ourselves in that area.*
- Other strengths included the **ability to network** (4 mentions), the **flexibility of the program** (3 mentions), and the **resources available** (e.g., specialized lab or field equipment) (3 mentions).

Experience With Advisors

- On average, most students reported **meeting with their advisors weekly** (16 mentions), followed by **daily or twice per month** (6 mentions each). Only two students reported meeting with their advisors only **twice a year**. Of these two students, one was finishing a doctorate and explained that the advisor had more new advisees than usual. The other student indicated that the advisor was always "quite busy…it's challenging."
- The majority of students reported a **good relationship with their advisors** (17 mentions), with a slightly smaller group indicating **challenges in their relationships** (12 mentions). Of those with positive relationships, many appreciated **the support and guidance** that their advisors offered.
  - o *I see my advisor every day, I work in her department and I'm also taking a class in which she's teaching, if I ever have an issue with what I'm writing, with my research, with what I'm doing, I either just see if her office door is open and if it is there I go. There is no, she's always available for us, we have a very, very good relationship. At the beginning of the year I went through a very tough situation and she was just one of the very few people that I just was able to confide in and she was able to guide me, not just research wise but life-wise and we have a very personal relationship also.*
- Of those who reported a negative or challenging experience with their advisors, the most common issue was that their advisors were **too "hands off"** (4 mentions). This was followed closely by difficulty with **scheduling meetings** (3 mentions) and having an advisor who is **not engaged** in the student's research (3 mentions).
  - o In at least two of the cases when the student reported having a "hands off" advisor, the students explained that their situations improved after honest conversations: *He expects mentorships from his more senior Doctoral students and I didn't get that from the senior Doctoral student that was here when I got here. It was so bad that I thought about quitting my first year. And then I realized, well, I really want to be here, I want to pursue this degree, I like this research, I need to figure something out. And so, kind of over that summer after the first year, I sat down with him and we kind of hashed some stuff*

> *out, and I learned how to communicate with him. And I think at that point, I learned to ap-*
> *preciate why he wants that independence in his Doctoral students and learned how I need to*
> *better communicate with him, and how he can better communicate with myself.*

- o In the other two cases, students felt frustrated with the lack of guidance: *I guess I've had both experiences. Too much micromanagement is annoying. But then, too much flexibility is bad. There needs to be this middle ground. Don't send me on my own and let me sink or swim.*

- Advisors can play a critical role in assisting students with securing funding, and students varied in the way that they funded their education. The majority of students reported that they were **employed by the school** (e.g., research assistants, teaching assistants, etc.) (12 mentions), followed by scholarships (11 mentions), self-funded (5 mentions), fellowships (3 mentions), and grants (3 mentions). Several students were funded by a combination of two or more of these sources (at least 10 mentions).

  - o For most students, their advisor actively helped them find and secure funding (7 mentions), and one explicitly indicated that their advisor did not help. Advisors supported student in a number of ways, including support in writing applications or grants (5 mentions), helping find opportunities, and writing letters of recommendation (1 mention each).

Figure 6. Length of time with current advisor (*N* = 40)
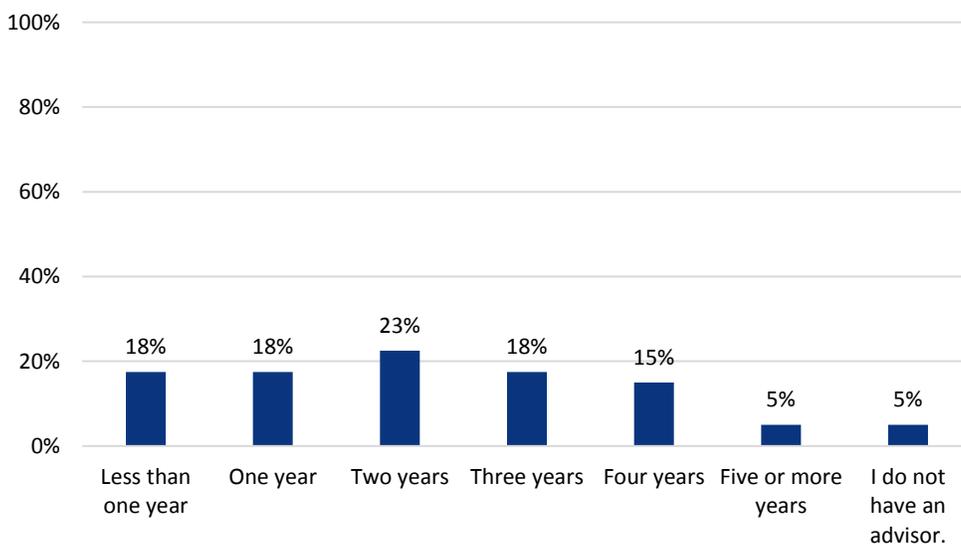
- The majority of students (74%) reported that their current advisors were faculty members they had hoped to work with in the program (data not shown).

- The majority of students (59%) had been working with their current advisors for 2 years or less.

Challenges and Areas for Improvement

- Students were asked to discuss if they had encountered any barriers to achieving their goals in graduate school. The most common challenged cited was **balancing demands** outside of school with the demands of completing degree requirements (5 mentions) and negative or challenging experiences with **advisors** (5 mentions).
  - Challenge in balancing competing responsibilities: *I juggle, I juggle a lot. Being an entry level engineer in the water, base water group, having children, 18 and 14 and going to school three quarter time, 'cause two classes at my university is three quarter time. I'm exhausted. The cost of living in Alaska is much more expensive than it is in Montana or some of the other places and so the intent being to graduate as fast as possible because cost of living is so doggone expensive that I need to be able to, my end goal is to increase my wage to help my husband support our family…*
  - Negative experiences with advisors: *I guess along those lines, I remember getting a lot of work that wasn't my own that I had to do, so I was doing a lot of my old advisor's work. I would have to do his, he had deadlines, so I'd have to get his work done, and then there wouldn't be much time left for my work. I kind of felt exploited a little bit.*
- Other areas for programmatic improvement included **better quality coursework** (3 mentions), **improving resources available** to students (e.g., lab equipment and funding) (3 mentions), and a need for **better practical career development** (2 mentions).
  - Improved course content: *Potentially, as well, a statistics course that feels pertinent for the STEM folks, because I know we have a, for the PhDs, we have a stat class that's required, but that usually is a little under-helpful, let's say, for the PhD students. I know I pursued a stats class as well as a Master's. It wasn't required on my plan of study, but I wanted more stats, and I ended up taking a class that didn't end up being as useful as I would have liked.*
  - Better career guidance: *I know that there has been a lot of discussion in this general physics community about the career development side of things; learning how to submit things for journals for publication or learning how to conduct interviews or how to get in touch with industry or what kind of opportunities are there available…but there hasn't been much at least on the university level that I know of.*

Overview of Preliminary Findings From Faculty Focus Groups

Reasons for Selecting Current Institution for Faculty Position

- Faculty varied in their reasons for selecting their particular institutions. One of the frequent responses was that they had selected their institution because of the **location**—either because it allowed them to be closer to family or they liked the weather (6 mentions). Faculty also frequently cited the ability to work with a **particular group of students** as playing a major role in their decisions (6 mentions).
  - *So it was actually the positions that made me realize just how much I like working with students and being able to watch them have the ah-ha moments and to have those thankful parts where oh my god I love this now, I never thought about it like this. I can't believe that I do this, have this impact on the environment that kind of stuff. Actually encouraged me to try to bridge what I was doing with the research that I also love and I was given that opportunity by coming back here and of course dealing with students that were basically coming through the same pipeline that I have been through.*
  - *I think after visiting was important on how I was looking up the demographics for the faculty at that time. I felt it was important to return to the HBCU where students will see someone who looks like them, someone young and they could aspire to go to graduate school themselves.*
- Other responses included the following: the specific program focus matched their **expertise** (3 mentions), a sense of **community** (2 mentions), and the ability to **build a program** from the ground up (2 mentions).

Figure 7. Length of time as faculty at current institution (*N* = 26)
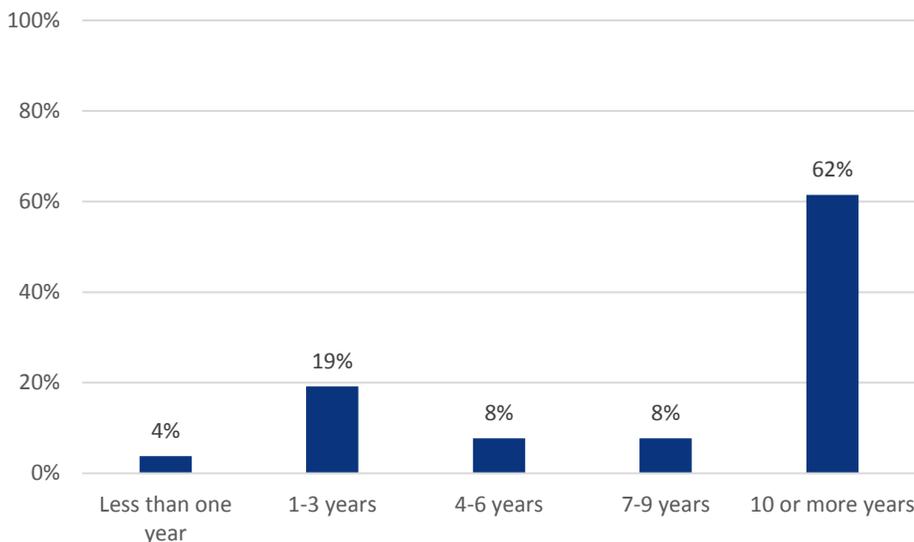
- The majority of faculty members had been at their current institutions for 10 or more years (62%).

How Faculty's Own Graduate Experiences Prepared Them for Their Current Positions

- In general, faculty reported that their own **graduate programs had prepared them well** for a faculty position. Respondents either emphasized the **strong research training** they received (13 mentions) or the **strong teaching experience** they received (11 mentions), and some mentioned both.
  - *Very effective because we were involved with the research right away and the first three semesters I was also the TA that prepared me you know, for the teaching part of the job. So I think personally these kind of programs is fairly useful because when you do a Doctorate program you don't know where you end up, you ended up in the industry you are prepared for that, if you are ending as a faculty you are also prepared for that.*
  - *One thing which I was truly thankful was, as a TA… I was really, really lucky to have opportunity to actually teach the course, being still a grad student. And that was an excellent preparation when I got my first position, I knew what the syllabus was about, I knew how to [handle] the homework assignments. I was able to already establish contact with students and get good feedback from the students on what I'm doing right and wrong. And what are my expectations…for the students.*
- Faculty across all institutions thought that **lack of grant writing or publishing experience** in their own graduate experience left them at an initial disadvantage in their careers (10 mentions).

- o *I think in terms of actually conducting the research, teaching ... I was teaching early on. So, I thought I was prepared there. I think, for me though, given the position I hold now, where external funding is critically important, and I've done that for a number of years now, there really wasn't that preparation.*

- o *I also feel that I was very well prepared in writing papers. Journal papers, conference papers. However, in my lab, I was not exposed to grant writing at all. That was something that my advisor did on his own, and I did not have that experience while I was a graduate student. And that was actually something that's very valuable.*

- o *I don't think publications were highlighted as much as they should've been earlier on. They were like, 'Well before you leave or in order for you to actually graduate we need to at least have two [articles] submitted [for publication]. So I wasn't pushed as much and that's one of the things I did learn is kind of like publish or perish once you get out.*

- While many faculty indicated that their programs had prepared them well for faculty positions in general, and teaching positions in particular, a smaller group of faculty indicated that their programs had not prepared them well for these positions (6 mentions).

  - o *When I was working the way through, the one thing that was definitely not emphasized, now see, I'm in engineering, learning how to teach. Don't need to do that. Learning how to be social with people, don't need to do that.*

  - o *My training was very R1 medical school based, so that was the expectation. You stay either in a major research institute…or you stay in medical school. Anything else was not welcome.*

  - o *When I was a graduate student, I was trying to be a researcher, so most time spend time in the lab. I was a TA as well, but I took a TA prep class, but that was minimum. I think some teaching preparation was just minimum. Does not prepare me to be an actual faculty member, because you're going to excel both in teaching and research.*

How Faculty View Their Roles and Responsibilities as Advisors

- The majority of faculty indicated that they **met with their advisees at least weekly** (14 mentions), followed by **monthly** (3 mentions), and some indicated that the frequency varied depending on the **advisee's needs** (3 mentions). Two faculty members reported that they met with their advisees **daily**.

- When asked about their role as advisors, the majority of faculty indicated that their primary responsibility, and therefore focus in working with students, was **advising them on their careers** (14 mentions).

  - o A number of faculty members tied the focus of their guidance as an advisor to their own experience in particular fields: *For me, I'd say it's the exposure I had to both industry and academia through my graduate training. I find that, in my specific discipline,*

> *students also often struggle between the opportunities that are available in the two arenas, and what would be the best choice for them. So, I think just the fact that I've had experience in both of those areas that serves me well to understand…some of their professional development, how they need to prepare themselves for different career choices. Why they would want to choose one career choice over another, and really having those conversations early on, in their training, seem to be critical for them develop themselves and take advantage of their time.*

- o Others emphasized the importance of "being prepared" for life after graduate school: *I think it's helping students research, but also prepare students for future career. Give them opportunity to attend different workshops and conferences. Give them network experience so they can succeed, not just by doing research, but many other aspects of academia preparation for graduate students.*

- o *One of the things that I try and work with, with the students I work with, whether they're my advisees or not or working for me on projects, I try and make it clear that life doesn't get easier when you're don with graduate school. Somehow junior faculty member doesn't really change the workload, and that they need to figure out now how much time things take, and how to balance their professional work with their work outside of school and getting their PhD or their master's or whatever they're working on, so that that's not such a rude awakening when they get to a faculty position and all of a sudden they have far more responsibility.*

- Another group of faculty discussed the importance of helping students **navigate through graduate school** itself in their roles as advisors (e.g., systems, structures, coursework, etc.) (8 mentions).

  - o *One of the things it felt like going to graduate school, is I'm playing a big game, and I don't know what the rule book is, but I keep getting penalized. So, you keep constructing what the rule book is, but that's exactly why I do things differently here. I feel I have to explain the rules. How do you get through this system? What does it mean? What are you being judged on? What are people doing? So, if someone comes to my office, but they're not my advisee, you need to do this, this, and this, because that person will not hire you for their group. I know they have an opening, but they're gonna watch you for the next three weeks, and they're looking for this. But if they didn't know that, they wouldn't potentially act the way they ought to get to get that research assistantship, which they really want. But it's a quick making things so much hidden, but in my case, it's like I hated that about graduate school.*

  - o *My conversations with students that I end up having like that occur prior to them officially declaring me as an advisor, and it's sort of like my pre-interview, what do you want to do, where do you want to be, to try to find out the suitability of me in that relationship, but once they agree to have an idea, okay this is what you want to do when you get finished, or this is how you want this research to get you to that place. I really don't have a lot of conversations about what they're doing in their career. It's mostly about the research because that's the nature of our collaboration and usually how they're having problems or what they have to say.*

- Faculty also acknowledged the importance of **providing emotional support** to their students (5 mentions).

- o *You know, it's sometimes they're trying to find the balance. That they feel like they may be overwhelmed. There are classes they are taking, there is projects… I think we are the first compass for the students and if I can't solve the problem or help them, at least I know where they should go. I can point them out in the right direction if it's something outside of my comfort zone, or outside of my expertise.*
  - o *I have a weekly lab meeting…Every week something happens and once somebody can't come, and so we're always in contact via email. And yes, they do bring out their problems at home, and that's a big issue. And I find myself trying to convince some of them that it's, you know, 'It's going to pass. You don't need to quit school.' I've had a few like that.*
- A small group of faculty were asked if there was anything for which their program was not preparing their students/advisees well. A number of faculty indicated that despite a strong research or teaching program, their programs did not necessarily help students learn "**soft skills**" (e.g., work ethic, communication, etc.) (6 mentions). A smaller group of faculty thought that teaching these skills was part of their job as advisors (4 mentions).
  - o Lack of soft skills: *[Case studies are] very important because when they finish they go in the job market day, each problem is a case, you know you cannot take a book where you find outside providing for the stake holder, how critically think. So I think that improve the communication skill that forces them to and look for information… if you ask them to a case study, they will Google a few things and they will not find all of them.*
  - o *One thing that you're hearing consistently across all disciplines I think is the soft skills. We don't have as much practice with the soft skills because [of] technology…They take things for granted. So it's the communication skills.*
  - o Advisor's role in developing soft skills: *The other thing that I consider important is the communication skills, I had an opportunity to attend a conference where one of the speakers was a big C.E.O from Construction Company and one of the things he was saying was even though they were higher in a lot of engineers, they wouldn't put those engineers in that position because they lack from communication skills.*
  - o *Lack of work ethic: That's one of the things said seems we are missing nowadays…even ten years ago, where you could find a graduate student in the lab till midnight, [I have been] talking to a lot my colleague not only here in the U.S but in other countries, and it is a problem that is emerging with a lot of students nowadays as far as research is concerned. We don't have that work ethic we used to have, you know, many years ago and when we were in the lab till midnight till 1 or 2 in the morning.*
- Faculty listed a number of other primary responsibilities as advisors, including hands-on experience with **research and/or teaching** (3 mentions), **finding funding** (2 mentions), and **building students' confidence** (2 mentions).

Figure 8. Number of advisees (*N* = 26)
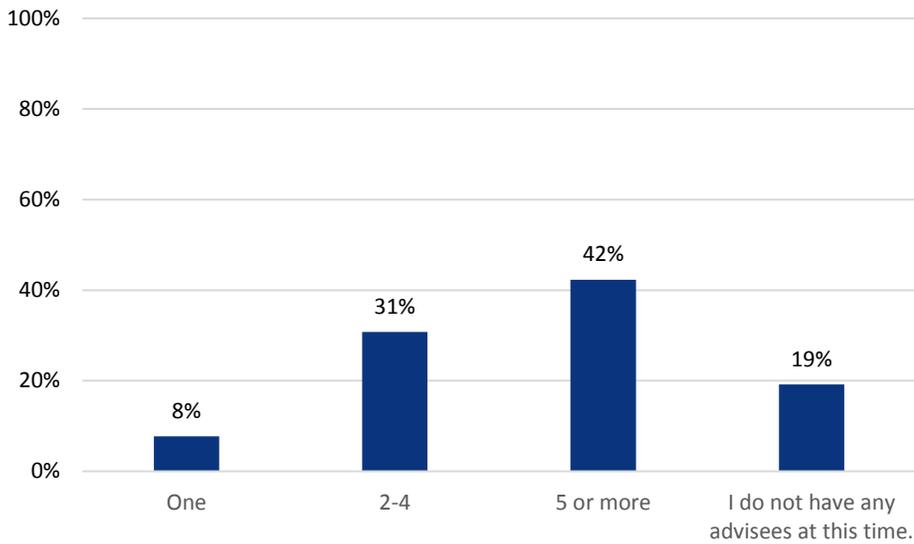
- Nearly three-quarters of faculty members (73%) had at least two advisees at the time of the focus group, with 42% having five or more.

Figure 9. Length of time advising students (*N* = 26)
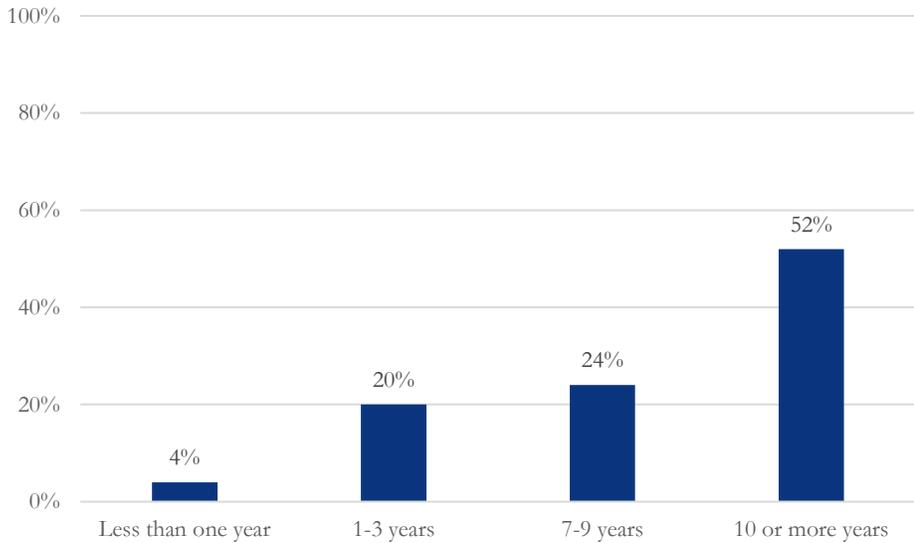
- Slightly over half of faculty members had been advising students for at least 10 years (52%).

Importance of Advisors in the Graduate School Experience

- Both students and faculty highlighted the influence and **importance of advisors** in the "making or breaking" of the graduate school experience. Many students acknowledged that if they had challenging interactions with their advisors, their general feedback about their experience was similarly negative (unless they had another faculty member or strong peer relationships to look to for support) (16 mentions).

  o Students on the struggles with their advisors: *Each of my coursework classes had projects and none of them were stringed together or had a successful purpose. Had I had an active advisor that gave a darn, each of my courses could have gotten a portion of my project done and because they had a project requirement in every single class and they didn't do that. So, looking back, now that I'm in my final semester and I'm scrambling to finish everything in my semester, I wish I would have done exactly that. I wish I would have had an advisor that met with me every single week and used the project course requirements for my research project in the master's program…For those of you that have that, you're really blessed.*

  o *And I guess, on the other end of that spectrum, my advisor's older, and so it feels he's more set in his ways and like, "This is how it should be." Communication sometimes is like, "Okay, but this." And he thinks it should be this way, and it should be this way.*
  I guess, also, in terms of organization, I'm getting ready to defend, but waiting for edits. The best I can describe it is trying to pull teeth, because every week is something. "Oh, I have a half marathon, so I won't get to it."

  o Positive impact of advisors: *I see my advisor every day…if I ever have an issue with what I'm writing, with my research, with what I'm doing, I either just see if her office door is open and if it is there I go. There is no, she's always available for us, we have a very, very good relationship. At the beginning of the year I went through a very tough situation and she was just one of the very few people that I just was able to confide in and she was able to guide me, not just research wise but life-wise and we have a very personal relationship also. There's never any ... I'm able to talk to her and say this is what's going on with my family, and this is what's happening and she seems to care for me as more than just her student but, you know, a person, and I really, really appreciate her for that.*

- Similarly, in reflecting on their own graduate school experience, some faculty members related how **their advisors had influenced** their experience (4 mentions).

  o *I went through three graduate advisors before I had someone who actually went with me to a research meeting, and then introduced me to people, and had them stand back and say well, this is this person, this is this. You may want to know. All of my graduate students, I make sure I buy them business cards, and they said well, why? None of the other faculty do that…[Learning proper etiquette], it's not anything my advisors ever did…I didn't like graduate school. I just wanted to get out at some point.*

o *I think it was very advisor-dependent. I think was fortunate to have a very good advisor who listened to me when I said I knew I wanted to go into academia, and help facilitate my training and process for that, by involving me in grant writing as a graduate student, by having me mentor undergraduate students. We had… programs for graduate students to help build their teaching skills. And I know other graduate students who were interested in those, because the advisors weren't supportive of that. My advisor was very supportive, because it was a time, some of my time taken away from the lab to be able to focus on some of those activities, but that was available, and I really think my advisor was a big point of that.*

Students' Recommendations for Graduate Education

- The most frequently-mentioned recommendation about how to improve graduate education was the need to provide **better funding to students**. For example, one student could not go to a conference they were accepted to because the program did not have the funding. A different student thought that funding outside of "TA-ships" (i.e., more research assistantships) would be helpful because "not all of us want to teach."

- A number of students also related the importance of getting **practical grant writing experience** as a graduate student (4 mentions), and many felt that graduate education in general fell short on this front.
  - o *Just from our program itself we come in usually with an assistantship and funding for our project. I think the skill of writing grants is important. Luckily I've had ... sometimes my funding would drop so I'd have to go in and apply for small grants here and there, but I think just building that skill across all of the graduate students in that program would be very, very helpful.*
    - ▪ In reflecting on their own graduate education, the majority of faculty underscored the lack of practical experience necessary to be successful as a researcher and/or faculty member (e.g., grant writing experience). This point is discussed in greater detail in the faculty section below.

- One student thought that better **mental health support** would could be helpful. This idea was also echoed by some faculty members, discussed in greater detail below.
  - o *I've heard several different stories of people getting burnt out, or feeling like they had too much pressure and that they couldn't enjoy the rest of their leisure time because they needed to do more work, or that they ended up having some mental issues because of all that. Maybe they had some issues before going in, and then it just got magnified because of all the pressure. I don't know yet if that's something, but I know that there have been initiatives, at least on the national level to raise awareness and concern to try to not stigmatize people who have difficulties who may need some time off to recuperate and recover.*

Faculty Recommendations for Graduate Education

- Like students, a number of faculty echoed the concern about inadequate or nonexistent **funding for students** and/or resources for students (e.g., access to high-quality lab equipment, funding for conference attendance) (7 mentions).
  - *Money. Yeah. We worked hard to be academic entrepreneurs, and both fund students and fund student travel, 'cause that's really important to try to ensure we have appropriate funds for citizenships, but it's difficult, and I know it's the institution, as a whole, but some of it is balancing grant development workload with high teaching loads, and high advising loads. But some of that is just baseline budget.*
  - *Instability of resources, infrastructure, in particular. Instability of infrastructural resources. There are certain fields where you could need, say you work with perennial plants, you need those in place. There is a tendency, at the higher administration, they're on five year plans. So, they've gotta show they did something. So, there's this cannibalism of something that's working to make something with a new name so that they can make their leap is something I've experienced in our college.*
- Consequently, the most common recommendation to improve graduate education was to **increase funding** (9 mentions), which included more money to support better hands-on experience (6 mentions) and paying students more (3 mentions).
  - More money for hands-on experience: *In fact at some point I used to… [get] summer money from the graduate school to support graduate students. There were lots of ways to use it, and I regularly had grad students come and work with me working with middle school and high school teachers, and [about how to teach math]. We did that for a long time, and at some point there was a decision made either within the department or at the grad school, that our summer money was only to be used to support research. So all of those opportunities that our grad students desperately needed to be able to get the jobs that were out there were now cut off.*
  - *Part of that too is structural. It's about money. The people that we want to hire for those jobs have been teaching for 20 years, and they're making 50, 60, $70,000. They do not have a PhD, and if we want to try and hire them at adjunct rates, at the sort of rates that they're going to come work at, they're not going to take jobs at $35,000 a year.*
  - Paying graduate students better: *Yes and I think this is the problem because are we allowed to see more US students in my program, and why don't I have them? Because many students who come, the assistance she will provide or fellowship she'll provide say this is not enough money for me. To get involved in the program, I cannot [take care of] myself with that.*
  - *They're neither getting research experience nor teaching experience, and in the MA, the students right now are having to fund their own graduate education, which I find that strange because I'm unaware of, and this is out of ignorance, but I'm unaware of any faculty that I know of that didn't go to school on some sort of graduate assistantship. I don't know of any science faculty in Ross Hall that are paying student loans or their graduate education. I may*

be wrong about that, but it's certainly not in earth sciences. No one has gone to graduate school without having some sort of either graduate assistantship in research or teaching assistantship.

- In their focus groups, many students indicated that finding an appropriate balance between work and school and life was challenging. One student mentioned the need for **more mental health support** for students, and one faculty member echoed this need as well. At least three faculty members underscored the need to better acknowledge that students have a life and **demands outside of school**.
    - *I think we have to be sensitive to students' needs outside the academia. That is the stopping point for them. [Family] a big deal for them. And they're going to this school because they don't want to be away from family, 'cause that's a big deal. So, our education needs to acknowledge that, and then make ways for them to handle academics as well as family life. Because otherwise, if we're forcing them to be in the lab from 6 A.M. to 10 P.M., that's not going to work for them. I think the education ... I'm comfortable with the level of education and preparation we're providing them to be ready to work in industry or academia, or to seek further education, but I don't think we're creating the environment for them to make it work for them, basically, if they have these other situations that they have to ... they think is priority for them.*
    - Mental health support: *I wish that we took more seriously the mental health of graduate students. Graduate school is a very stressful time, and the kinds of people who end up in graduate school are more prone to depression in general, and I don't think that we take that seriously enough.*
- Three faculty members thought that **advisors could do a better job** at supporting their students and advisees, even if their own graduate school experience was not supportive.
    - For example, one faculty member likened the mentality to "hazing": *Students don't necessarily learn or you know the same expectations can't be forced on students. Yes they do need to learn but I had this one instructor that was always saying, 'I had to walk six miles in the snow.' Like they want to haze you almost, like this is what I had to do.*
    - *[Some faculty feel like,] 'This is what I had to do, so I got my PhD, so this is what you need to have to do to get through, too.' Rather than helping to facilitate it is almost like, 'This is what I had to do, so you do this or you should have to go through this as well,' rather than, 'I went through this.'*