NORC

at the University of Chicago

Graduate Schools Respond to COVID-19:

PROMISING PATHWAYS TO INNOVATION AND SUSTAINABILITY IN STEM EDUCATION

WORKING PAPER | FALL 2020

Research You Can Trust™

NORC at the University of Chicago

REPORT AUTHORS:

Debra W. Stewart, Ann Kearns Davoren, James R. Neumeister,
Erin Knepler, Karen Grigorian, and Abrea Greene

RESEARCH TEAM:

Debra W. Stewart, Ann Kearns Davoren, James R. Neumeister,
Erin Knepler, Karen Grigorian, Laura Abram, Abrea Greene,
Katarina Yang, and Erika Greenia

TABLE OF CONTENTS

INTRODUCTION

Innovation and reform in graduate education – from academic and research training, to mental health and wellness of graduate students, to the structure and relevance of programs – have long been topics of debate as 2020 dawned on college campuses.[1] With the penetration of COVID-19 in March 2020, however, change in graduate education could no longer be debated. It became the critical element in maintaining academic and research programs.

As the dimensions of the pandemic became apparent, one graduate education dean described the predicament shared by all: "The problem is, when you're in a situation that has no precedent … trying to figure out what the next steps are and when they should happen is unbelievably difficult. It is a unique kind of thing."

Economist Paul Romer's famous quote – "a crisis is a terrible thing to waste"[2] – has renewed currency today as university administrators confront the crisis of a lifetime for most of their institutions. As challenging as the current situation is, when looked at against the backdrop of decades of reflection and research on strategies for improving graduate education, the pandemic could introduce an unparalleled climate for innovation. Crises provide conditions favorable to innovation: urgency for change, openness to options previously viewed as unrealistic, too risky, or too difficult, and the need to eliminate unnecessary activities to ensure execution on the critical ones.[3] While graduate schools across the country have been experimenting with a variety of innovations in graduate education for more than a decade, the silver lining of the pandemic may be that it offers a perfect storm of opportunity for innovation in education at the masters and doctoral level.

Recognizing this opportunity, a central goal of this study is to document the challenges posed by the pandemic and, critically, the innovative strategies graduate schools employed during the crisis. Our research investigation focused on collecting information on higher education activities designed to achieve three goals: stimulating the success of current and future STEM graduate students; sustaining STEM graduate programs through and after the crisis subsides; and identifying and sharing innovations with the potential to transform and improve graduate education in the future.

This working paper reports results of a survey designed to document efforts to achieve these objectives. This survey, conducted with STEM graduate deans, focused on challenges posed by the pandemic in three domains: ensuring student academic and research progress, providing for student health and wellbeing, and maintaining program sustainability. In addition, the survey collected information on innovative strategies institutions employed during the crisis, some enabled by technology, some involving changes in policy, and some reflecting new practices or processes.

The working paper has four sections: a brief outline of the methods used to collect the data, a report of the challenges graduate institutions faced from the pandemic, a discussion of reported innovations, and a series of questions that frame the convening discussions.
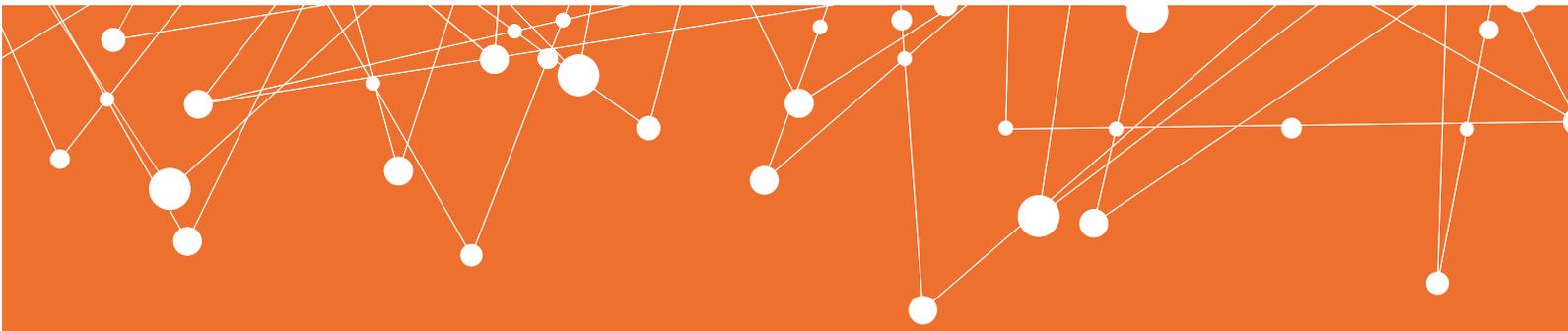
---

1 Caramello, C. (2018). *Useful knowledge: An annotated bibliography of CGS publications.* Council of Graduate Schools.
National Academies of Sciences, Engineering, and Medicine. (2018). *Graduate STEM education for the 21st century*. National Academies Press. https://doi.org/10.17226/25038.
   Weisbuch, R., Cassuto, L., Bruns, P., Butler, J. & Strouse, A. W. (2016). *Reforming doctoral education, 1990 to 2015: Recent Initiatives and future prospect.* Andrew W. Mellon Foundation. https://mellon.org/media/filer_public/35/32/3532f16c-20c4-4213-805d-356f85251a98/report-on-doctoral-education-reform_june-2016.pdf.

2 *See* Rosenthal, J. (2009, July 31). On language: A terrible thing to waste. *The New York Times Magazine.* https://www.nytimes.com/2009/08/02/magazine/02FOB-onlanguage-t.html

3 Chisholm-Burns M. A. (2010). A crisis is a really terrible thing to waste. *American Journal of Pharmaceutical Education*, 74(2), art. 19. https://doi.org/10.5688/aj740219

1 | **Graduate Schools Respond to COVID-19:**
PROMISING PATHWAYS TO INNOVATION AND SUSTAINABILITY IN STEM EDUCATION

✳NORC

Section 1.

OVERVIEW OF THE METHODS

✴NORC

Section 1.
Overview of the Methods

This research is funded by Rapid Response Research (RAPID) grant number 2030148 by the Innovations in Graduate Education program in the Division of Graduate Education/Directorate of Education and Human Resources at the National Science Foundation (NSF) using funds from the Coronavirus Aid, Relief, and Economic Security Act. The research purpose is to survey senior graduate education officers to identify and document the challenges faced by science, technology, engineering, and mathematics (STEM) doctoral and masters programs and students and to understand innovations developed as universities respond to the 2019 coronavirus disease (COVID-19) pandemic. A full and complete overview of our methods will be included in the final report issued after the virtual convening.

Participants

The sample was comprised of 300 graduate STEM degree-producing U.S. institutions. A stratified purposeful sample was drawn first removing any institution in which more than 40% of its graduate students were enrolled solely in distance education courses. This was important to ensure that we were targeting institutions for which a pivot to online course delivery may have been more disruptive. From this, we sampled 258 doctoral institutions that awarded the most STEM PhDs in 2018 according to the Study of Earned Doctorates,[4] 27 masters-level institutions awarding the most master's STEM degrees in 2018 according to the U.S. Department of Education,[5] and, in recognition of their importance in diversifying the STEM pipeline and professional ranks, 15 additional historically Black colleges and universities (HBCUs) that awarded the most graduate degrees (masters and doctoral) in STEM fields in 2018.[6] From each institution, the graduate school dean (or individual in an analogous position) was identified .to represent their school and their professional contacting information was assembled. The deans were contacted by email and asked to complete the online, self-administered study on behalf of their institution.

70%
Response rate of the 300 STEM-focused graduate institutions completing the survey

Measures

The survey [7] asked participants to report on the major challenges STEM graduate students and STEM graduate programs are facing as a result of COVID-19 and what promising practices and innovations have been developed by institutions to address these issues. More specifically, the survey focused on the impact and innovations in three broad areas of STEM education: (1) graduate student academic and research progress, (2) graduate student health and well-being, and (3) graduate program continuity and sustainability.

Survey Administration and Responses

The survey was conducted from July 8 to August 24, 2020. In total, representatives from 208 institutions participated in the survey resulting in an overall response rate of 70%. Characteristics of the institutional sample are provided in Table 1. Analyses were performed primarily exploring for differences between the basic Carnegie Classifications (doctoral institutions with the highest research activity, doctoral institutions with lower research activity, master's institutions, and special-focus institutions, which award a high concentration of degrees in a single field or set of related fields, such as medical schools, medical centers, and schools of engineering) and status as a minority serving institution (MSI; i.e., yes/no). Differences by the public/private status among doctoral institutions with the highest research activity also were explored.

---

4 National Science Foundation. (2019). *Survey of earned doctorate* (Table 7: Doctorate-granting institutions, by state or location and major science and engineering fields of study: 2018). Available from https://ncses.nsf.gov/pubs/nsf20301/data-tables/

5 U.S. Department of Education. (n.d.). *IPEDS: Integrated postsecondary education data system* [online database]. Available at https://nces.ed.gov/ipeds/ (Note: To ensure a focus on institutions that awarded masters degrees as their highest degree, we excluded any institutions that were technically classified as Masters institutions but that also awarded any STEM-related PhDs in 2018.)

6 *Id.*

7 The full survey can be found in Appendix.

Table 1. Characteristics of Sampled Institutions

Institutional Characteristic	Sample		Respondents		Response Rate
	N	**%**	**N**	**%**	
Overall	300	100%	208	69%	70%
Sampling Category					
Doctoral	258	86%	185	89%	72%
Master's	27	9%	15	7%	56%
HBCU†	15	5%	8	4%	53%
Carnegie Classification					
Doctoral institutions, highest research activity	131	44%	100	48%	76%
Doctoral institutions, lower research activity	106	35%	73	35%	69%
Master's institutions	37	12%	19	9%	51%
Special-focus institutions (e.g., medical school)	26	9%	16	8%	62%
Other Characteristics					
Minority-serving institutions (HBCU, HSI, etc.)	74	25%	52	25%	70%
Public institutions	205	69%	158	76%	77%
Private institutions	94	31%	50	24%	53%
Region					
Northeast	85	28%	56	27%	66%
Midwest	63	21%	49	24%	78%
Southeast	66	22%	48	23%	73%
West	86	29%	55	26%	64%
Urbanicity					
Large city	118	39%	80	38%	68%
Small or midsize city	96	32%	72	35%	75%
Suburb	58	19%	39	19%	67%
Town or rural	28	9%	17	8%	61%

Notes. HBCU = Historically Black colleges and universities; HSI = Hispanic-serving institution.

† Two additional HBCUs were included within the doctoral institution sample, for a total of 17 HBCUs.
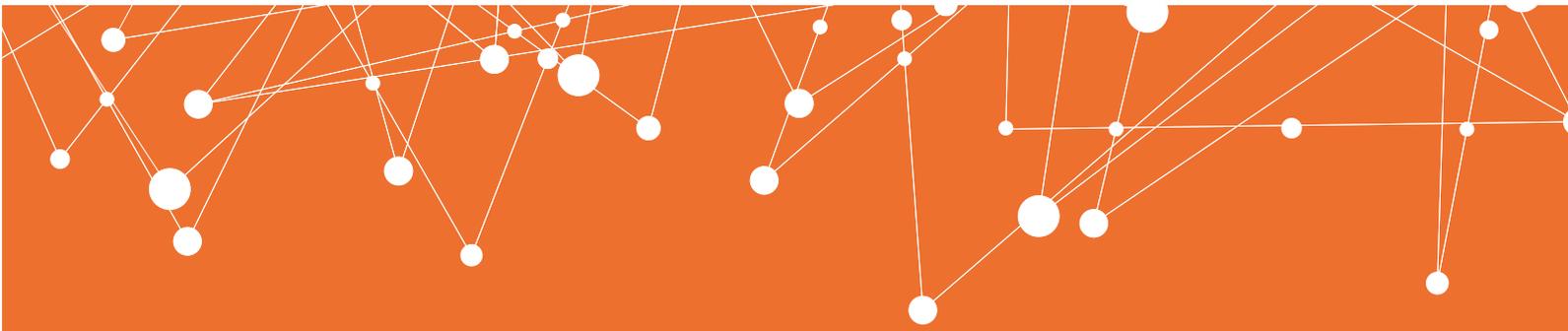
✦NORC

Section 2.

INSTITUTIONAL CHALLENGES IN THE FACE OF COVID-19

✴NORC

Section 2.
Institutional Challenges in the Face of COVID-19

The impact of COVID-19 on higher education goes beyond the disruption of in-person classroom and laboratory education. It extends to student health and well-being, including the potentially disproportionate impact on the most vulnerable student populations (e.g., international students, students with disabilities, and students with families), and to program continuity and sustainability, including not only the retention of current classes but also the recruitment of new classes. Although a central goal of this project was to identify and share innovations developed in response to COVID-19, understanding how and to what extent institutions and their students have been impacted by COVID-19 is an important first step in contextualizing the subsequent innovations. To that end, institutions were asked a series of questions on their immediate response to COVID-19 as well as their future planned activities, the perception of impact on their students, and the greatest challenges they see as a result of the pandemic.

Planning and Response

Prior to COVID-19, all but seven institutions reported having a crisis management plan. Over one-half (54%) found that plan to be *very helpful*, and an additional 39% found it to be *somewhat* helpful. Special focus institutions were more likely than the three other Carnegie Classifications to report the plans as helpful.[8]

All but two responding institutions indicated that their institution had a central administration team or task force that developed the institutional response to COVID-19, and the majority of survey participants (74%) were themselves a part of that team.

At the time of survey administration, 88% of institutions indicated that their graduate students would likely be on campus for some form of in-classroom instruction in the fall and that the STEM laboratories would be open for principal investigators (PI) and graduate students, and 94% reported that STEM field work/research would be conducted.

Graduate Student Academic and Research Progress

Online Learning, Alternative Grading, and Student Advising

In response to COVID-19, over one-half (57%) of responding institutions moved all of their in-person graduate courses to a remote/online format either in whole or in part. An additional 14% moved at least 90% of their courses to a remote/online format. Roughly 8% of institutions indicated that less than one-half of their graduate courses moved online in response to COVID-19.

In spite of the large proportion of graduate courses that moved online in response to COVID-19, nearly one-half of institutions (48%) rated their institution's technical capacity to provide online learning as only *marginally* or *somewhat* capable. Less than 1 in 5 institutions (18%) rated their institutions as *fully capable* of supporting online/distance learning. While non-MSIs were significantly more likely[9] to indicate they are *fully capable* of online instruction, there was no relationship between institutions' perceived capabilities of online instruction and the proportion of graduate classes that moved online as a result of the pandemic.

While the overwhelming majority of graduate courses moved online as a result of COVID-19 (see Section 3), institutions did acknowledge that there were several obstacles for their students in transitioning to online learning (Table 2). Among the most significant obstacles were completion of required learning activities like internships or practicums and access to reliable internet service. MSI institutions reported more significant obstacles than non-MSI institutions with regards to accessing reliable computer hardware and software.

> MSI institutions reported more significant obstacles for their students with regards to accessing reliable computer hardware and software.

---

8 Kruskal-Wallis H test, χ^2 (*df* = 3) = 8.85, *p* = 0.031, η^2[H] = 0.03
9 Mann-Whitney U test, 21% non-MSI vs. 8% MSI, *U* = 3273.5, *p* = 0.034, *r* = 0.147

Table 2. Percent Reporting a Major or Moderate Obstacle to Transitioning to Online Learning

Obstacles for Graduate Students Transitioning to Online Learning…	Overall	MSI Status	
		MSI	Non-MSI
Access to a reliable computer	19%	25%	17%
Access to other reliable computer hardware*	27%	36%	24%
Access to software*	26%	33%	24%
Access to reliable internet service	40%	46%	38%
Access to library resources	29%	37%	26%
Access to academic support services	22%	31%	19%
Completion of required learning activities (e.g., internship, practica)	77%	85%	74%

* Denotes statistically significant difference by MSI status, Mann-Whitney U test, $p < 0.05$

With the move to online or remote learning, 79% of the institutions reported that they temporarily offered a pass/fail grading system instead of traditional letter or percent grades; an additional 3% made switching to the pass/fail grading system mandatory. The overwhelming majority of schools (83%) also reported that the pass/fail criterion for graduate students differed from undergraduate students.

In addition to the course delivery obstacles, participants reported obstacles and challenges with regard to graduate student advising and mentoring. Less than a quarter (24%) of institutions reported that they *agree* that graduate students received consistent advising from graduate faculty during COVID-19, and even fewer (12%) reported they agree that virtual advising is an adequate replacement for in-person contact.

Research Progress during COVID-19

As classroom learning was disrupted due to the COVID-19 pandemic, so too was laboratory and field research. Just 7% of institutions reported that all laboratories remained open during COVID-19 with or without enhanced safety measures. Most institutions (79%) had some of their STEM laboratories open in some capacity, while 14% reported that all laboratories and lab activity closed when the campus closed. One institution remarked that graduate students were allowed to return to the labs once a 3-credit hour intensive COVID-19 course was completed. Institutions varied in their reports of the extent to which they were able to use online, virtual, or distance formats to remain productive while labs were closed. A little less than one-half (42%) indicated they could use distance formats to a *small extent*, while a little more than one-half (56%) could use distance formats a *moderate* to a *great* extent. Just three institutions reported not being able to use distance formats for laboratory research at all.

24% reported that graduate students received consistent advising from graduate faculty during COVID-19

✳NORC

On average, institutions report that 67% of the STEM research at their institutions was delayed or discontinued due to COVID-19. As seen in Figure 1, however, the proportion of disrupted research varies considerably by the degree to which the institution's lab was open.

Figure 1. Institutional Lab Closure Policy compared to Mean Proportion of Disrupted Research
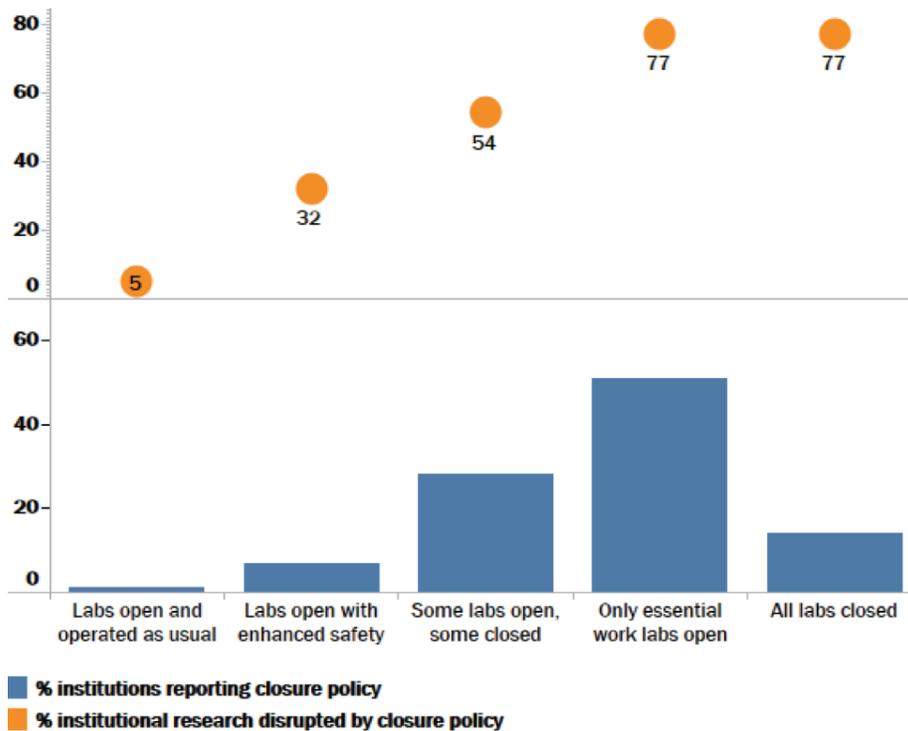
A little over two-thirds of institutions (68%) reported that some of their STEM graduate students were deemed essential workers for the purposes of maintaining laboratory or field research activities. Among those institutions, on average, 18% of graduate students were considered essential; however, the range varied from 1 to 100% of graduate students. Doctoral institutions with the highest research activity (80%) were significantly more likely[10] than doctoral institutions with lower research activity (61%) or master's institutions (37%) to have classified some of their graduate students as essential.[11] Doctoral institutions with the highest research activity did not, however, employ, on average, more graduate student essential workers when compared with doctoral institutions with lower research activity and masters institutions. Most institutions (80%) did not provide hazard pay or extra compensation for these graduate students.

With 88% of institutions indicating that their laboratories would be open in the fall for graduate students and 94% reporting graduate students will be conducting field work in the fall, institutions were asked what safety measures will be required. All respondents indicated that social distancing and personal protective equipment would be required of at least some of their graduate students, and all but seven institutions reported personnel would be scheduled at alternating dates and times (see Table 3). Institutions also were provided an opportunity to share any additional COVID-19 safety-related precautions they are taking. Several institutions mentioned monitoring of symptoms including temperature checks, submission of and adherence to a safety plan, training specific to COVID-19 safety, and more frequent cleaning. One institution also reported that when they reopened their labs it was voluntary for graduate students to return; in this message, the institution not only highlighted the voluntary nature of returning but also included language around the power differential between professors and students.

68% reported that some STEM graduate students were deemed essential workers for maintaining laboratory or field research activities.

10 Chi-square, χ^2 (df = 3) = 16.14, p = 0.001, ϕ = 0.286
11 Among special focus institutions, 69% reported classifying some STEM graduate students as essential. This did not differ significantly from the other three Carnegie types.

★NORC

Table 3. Percent of Institutions Implementing Safety Requirements as a Condition to Resumption of Laboratory Activity and Field Work

Requirements in Place to Resume Lab/Field Work	Not Required	Labs Only	Field Work Only	Both Labs & Field Work
Limit number of personnel	--	14%	1%	86%
Schedule personnel to work on alternating dates/times	4%	23%	1%	73%
Use of personal protective equipment	--	12%	1%	88%

Finally, institutions were asked if they have any mechanisms or process (e.g., website, hotline, or ombuds office) that allows graduate students to confidentially or anonymously report actions or directives that could endanger an individual's health or safety. The majority (77%) had one in place prior to COVID-19, and an additional 12% implemented one at the onset of COVID-19.

Graduate Student Well-Being

Understanding that students will respond in different ways, the survey queried respondents on the perceived impact that COVID-19 has had on various aspects of graduate student well-being. Feelings of loneliness was the most frequently reported well-being concern; 37% reported that loneliness had a large impact on their graduate students, followed by other mental health concerns (33%), physical health concerns (20%), food insecurity (14%), and access to housing (12%).

Vulnerable Graduate Student Populations

Institutions were asked how their vulnerable populations, including international graduate students, graduate students with families, and graduate students with disabilities have been particularly affected by COVID-19. Institutional respondents reported that international students and students with families, in particular, faced considerable added pressures.

Travel restrictions – both the ability to return to their home country and the ability to re-enter the United States – were cited as having a large impact on the international graduate student population (68% and 81%, respectively) across the participating institutions. A few respondents expanded on this in open-ended comments with one institution leader indicating the international students struggle with "feeling wanted and valued by [this] nation." Other areas having a large impact on international student well-being include Optional Practical Training (45%) and housing (26%).

The closure of day care facilities and schools was cited as having the greatest impact on students with families – 72% reported that child care and 70% reported that home schooling has had a large impact on students with families. Access to family health care was cited as a concern (26%) but to a substantially smaller degree than child responsibilities.

The greatest reported impact on students with disabilities was accessibility of community-based services (25%). This was reported in greater numbers than accessibility of campus-based support services (19%).

Finally, institutions were asked if financial concerns resulting from COVID-19 have impacted more vulnerable graduate student groups. Institutions reported that international graduate students and graduate students with families have been impacted financially more than students with disabilities (45%, 42%, and 28%, respectively). Among the highest research doctoral institutions, public institutions were significantly more likely to report a large impact on international student finances when compared with private institutions (58% versus 23%).[12]

International students and students with families, in particular, faced considerable added pressures from COVID-19.


✴NORC

Given these well-being concerns, it was important to learn if institutions were continuing to provide mental health services during the pandemic. Among the responding institutions, all but two institutions provided mental health services to graduate students prior to COVID-19, and among those, 96% continued those services to all graduate students in need. The remaining 4% reported that their continuing services were for graduate students in crisis only.

Institutional Finances and Program Continuity

Budget Cuts

About two-thirds (67%) of institutions reported that they anticipate they will need to cut the budget of their graduate school or graduate programs. Recruitment of faculty, recruitment of students, and student funding were the areas reported most likely to receive major budget cuts. Just seven institutions reported that there would be no cuts in faculty recruitment. Among schools in the highest research doctoral Carnegie Classification, public institutions were significantly more likely than private institutions to report major budget cuts to student funding/assistantships (21% versus 34%) and recruitment of faculty (46% versus 67%).[13]

Figure 2. Percent Reporting Budget Cut by Area
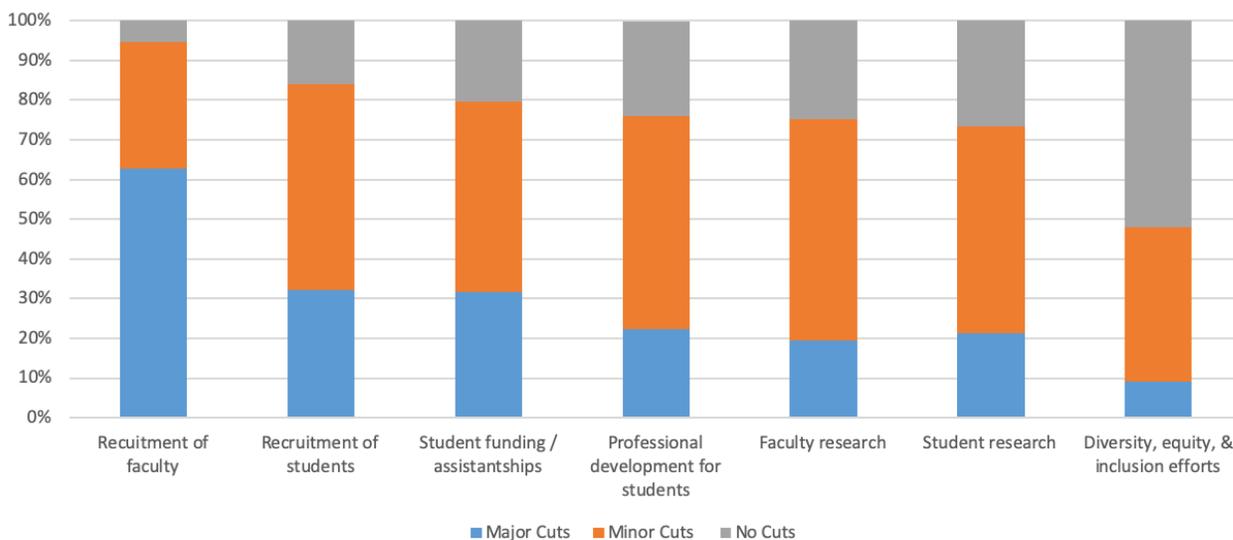
67% of institutions anticipate budget cuts in their graduate school or graduate programs.

While the majority of institutions anticipate budget cuts in some areas, a smaller proportion anticipate substantial impacts on these areas. For example, while 84% reported at least minor budget cuts in student recruitment, just 17% of those anticipate a substantially smaller incoming Fall 2020 class, and 8% anticipate a substantially smaller 2021 entering class. In fact, in all areas besides student recruitment, between one-half and 70% of institutions reported no anticipated impact.

---

13 Chi-square, χ^2 (df = 2) = 7.58, p = 0.023, ϕ = 0.352 (student assistantships); Chi-square, χ^2 (df = 2) = 7.91, p = 0.019, ϕ = 0.366 (recruitment of faculty)

✳NORC

Table 4. Percent Reporting Impact of COVID-19 on Graduate Program Areas

Graduate Program Area	Substantially or Somewhat Smaller	About the Same	Substantially or Somewhat Larger	Unknown / Undecided
The size of the Fall 2020 incoming class	52%	33%	13%	4%
The size of the Fall 2021 incoming class	37%	37%	19%	8%
The number of financial packages for students	41%	49%	6%	5%
The value of financial packages for students	19%	71%	8%	3%
The number of courses available to graduate students	22%	72%	4%	3%
The number of research assistantships available to graduate students	32%	64%	2%	3%
The number of teaching assistantships available to graduate students	32%	54%	10%	5%
The number of professional development opportunities for graduate students	28%	50%	21%	2%

There were some noteworthy differences by Carnegie Classification reported:

- Doctoral institutions with the highest research activity were significantly less likely than doctoral institutions with lower research activity to report that the value of financial packages be smaller (10% and 45%, respectively).[14]

- Doctoral institutions with the highest research activity were significantly less likely than doctoral institutions with lower research activity to report that the number of available research assistantships would be smaller (28% compared to 49%, respectively).[15]

Admission and Retention

While more than one-half of institutions were anticipating at least a somewhat smaller incoming class in 2020, the majority report no anticipated effect due to COVID-related changes in their admissions process on racial and ethnic diversity (56%), gender diversity (76%), and the overall strength (73%) of incoming students. Among those that anticipated an effect, slightly more institutions anticipated a negative effect in each of these areas. Responses were a little more mixed with regard to the impact on the socio-economic diversity of their incoming students. Just under one-half (49%) report no effect on socio-economic diversity with an additional 37% reporting a negative effect and 14% reporting a positive effect. Institutions that reported they would have fewer financial aid packages for students were more likely to report a negative effect on their socio-economic diversity.

Most institutions anticipate no effect from COVID-19 on the racial/ ethnic diversity (56%), gender diversity (76%), or the overall strength (73%) of incoming students.

---

14 Kruskal-Wallis H test, χ^2 (df= 3) = 11.168, p = 0.011, η^2[H] = 0.041
15 Kruskal-Wallis H test, χ^2 (df = 3) = 11.548, p = 0.009, η^2[H] = 0.043

✶NORC

Table 5. Percent Reporting Anticipated Effect to Incoming Class Characteristics

Incoming Class Characteristic	Negative Effect	No Effect	Positive Effect
Racial/ethnic diversity	27%	56%	17%
Gender diversity	12%	76%	12%
Socio-economic diversity	37%	49%	14%
Overall strength of students	15%	73%	12%

Over three-quarters of institutions (79%) reported anticipating their orientation for new students this fall would be entirely online. Just two institutions reported it would be entirely in-person. The rest were a mixture of online and in-person or dependent on department. After the threat of COVID-19 has passed, institutions report an anticipated change in how orientation will be conducted. About two-thirds (65%) of institutions reported that they conducted their orientation completely in-person before COVID-19.[16] Among those, 77% report that they will move to a mixture of online and in-person post-COVID-19. Just 16% will return to an entirely in-person orientation.

Similar to institutions anticipating a smaller incoming class, they also were anticipating, at the time of survey administration, a decrease in retention of current students. Overall, 32% anticipated a *moderate* decrease of domestic student retention (one institution anticipated a large decrease), and over three-quarters anticipated a decrease in international student retention – 24% anticipated a *large* decrease, and an additional 54% anticipated a *moderate* decrease. Master's and doctoral institutions with lower research activity were almost twice as likely to report that they anticipated a *large* decrease in international student retention (33% for each) when compared with doctoral institutions with the highest research activity (19%).[17]

Job Placements for Graduates

The overwhelming majority of institutions reported that there will be fewer placements for graduation students as shown in Table 6.

Over three-quarters of institutions anticipated a large (24%) or moderate (54%) decrease in international student retention.

Table 6. Percent Reporting Change in Job Placements for Graduating Students

Graduating Student Type	Significantly Fewer	Slightly Fewer	No Impact	Slightly More	Significantly More
Master's students	22%	62%	13%	3%	--
PhD students in positions within academe	55%	36%	7%	2%	--
PhD students in positions outside of academe	18%	60%	16%	4%	2%

---

16 In addition, one institution (<1%) reported it was entirely online; 24% reported a mixture of online and in-person, and the remaining 11% reported that it varied by department.
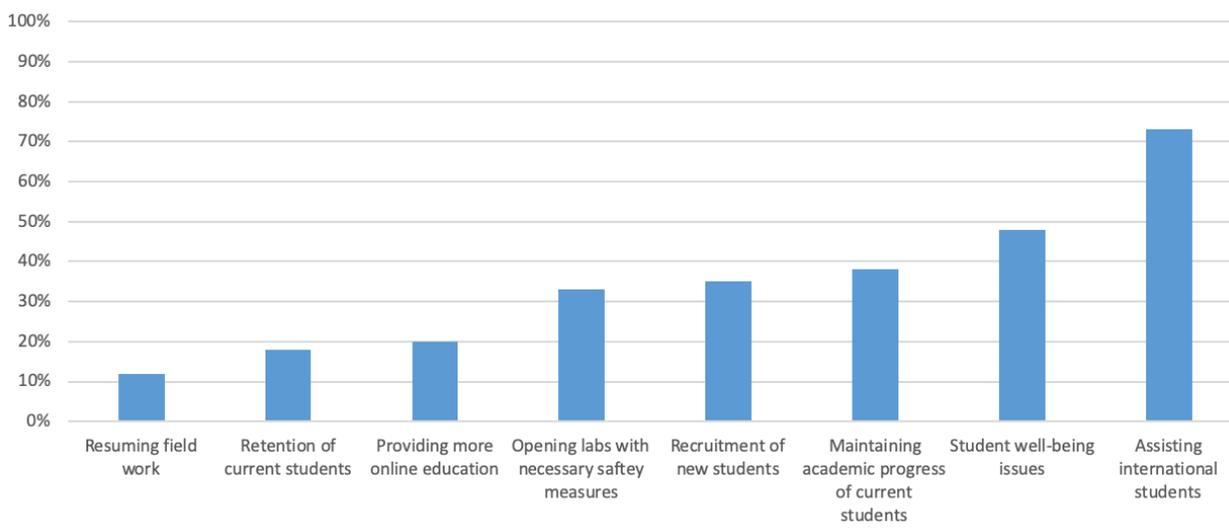
17 Overall, about 80% of institutions indicated both that at least a few of their students chose to delay their program completion and at least a few were forced to delay their program completion.

✕NORC

Most reported that the impact on job placements would not disproportionately affect certain fields. For both master's and doctoral graduates, just 18% and 16% of respondents, respectively, indicated that certain STEM fields have been negatively impacted more than others. Engineering was the most frequently reported field to be disproportionately affected for master's graduates. The most cited fields for disruptions in PhD graduate placements were a little more varied; however, positions in academe and those requiring field work were cited by multiple respondents.

Final Thoughts on Institutional Challenges

Institutional respondents were asked what they believed the top three challenges will be in the 2020-21 academic year (see Figure 3). The most frequently cited item was *assisting international students*, which was endorsed in the top 3 by 73% of respondents. Student well-being issues (48%) and maintaining the academic progress of current students (38%) ranked #2 and #3, respectively. There were no differences by Carnegie Classification or MSI status with regard to these rankings.

Figure 3. Percent of Institutions Ranking Each Challenge in the Top 3 Challenges for 2020-21
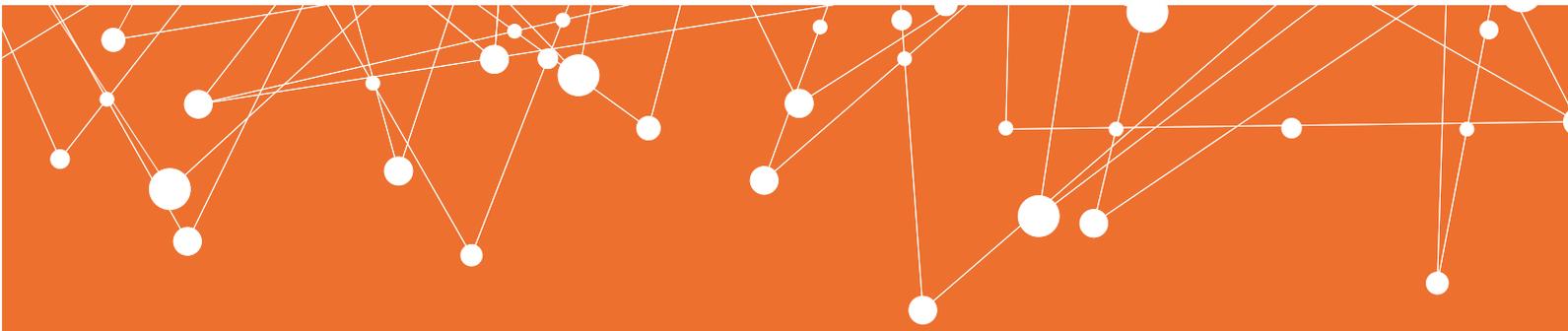
✳NORC

Institutions indicated that the effects of COVID-19 will be felt not just in this academic year but looking ahead to 2021-22, as well. Overall, 79% of institutions reported that COVID-19 will have at least a *somewhat negative* impact on their STEM graduate programs in the 2021-22 academic year and beyond. Respondents were asked to expand upon their response to the anticipated effect of COVID-19 in 2021-22 and beyond. Table 7 identifies some exemplary responses explaining why institutional respondents felt that COVID-19 would affect institutions moving forward.

79%

reported that COVID-19 will have at least a somewhat negative impact on their STEM graduate programs in 2021 and beyond.

Table 7. Corresponding Comments Explaining Perceived Future Impact of COVID-19 on STEM Graduate Programs

Anticipated Effect of COVID-19 in 2021 and Beyond	Corresponding Comment
Extremely negative	COVID-19 will have an extremely negative impact due to the shutdown of non-essential research labs. Students and faculty have lost time (not to mention millions of dollars in animals and reagents). This will have a systemic impact on our graduate programs and research profiles.
Negative	• Loss of time in the lab and slow down had frustrated students and resulted in feeling of being "behind." Recruitment of students for the incoming class will be negatively impacted and the ability to recruit for next year will be difficult. • The budget cuts associated with declining tuition revenue and state funding will significantly reduce the number of assistantships we can award. We also froze hiring so the number of new faculty we have coming in is significantly smaller, reducing graduate opportunities. Depending upon what happens with ruling about international students and online courses, we are questioning the ethical aspects of matriculating any international students (would it be in their best interest or not).
Somewhat negative	I do not think all virtual education is currently at the same quality as our in-person courses. I am confident this gap will diminish however. In addition, lab work with COVID safety measures in place is clearly less efficient than pre-COVID, so the experiential educational area will also be adversely impacted for some time to come. Finally, the potential negative impact on the mental health of students and mentors has the possibility to take this from a somewhat negative to a severely negative impact.
No impact	Eventually we will recover and rebound. Public health and biomedical science programs may even get a boost from increased research funding and interest.
Somewhat positive	We are making many small changes that COVID-19 has helped us promote, though the changes were underway prior. The crisis has awakened quite a few to seeking a new way.
Extremely positive / positive	We have been forced to think out of our comfort zone and COVID-19 required extreme changes which will be lasting. Without COVID-19 these changes would have been evolutionary.

✳NORC

Section 3.

INNOVATIONS SPURRED BY COVID-19

*NORC

Section 3.
Innovations Spurred by COVID-19

Identifying and sharing innovations developed by universities in response to the COVID-19 pandemic is a central goal of this project. More specifically, this study asked graduate institution deans and leaders to consider various areas associated with their graduate STEM programs and identity "new or innovative approaches that were used during the COVID-19 crisis that you may continue or institutionalize in the future." Key findings regarding these reported innovations fall into three broad areas:

(1) Academics and research activities

(2) Student health, well-being, and finances

(3) Retention and recruitment of graduate students and program sustainability

From the reported responses, the (a) technological innovations, (b) innovations in policy, and (c) innovations in practice have been identified and summarized.

Innovations in Academics and Research Activities

Technological Innovations

The most obvious and apparent innovation that virtually all graduate programs utilized in response to the coronavirus pandemic was a shift toward online education for over 2.7 million graduate students, including more than 1.8 million (60.2%) who were enrolled solely in face-to-face courses, and over 900,000 (30.7%) who were enrolled in a mixture of in-person and online courses; by contrast, prior to the pandemic, less than 275,000 graduate students (9%) were enrolled solely in online courses.[18]

According to the survey results, the practical and strategic changes made by institutions in response to the pandemic will likely permanently shift the number of graduate students enrolled in online courses and programs. With regard to graduate *courses*, 94% of survey respondents reported, *after the effects of COVID-19* have passed, their institutions would likely increase the number of classes offered in a "hybrid" format (i.e., a mixture of in-person and online instruction), and 83% would likely increase the number of courses conducted solely online. Furthermore, with regard to graduate programs, more than three-quarters (82%) of the institutions anticipated expanding the number of programs offered in a hybrid format, and more than one-half (54%) anticipated expanding the number of graduate programs offered solely online after the pandemic has passed. Table 8 illustrates these changes, showing the significant shift in the estimated proportion of courses conducted entirely online before and after COVID-19, both for master's and doctoral classes.

83% will likely increase the number of online graduate courses after COVID-19 has passed.

18 U.S. Department of Education, National Center for Educational Statistics. (2019). *Digest of education statistics* (Table 311.15: Number and percentage of students enrolled in degree-granting postsecondary institutions, by distance education participation, location of student, level of enrollment, and control and level of institution: Fall 2017 and fall 2018). https://nces.ed.gov/programs/digest/d19/tables/dt19_311.15.asp?current=yes

✴NORC

Table 8. Proportion of Graduate Institutions Conducting Master's and Doctoral Courses Entirely Online, before and after COVID-19

Proportion of Courses Conducted Entirely Online	Master's Courses		Doctoral Courses	
	Before COVID-19	After COVID-19	Before COVID-19	After COVID-19
None	24%	8%	60%	26%
<25%	66%	40%	26%	48%
26-50%	7%	35%	2%	14%
51-75%	3%	9%	1%	4%
76-99%	1%	6%	1%	6%
100%	1%	2%	1%	1%

Notes. Differences before and after COVID-19 were statistically significant both for Master's courses (Wilcoxon Z = 9.199, p < 0.001, r = 0.432) and for doctoral courses (Wilcoxon Z = -8.391, p < 0.001, r = 0.429).

To help with the mass transition to online education in spring 2020, 99% of the responding institutions offered training for faculty, and 82% offered training to graduate teaching assistants (TA) to help them teach effectively online; however, fewer institutions (70%) provided training or resources for students to learn better online.[19] In addition to training, 93% of institutions reported providing accommodations for students with disabilities to assist in the transition to online education, and 58% of institutions installed (or expanded) wifi "hotspots" around campus to provide greater internet access.[20]

Beyond simply switching to online delivery of their own courses, small numbers of institutions utilized other innovative strategies to deliver classes during the pandemic: 8% of institutions collaborated with other institutions on online courses, 6% of institutions utilized the services of an online program manager (OPM) to transition online, and 3% of institutions reported offering credit for students completing certain massive open online courses (MOOC). One respondent noted that, prior to COVID-19, faculty were very hesitant to transition their courses online, even though the institution had an OPM partner, but resistance fell following the pandemic because faculty realized that they could remain subject matter experts and allow the OPM to design and set up online versions of their courses. A number of institutions also wrote that they worked with offices or colleagues specifically charged with online teaching and learning initiatives on their own campuses to assist in transitioning graduate courses to virtual delivery.

Several institutions noted that they will make added use of asynchronous learning elements in the future. One respondent noted: "Asynchronous modules will likely be used post-COVID-19 to partner with in-person experiences, [using] the asynchronous to support better learning when coupled with in-person, hands-on learning activities." Another wrote that the pandemic spurred further development and expansion of "self-paced" online courses, which could be used to supplement or complement face-to-face instruction, but could also be deployed on their own.

Numerous institutions also plan to expand the use of technology to better facilitate and enable advising and mentoring of graduate students. One respondent noted: "Faculty and students have become accustomed to video conference and chat for routine coaching, guidance, etc., as well as team meetings." Another stated: "We really did not use Zoom at all before mid-March, and now it is essential. We expect these technologies to be the new norm." In fact, many institutions found that online advising sessions were "easier to schedule and more efficient" and made it simple to conduct regular "check-ins" with graduate students to ensure they were progressing toward their degrees.

"We really did not use Zoom at all before mid-March, and now it is essential."

Institutions also found ways to use technology to facilitate research efforts. Numerous institutions noted the widespread use (and effectiveness) of virtual lab meetings, and one found that computational labs were able to seamlessly transition online with virtual collaboration. Others used video and computer-based

---

[19] When analyzed by Carnegie class, significantly more doctoral institutions with the highest research activity (80%) offered training or resources to students to effectively learn online compared to masters institutions (44%); Chi-square, χ^2 (df = 3) = 11.460, p = 0.009, ϕ = 0.246.

[20] When analyzed by Carnegie class, significantly fewer special-focus institutions (largely medical schools; 25%) provided wifi hotspots than doctoral institutions with the highest research activity (66%); Chi-square, χ^2 (df = 3) = 9.998, p = 0.019, ϕ = 0.232.

17 | **Graduate Schools Respond to COVID-19:**
PROMISING PATHWAYS TO INNOVATION AND SUSTAINABILITY IN STEM EDUCATION

✳NORC

interactions to enable and continue research and field work. Videoconferencing technologies were also used to conduct human subjects research. One institution reported using online technology to shift their entire graduate research conference online.

Innovations in Policy

Beyond online teaching and learning, virtually all institutions amended their policies to authorize virtual and online processes for many other academic tasks. As shown in Table 9, during the pandemic, nearly all graduate programs in our sample authorized and utilized online processes for dissertation proposals (99%), dissertation defenses (99%), thesis defenses (98%), doctoral exams (97%), and qualifying exams (94%) – practices that, prior to the COVID-19 pandemic, had only been used by fewer than 1-in-5 graduate schools. Nearly 4-in-5 institutions (79%) adopted remote methods of proctoring exams. Nearly two-thirds of institutions *automatically* extended timelines for degree completion for all doctoral students (65%) and masters students (61%), and numerous additional institutional representatives clarified that their institutions granted such extensions on a case-by-case basis (and often quite liberally).

Table 9. Adoption of Academic Policies and Practices in Response to (and Prior to) COVID-19

Academic Policies and Practices	Allowed **in Response** to COVID	Allowed **Prior** to COVID	Total
Online dissertation defenses	84%	15%	99%
Online dissertation proposals	82%	17%	99%
Online thesis defenses	85%	14%	98%
Online doctoral exams	87%	10%	97%
Online qualifying exams	85%†	9%	94%
Remote proctoring of exams	63%	16%	79%
Automatically extend timeline for completion for PhD students	65%	6%	71%
Automatically extend timeline for completion for master's students	61%	7%	68%

Note. Individual values may not add up to the total due to rounding.

† When analyzed by Carnegie class, doctoral institutions with the highest research activity (87%) were significantly more likely to allow online administration of qualifying exams in response to COVID-19 than master's institutions (59%); Chi square, χ^2 (6) = 21.827, p = 0.001, ϕ = 0.232.

With regard to research practices, a number of institutions revised and updated their laboratory continuity policies and contingency plans, as well as policies governing essential workers. Institutions also changed policies on scheduling of lab personnel to de-densify labs.

To continue research, some institutions noted that they had to engage in "creative thinking about what constitutes research in STEM, e.g., systematic review, meta-analysis." Another institution introduced "a rapid internal grant competition for innovative research projects on COVID-19-related topics. This was very successful, and we will be doing more of these in the future (we have already done a second, focused on studies related to increasing URM participation in research)." Other institutions made new arrangements with outside partners; for example, one institution arranged for its lab-based students to assist the state health department with COVID-19 testing, and another expanded its outside research and clinical partners to de-densify sites and find new opportunities for students whose prior placements were ended due to COVID-19.

★NORC

Respondents identified numerous other academic policy changes that authorized or established:

- Digital forms, files, signatures, and paperwork, with many noting added efficiency

- Online course evaluation

- The recording of classes (generally via videoconferencing platforms) to assist students who were unable to participate and students who wished to review classroom discussions or topics

- Student academic leave of absence policies (both new or revised)

- Loosening of requirements for in-person attendance

- The virtual participation of external dissertation committee members

Innovations in Practice

Institutions also identified a number of helpful adaptations in their academic and research practices during the pandemic. More than anything, several respondents noted the pandemic made institutions re-evaluate *all* of their practices by magnifying all the things that were not working well. In the words of one dean, COVID-19 made institutions focus on "why we are doing what we're doing," to figure out what was necessary and to change or do away with practices and procedures that were not useful.

One important development, noted by several respondents, was that the shift to online learning placed greater attention on and increased use of inclusive pedagogies (such as universal design for learning) for students with disabilities and other marginalized groups.

Another practice that gained traction during the pandemic was formative assessment. Just over one-half of respondents reported that they *agree* (14%) or *somewhat agree* (45%) that the coronavirus pandemic expanded the need for more regular and ongoing evaluation in graduate courses. One institution noted they were recommending that professors "embed student learning assessments within every lecture." Another noted that online platforms and educational technologies contain analytics that can allow professors to "more precisely" track student performance "because it left footprints of data in relation to assignments, responses, and engagement in general." Another respondent noted its faculty were using transcripts from videoconferencing platforms like Zoom to help provide feedback to graduate students following academic presentations like, oral examinations, proposals and defenses.

Within the research realm, institutions adopted numerous practices to limit virus exposure and allow for greater social distancing in labs and field work sites. For example, "The same people were scheduled in the lab for every shift, creating 'pandemic pods' and limiting exposure to too many different people. This has helped cohesion and morale. It has motivated students and faculty to observe the public health rules and keep each other safe." Another dean noted the pandemic will lead them to take a more "hands-on approach to assigning lab rotations" for its first-year graduate students. Other respondents acknowledged networking with other institutions to help secure and share online and virtual services for field work, testing, and other research efforts.

Interestingly, only 14% of institutions reported COVID-19 had spurred increased efforts to reduce graduate student dependence on faculty and PIs for funding, research opportunities, and academic progress. One respondent noted that graduate schools need to "re-think student-faculty relationships" and "alter the research dynamic to give students more say in what they study." Another institutional representative noted the pandemic highlighted the need for faculty to receive more training in mentoring and advising.

Although institutions developed and utilized a number of innovative practices to facilitate student learning and research during the pandemic, perhaps the most substantial change was the simplest: "The faculty were kind and forgiving. The human component of caring about students as human beings cannot be underestimated."

Innovations in Student Health, Well-Being, and Finances

Technological Innovations

Numerous institutions noted the widespread use of telehealth to provide graduate students with health and wellness support during the pandemic. Indeed, as reported in Section 2, of the 99% of respondents whose

Over one-half believe that the coronavirus pandemic expanded the need for more regular and ongoing evaluation in graduate courses.

"Scheduling 'pandemic pods' in research labs limited exposure, helped cohesion and morale, and motivated students and faculty to keep each other safe."

✴NORC

institutions provided counseling services to graduate students prior to the pandemic, all continued to provide services during the pandemic, with 96% providing access for all graduate students and the remaining 4% providing services for graduate students in crisis.[21] Telehealth was used for counseling, group therapy, and medical services. However, the state law in at least one institution's jurisdiction does not authorize or permit telehealth services for students who reside in other states, which restricts the efficacy of this solution. Other institutions noted that they used online technology to provide regular webinars for graduate students on mental health and wellness topics, including meditation and mindfulness sessions.

Online technology was also used to build community and support systems during COVID-19. One institution reported using its learning management system (LMS) to organize all of its graduate students into online "communities," which facilitated information sharing from the institution and interaction between the students themselves. Another institution developed a Slack channel[22] to "build a safe and private online community outside uncontrolled platforms like Facebook." Still another institution "instituted some virtual community-building activities for affinity groups, such as a virtual 'homeroom' for international students just to check in."

Policy Innovations

A number of the policy innovations spurred by the pandemic were adopted to address the financial impact of COVID-19 response on graduate students. Only a small fraction of graduate schools automatically extended funding for their students, with just 13% extending funding for master's students and 20% extending funding for doctoral students.[23] However, numerous respondents noted in open-ended responses that funding extensions were made on a case-by-case or department-by-department basis, and other respondents noted their institutions expanded and/or extended graduate student benefits (such as health coverage).

There were also significant policy issues associated with funding international students, especially those who as a result of the pandemic would be residing outside of the United States (see Table 10). Although about one-quarter of institutions (or more) indicated students (both domestic and international) residing in the United States would remain eligible for assistantship positions even if not physically present on campus, only 15% of institutions reported international students residing abroad would be eligible for any type of assistantship.

Table 10. Eligibility for Assistantship Positions If Graduate Student Is Unwilling or Unable To Be Physically Present on Campus by International Status and Residence

Student Type	Research Assistantship		Graduate Assistantship		Teaching Assistantship	
	Yes	It depends	Yes	It depends	Yes	It depends
Domestic	24%	67%	28%	57%	40%	48%
International, residing in the U.S.	23%	65%	25%	59%	38%	47%
International, residing abroad	9%	42%	11%	33%	15%	27%

---

21 When analyzed by Carnegie class, significantly more doctoral institutions with the highest research activity (99%) continued to offer counseling services to all graduate students during the pandemic compared to masters institutions (83%), which were more likely to offer counseling only for graduate students in crisis (17% vs. 1%); Chi-square, χ^2 (df = 6) = 10.805, p = 0.013, ϕ = 0.234.

22 Slack is an online communication tool that allows organizations to set up chat rooms and private groups.

23 When analyzed by Carnegie class, specialty institutions (largely medical schools; 44%) were significantly more likely to automatically extend funding for PhD students than doctoral institutions with the highest research activity (12%); Chi-square, χ^2 (df = 6) = 22.075, p = 0.001, ϕ = 0.236. It should also be noted that there were no significant differences in the proportion of institutions that automatically extended funding for either Master's or doctoral students based on the public/private status of the institutions. This was true both within the overall sample population and within the group of doctoral institutions with the highest research activity.

20 | **Graduate Schools Respond to COVID-19:**
PROMISING PATHWAYS TO INNOVATION AND SUSTAINABILITY IN STEM EDUCATION

✴NORC

With regard to funding for international students living abroad, several respondents indicated they had developed innovative approaches to circumvent potential limitations associated with hiring/employing foreign students living outside of the United States by entering into sophisticated legal arrangements with a third party, such as Mauve (mauvegroup.com), which would hire and pay the students. These arrangements, however, were described as highly technical and expensive and involved complicated tax issues. Others simply converted assistantships into scholarships for international students. One dean of a public institution, however, noted that it was not politically feasible for them to even consider sending "state" money to students in foreign countries, even if they were enrolled at the institution.

Institutions took a variety of other approaches to address the financial needs of students during the pandemic. Several institutions designed and adopted new types of assistantships to assist with remote course design and delivery ("technical teaching assistantship" or "remote course facilitators"). Other institutions authorized payment of graduate students who participated in training for online teaching or extended assistantships from nine to 11 months.

Institutions also lowered fees and expenses for graduate students. One reduced the enrollment cost for students in candidacy; one waived health care fees for students over the summer; another removed surcharges and separate tuition rates for online courses; others allowed students to keep tuition and fee waivers even if enrolled in all online courses; another reported adopting courses that only ran for one-half of a semester; and one reduced fees for fully off-campus students. More dramatically, one institution reported that it would reduce the size of future cohorts to accommodate "the heterogeneous impact of COVID-19 on dissertation progress."

Other policy innovations were implemented to provide greater mental health support and assistance to graduate students during the pandemic. One institution, which previously had a part-time counselor dedicated to graduate students, converted that position to full-time (even after the COVID-19 pandemic passes) and will house that professional within the graduate student services building on campus. Other campuses sought to increase mental health support by allowing graduate students to access their institution's employee assistant program or by providing graduate students with access to community-based mental health benefits. One campus authorized the institution's social work students (many of whom lost clinical placements as a result of the pandemic) to provide mental health services for graduate students. Other institutions indicated the pandemic helped them build deeper connections and cooperation with their campus student health and wellness partners.

Practice Innovations

Institutions utilized a number of practices to maintain a sense of community and student well-being within their graduate programs during COVID-19. Efforts implemented by at least three-quarters of all institutions included: coordinating meetings about wellness (78%), increasing the frequency of communications (77%),[24] and hosting virtual academic meetings (75%).[25] Two additional efforts used by at least one-half of respondents included: coordinating support groups (58%)[26] and hosting virtual social events such as coffee breaks or happy hours (51%).[27] Other efforts to address the sense of community within graduate schools included the use of needs assessment surveys, meetings on potential unionization, and virtual town halls.

Institutions utilized a variety of practices to support the needs of graduate students during the pandemic, such as keeping campus food pantries operational during the crisis and expanding on-campus childcare. One institution is designing a "trauma-informed" approach to graduate student services "that was motivated by the challenges students are having during COVID."

Institutions also lowered fees and expenses for graduate students.

One institution is designing a "trauma-informed" approach to graduate student services "that was motivated by the challenges students are having during COVID."

---

24 When analyzed by MSI-status, significantly fewer MSIs (65%) increased communications during the pandemic compared to institutions not designed as MSIs (81%); Chi-square, χ^2 (df = 1) = 5.200, p = 0.023, ϕ = 0.158.

25 When analyzed by Carnegie classification, special-focus institutions (largely medical schools, 100%) and doctoral institutions with the highest research activity (82%) were both significantly more likely to conduct virtual academic meetings than doctoral institutions with lower research activity (63%); Chi-square, χ^2 (df = 3) = 16.273, p = 0.001, ϕ = 0.280.

26 When analyzed by Carnegie classification, special-focus institutions (largely medical schools, 88%) were significantly more likely to coordinate student support groups than masters institutions (37%); Chi-square, χ^2 (df = 3) = 10.607, p = 0.014, ϕ = 0.226.

27 When analyzed by Carnegie classification, doctoral institutions with the highest research activity (61%) were significantly more likely to coordinate virtual social events than masters institutions (16%); Chi-square, χ^2 (df = 3) = 15.076, p = 0.002, ϕ = 0.269. When analyzed by MSI-status, significantly fewer MSIs (39%) coordinated virtual social events during the pandemic compared to institutions not designed as MSIs (55%); Chi-square, χ^2 (df = 1) = 40.07, p = 0.045, ϕ = 0.139.

✸NORC

To help with student finances, one institution instituted a centralized process for proving funding for graduate students to attend or present at virtual conferences. Another institution increased its fundraising efforts specifically to provide additional assistance for need-based students, especially international students.

Most fundamental, however, was this advice for supporting students during the pandemic: "Increased communication – students really appreciate an authentic personal touch. It has to be real!! Relationships matter. Trusted people matter. It cannot be rote, boilerplate platitudes."

Innovations in the Recruitment and Retention of Graduate Students and Program Sustainability

Technological Innovations

As in other areas, the use of online and virtual tools were key innovations used by graduate institutions to recruit students (especially international students). Numerous institutions increasingly turned to online recruitment fairs, hosted virtual recruitment sessions and webinars, and held Zoom-enabled meetings with admitted and incoming students. One dean reported personally hosting an online information/Q&A session with over 450 admitted students, which the dean expects to continue post-pandemic.

Several institutions entered collaborations with technology partners to assist with recruitment. One institution is having an outside firm develop a digital recruitment platform for them, and several others substantially increased their digital market budgets. Another institution hired a third party to design a ChatBot powered by artificial intelligence that will be able to provide answers to over 500 common questions about the institution and its programs that could be used by applicants, as well as by admitted and current students. The ChatBot will also include a text messaging interface.

Several institutions noted that they were looking to strategically develop more online programs to help increase enrollments. One institution, for example, prioritized expanding online options in programs with large numbers of international students, who may be less likely to be able to enter the United States or attend class on campus. Another institution is working with some of its smaller graduate programs – programs that had previously resisted online options – to explore virtual options as a way of expanding the size and sustainability of those programs.

Innovations in Policy

Large proportions of institutions modified their admissions policies in light of the COVID-19 restrictions, as seen in Table 11. At least one-half of all institutional respondents reported engaging in virtual interviews, expanding consideration of pass/fail courses, extending application deadlines, and waiving both standardized tests and on-campus visits or interviews. Forty percent of institutions expanded their use of holistic review processes during the admissions process (in addition to the 40% who had already adopted this process prior to COVID-19). Although only a fraction of institutions (17%) reported waiving English proficiency exams, a number of respondents noted in comments they accepted alternative methods of determining proficiency with DuoLingo mentioned multiple times.

40% expanded their use of holistic review processes during the admissions process (in addition to the 40% who had already adopted this process prior to COVID-19).

✴NORC

Table 11. Modifications to Admissions Policies in Response to COVID-19

Admissions Policy	Changed **in Response** to COVID	Allowed **Prior** to COVID	Total
Conducted virtual interviews	68%	16%	84%
Expanded consideration of pass/fail or credit/no credit courses	64%	2%	66%
Extended application deadline	59%	4%	63%
Waived standardized tests (GRE, etc.)	55%	17%	72%
Waived campus visits/interviews	55%	12%	67%
Expanded holistic review	40%	40%	80%
Waived English proficiency exams	17%*	2%	19%

Note. Individual values may not add up to the total due to rounding.

* When analyzed by Carnegie class, masters institutions (41%) were significantly more likely to waive English proficiency exams in response to COVID-19 than doctoral institutions with the highest research activity (12%); Chi-square, χ^2 (df = 9) = 19.450, p = 0.022, ϕ = 0.182.

Institutions also adopted other innovative policies to assist with the recruitment and retention of graduate students. Institutions have entered strategic partnerships with global entities and partners to assist international recruitment efforts. Some institutions implemented formal deferral policies, adopted academic leave of absence policies, and extended time to degree. One institution marketed a "free fee day," which allowed students to apply without an application fee and generated a large number of highly competitive candidates. Another respondent reported their institution hired its continuing international students to serve as "Global Ambassador Peer Mentors" which was expected both to improve retention of current international students by providing them needed funding and to assist in the recruitment of new international students. Another innovative effort to secure new students included offering full scholarships to incoming students to enroll in summer classes.

Innovations in Practice

Most fundamentally, institutions reported engaging in considerably greater efforts to recruit and retain graduate students during the COVID-19 crisis. In fact, nearly one-third (32%) of institutions reported engaging in *substantially* more effort to ensure newly admitted graduate students would enroll at their institution this fall, and nearly one-half (48%) had engaged in *somewhat more* effort to secure the enrollment of admitted students. As one dean explained: "Faculty got much more engaged, they knew it was dynamic and tense, so they increased their efforts to increase certainty." Institutions reported developing and implementing detailed communications plans for incoming (and returning) students, appointing "virtual buddies" for admitted students, and ensuring faculty had weekly online office hours just for recruited students (especially international students).

"Faculty got much more engaged [in recruitment], they knew it was dynamic and tense, so they increased their efforts to increase certainty."

Multiple institutions tracked which continuing students had yet to register for fall courses and "then contacted those students to offer assistance and encouragement." Other institutions provided lists of admitted students who had yet to enroll to program directors, who, then, personally followed up with the students to encourage them to enroll.
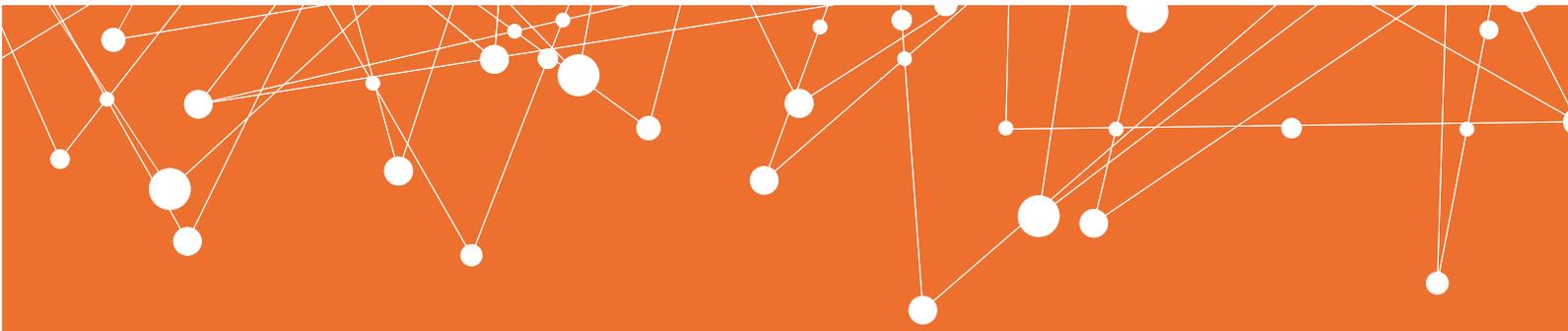
Many institutions also took efforts to recruit graduating seniors at their own institutions. For example, one institution sent postcards to undergraduates with high GPAs to inform them of graduate options, several were looking to develop more accelerated degree programs, and one created scholarships for its graduating seniors to enroll in its master's programs at substantially reduced rates. Other institutions targeted recruitment efforts at institutions with larger number of international undergraduates, with the hope of alleviating visa issues.

Multiple institutions also noted that the pandemic situation forced them to review and reform their curricula. One institution, for example, decided to eliminate many "specializations" that were offered, deciding instead to focus on the core competencies that all graduate students would need. Another institution noted the pandemic's impact on the economy and career opportunities reinforced the need of STEM graduates "to combine technical skills with soft skills so as to broaden career options." Another institutional representative noted the changes resulting from COVID-19 emphasized the importance and need to "get people out of disciplinary silos" and engage in more trans- and interdisciplinary research.

✳NORC

Several institutional representatives highlighted the importance of communication and engagement between programs and their students. "The programs doing the best," one dean reported, "are the ones who are finding ways, on their own, to do outreach to and engagement with their graduate students." Another wrote: "We preach open and frequent communication all the time and don't necessarily even follow our own advice, even though a vast majority of our challenges could have been averted with good communication. COVID has proven this out in a real time experiment. We had weekly communiques from the dean, we encouraged regular communication between students and course directors and mentors. We were relentless in messaging regular communication and frankly it paid off and in many ways we had much fewer problems than might have normally arisen."

Finally, a number of institutional respondents noted the pandemic highlighted broader issues of social and racial justice which continue to persist on campus and (in particular) in STEM fields. "[T]he interaction of anti-Black racism, white privilege in graduate education, and the differential impact of COVID-19 by race, ethnicity, and socioeconomic status … is the major issue going forward in my view." Stated another: "Parallel with the impacts of COVID-19 has been a rise in awareness of social justice issues…. I think that the impact of the latter on this campus and on STEM fields will be significant and perhaps obscure the effects of COVID." These issues demand attention and focused response: "There is a need for an absolute rededication to social justice, the awareness of structural inequalities in academe and elite institutions in particular, and the lack of diversity among the faculty. In this rededication, white folks need to commit to humility and responsibility for structural inequalities – and how that informs our environments, collaborations, etc…. That has all been laid bare by … COVID and other crises."

"The interaction of anti-Black racism, white privilege in graduate education, and the differential impact of COVID-19 by race, ethnicity, and socioeconomic status is the major issue going forward."

24 | **Graduate Schools Respond to COVID-19:**
PROMISING PATHWAYS TO INNOVATION AND SUSTAINABILITY IN STEM EDUCATION

✳NORC

Section 4.

KEY QUESTIONS TO INFORM THE CONVENING DISCUSSION

✳NORC

Section 4.
Key Questions to Inform the Convening Discussion

Six major topics will frame the discussion over the two-day Convening. Under each topic, panelists and all convening participants are invited to comment on a series of questions from their own institutional experience.

The three topics discussed on the first day of the convening address how universities came to understand the challenges and the strategies they adopted in response to the pandemic crisis. The second day will feature three topics focused directly on innovations in graduate education emerging from the crisis. In addition to thinking technological, policy, and practice innovations, it may also be helpful to think about how innovations can also be classified in another way: (1) innovations that were primarily an acceleration of activity already underway, (2) innovations that were "new to us" though may have been in place at other institutions previously, or (3) entirely new innovations. All these kinds of innovation are essential to share and understand. All three represent significant pathways to improving graduate education.

Session 1: Crisis Management and Program Preservation: Things that Worked and Opportunities for Improvement from a Graduate School Perspective

- What can we learn from how our universities approached to managing the COVID-19 crisis and from the sharing the specific strategies undertaken to ensure program preservation?

- What aspects of how your university responded to the crisis were most important in ensuring graduate student progress and program stability?

- How might you consider urging your university to do things differently in the future?

- Will your university institutionalize a particular form of crisis management because of the pandemic experience?

- Since enrolling students and ensuring good retention is critical to any graduate program's success, were there particular strategies for recruitment and retention that seemed promising or ones that should be avoided?

Session 2: Ensuring Academic Progress and Research Continuity for All Graduate Students

- What were/are the largest obstacles to overcome in assuring students make **academic progress**?

- Are there significant variations across STEM fields? Are there lessons learned in one field that could apply in another?

- Are there significant variations by degree level, masters versus PhD?

- What were/are the most significant obstacles to overcome in assuring students make **research progress**?

- Are there notable variations across STEM fields? Are there lessons to be learned from one field that could be applied in another?

- Concerning maintaining academic progress in assuring research continuity, what were/are the challenges unique to international students? Are there lessons learned that you would like to share?

- Concerning maintaining academic progress and assuring research continuity, what were/are challenges unique to students from underrepresented populations? Are there lessons learned that you would like to share?

26 **Graduate Schools Respond to COVID-19:**
PROMISING PATHWAYS TO INNOVATION AND SUSTAINABILITY IN STEM EDUCATION

✳NORC

Session 3: Sustaining the Health and Well-Being of All Graduate Students

• What were the greatest obstacles to overcome to ensure the health and wellbeing of graduate students on your campus?

• On your campus were there particular challenges associated with ADA (disabilities) issues, insurance concerns, or access to medical treatment facilities?

• Concerning mental well-being, how did the pandemic exacerbated existing problems, what new problems emerged, and how did the existing mental health support system respond?

• What were the life management/family responsibility challenges that emerged, and how were graduate schools and/ or universities able to respond?

• Concerning all the above, what was the impact of racial or gender disparities that may have existed pre-pandemic? Are there lessons learned and strategies to share?

Session 4: Technological Innovations: Search for the Silver Lining

• How has technology facilitated innovation across the graduate school and graduate programs in response to the crisis of COVID-19? Topics might include recruitment, admissions, teaching/coursework, advising, mentoring, laboratory research, field research, supporting student health and wellbeing, examinations, or other aspects of graduate education.

• In considering this question remember innovations may be an acceleration of activity already underway, or may be new to your institution though in place at other institutions. Some innovations may be entirely new. All types of innovation represent significant pathways to improving graduate education.

Session 5: Innovations in University or Graduate Policy and Process: Search for the Silver Lining

• What innovations in university policy or process have been adopted or are occurring at your institutions in response to the COVID-19 crisis? Topics might include: recruitment and admissions: mentoring and advising, financing (assistantships, fellowships, other financial support), fundraising, career /placement.

• In considering this question remember innovations in policy or process may be an acceleration of activity already underway, or may be new to your institution though in place at other institutions. Some innovations may be entirely new. All types of innovation represent significant pathways to improving graduate education.

Session 6: Requirement to Sustain Innovations

• It is now commonplace to say that universities, including graduate education, will be forever changed because of this pandemic. The question is: in what ways, toward what ends, and are the positive innovations sustainable?

• How will the innovations engendered in response to COVID-19 intersect with the political movement for racial equality and social justice?

• How will the innovations triggered as a response to COVID-19 fare given the financial constraints facing many universities going forward?

• What have we learned about new ways of leading and managing as universities leaders have responded to the challenges of COVID-19?

27 | **Graduate Schools Respond to COVID-19:**
PROMISING PATHWAYS TO INNOVATION AND SUSTAINABILITY IN STEM EDUCATION

✶NORC

Conclusion

We hope that these preliminary findings and questions will spur all of us – graduate education leaders and researchers alike – to reflect further on the pandemic's impact on and implications for graduate education in STEM fields. Reforming graduate education has long been lauded as both necessary and overdue, and COVID-19 has provided a critical impetus – and opportunity – to address and rectify many long-recognized issues.

Please remember, this report is a working paper and an intermediary step in the project. The upcoming virtual convening, during which time we will review and discuss both challenges and innovative practices, remains another key component of our research effort. The discussions and information shared at those meetings will be added to our existing corpus of data. Thus, we depend on your continued insights, observations, and feedback as we continue to explore the ongoing implications of the pandemic.

Following the convening, our research group will prepare a final report, which will be shared before the end of this calendar year. With your continued assistance and insight, we can help ensure that this crisis is indeed not wasted.

28 | **Graduate Schools Respond to COVID-19:**
PROMISING PATHWAYS TO INNOVATION AND SUSTAINABILITY IN STEM EDUCATION

✷NORC
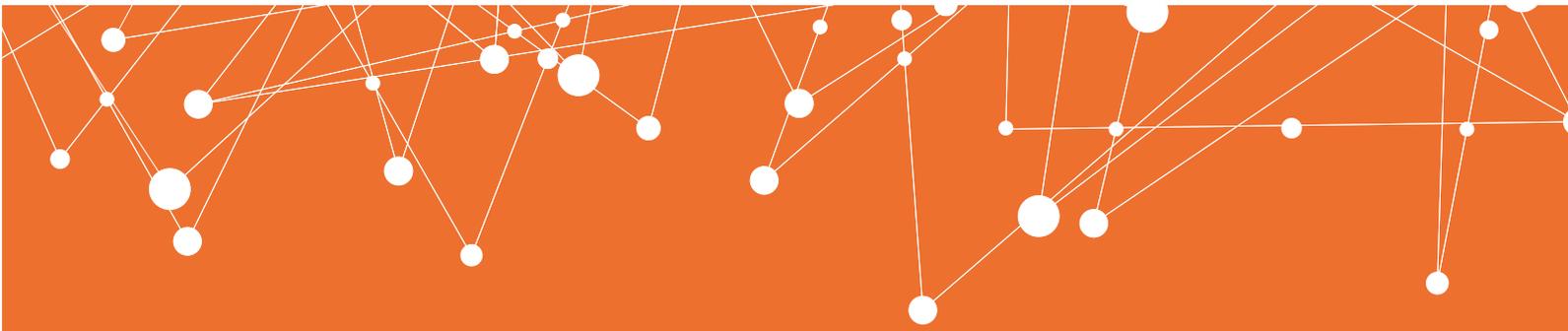
APPENDIX:
SURVEY TEXT

Appendix:
Survey Text

Informed Consent Page

Thank you for your participation in our NSF-funded survey, "Ensuring the Success and Sustainability of STEM Graduate Programs in Response to COVID-19." The purpose of the survey is to identify challenges the COVID-19 pandemic poses to graduate STEM programs at colleges and universities across the United States, as well as document and share innovative strategies institutions employed during the crisis. Responses to the survey will help to inform a subsequent convening and final recommendations report, which will share promising practices institutions used to adapt to the numerous ways COVID-19 impacted their STEM graduate programs, students, and research.

Your responses are voluntary and confidential. No individuals or their institutions will be identified in any reports. Please answer the survey questions as completely as possible. You may refuse to provide a response to any question you prefer not to answer or to any you feel do not apply to you. You may stop participating at any time. By entering the survey, you are granting consent to participate in this research.

We estimate that it will take you about 20 minutes to complete this survey.

If you have any questions or concerns, you may contact the research team at nsfcovid19survey@norc.org. You can also visit the following website for additional information: https://www.norc.org/Research/Projects/Pages/ensuring-the-success-of-stem-graduate-students-and-research-programs-during-the-COVID-19-crisis.aspx.

If you have any questions or concerns about your rights as a research participant, please contact the NORC IRB Manager by toll-free phone number at (866) 309-0542.

Demographics

For purposes of this survey, "STEM" includes the traditional science, technology, engineering, and mathematics fields, as well as the social and behavioral sciences (e.g., economics, psychology, sociology).

1. **Regarding plans for Fall 2020, please answer the following to the best of your current knowledge.**
   Answer "Yes" even if these statements apply to only a portion of your students, laboratories, or fieldwork sites and even if alternative arrangements are used in those settings; for example, implementing physical distancing requirements; restricting the number of individuals allowed in class sessions, labs, or field settings; or conducting activities using a hybrid/blended format that is partially online and partially in-person.

	No	Yes
Graduate students will be on campus for in-classroom instruction in the fall	○	○
STEM laboratories will be open in the fall for PIs and graduate students	○	○
STEM field work/research will be conducted in the fall for PIs and graduate students	○	○

✳ NORC

2. Were you a part of the central administration team/task force that developed the institutional response to COVID-19?

○ No

○ No, but another senior graduate school official was a part of the team

○ Yes

○ Our institution did not have a central team/task force

3. How helpful was your institution's crisis management plan in responding to the effects of COVID-19 on graduate programs?

○ Not at all helpful

○ Somewhat helpful

○ Very helpful

○ N/A – Our institution did not have a crisis management plan

4. Is your institution or graduate school using any of the following to address COVID-19 issues with graduate students and graduate programs?

	No	Yes
Central website where updates are posted	○	○
Email blasts	○	○
Town hall meetings (can be virtual)	○	○
Designated COVID response team to field questions	○	○
Designated individual in the graduate school to field questions	○	○
Other, please specify: _____	○	○

ACADEMICS

Please consider all courses that are delivered in online, remote, or virtual formats (whether synchronous or asynchronous) as online. Courses that are conducted in-person but which are simultaneously available to students via Zoom or similar technology are NOT considered online.

5. **After the immediate impacts of COVID-19 have passed**, do you anticipate any of your STEM graduate programs will **expand** the following?

	No	Yes	N/A – We don't currently offer this
Courses taught **entirely** online or in a remote format	○	○	○
Hybrid courses taught partially online and partially in-person	○	○	○
Degree **programs entirely** in an online or remote format	○	○	○
Hybrid degree **programs** offered partially online and partially in-person	○	○	○

Graduate Schools Respond to COVID-19:
PROMISING PATHWAYS TO INNOVATION AND SUSTAINABILITY IN STEM EDUCATION

✦NORC

6. **Prior to COVID-19**, approximately what percent of your STEM graduate courses were taught **entirely** online?

	None of these courses were online	Up to 25%	26-50%	51-75%	76-99%	100%
Master's Programs	○	○	○	○	○	○
PhD Programs	○	○	○	○	○	○

7. **After the immediate impacts of COVID-19 have passed**, approximately what percent of your STEM graduate courses do you anticipate will be taught **entirely** online?

	None	Up to 25%	26-50%	51-75%	76-99%	100%
Master's Programs	○	○	○	○	○	○
PhD Programs	○	○	○	○	○	○

8. **Prior to COVID-19**, how would you have rated your institution's technical capacity to provide online/distance learning for graduate students? When answering, please consider both your institution's internal abilities and any then-existing arrangements with third-party providers or online program management companies.

   ○ Not capable of supporting online/distance learning

   ○ Marginally capable

   ○ Somewhat capable

   ○ Largely capable

   ○ Fully capable of supporting online/distance learning

9. As a result of COVID-19, did your institution **temporarily** use or expand a pass/fail type of grading system for graduate students instead of traditional letter or percent grades?

   ○ No

   ○ Yes, we provided the option but didn't require it

   ○ Yes, we required it of all graduate students

✳NORC

10. **Did the pass/fail criterion for graduate students differ from undergraduate students (e.g., a C in a graduate course is considered failing at most institutions, but passing for most undergraduate courses)?**

   ○ No

   ○ Yes

Please consider all courses that are delivered in online, remote, or virtual formats (whether synchronous or asynchronous) as online. Courses that are conducted in-person but which are simultaneously available to students via Zoom or similar technology are NOT considered online.

11. **In response to COVID-19, has your institution provided or expanded use of the following?**

	No	Yes
Collaboration with other institutions to provide online courses for graduate students	○	○
Offering academic credit for graduate students completing MOOCs if certain criteria are met	○	○
Contractual agreements with third-parties, such as Online Program Managers (OPMs), to develop or provide online courses or programs for graduate students	○	○
Collaboration with other institutions or groups to provide online professional development to graduate students	○	○
Other, please specify _____	○	○

12. **ONLINECOV In response to COVID-19, what proportion of your in-person graduate courses moved to a remote/online format, either in whole or in part? (Please provide your best estimate.)**

13. **In response to COVID-19, were any of the following provided to assist with the transition to online classes?**

	No	Yes
Training or resources for students to effectively learn online	○	○
Training or resources for **TAs** to effectively teach online	○	○
Training or resources for **faculty** to effectively teach online	○	○
Accommodations for students with disabilities (e.g., captioning of lectures or videos)	○	○
Provided or expanded wifi "hot spots" around campus	○	○

14. **Regarding the transition to online classes, are there new or innovative approaches that were used during the COVID-19 crisis that you may continue or institutionalize in the future? If so, please briefly identify them here.**

✶NORC

15. Did any of the following pose obstacles for your STEM graduate students in transitioning to online learning?

	No obstacle at all	A minor obstacle	A moderate obstacle	A major obstacle
Access to a reliable computer	○	○	○	○
Access to other reliable computer hardware (e.g., printers, scanners)	○	○	○	○
Access to software (e.g., statistical packages)	○	○	○	○
Access to reliable internet service	○	○	○	○
Access to library resources	○	○	○	○
Access to academic support services (e.g., statistics tutoring, writing lab)	○	○	○	○
Completion of required internships, practica, or other experiential learning activities	○	○	○	○
Other, please specify_____	○	○	○	○

34 | **Graduate Schools Respond to COVID-19:**
PROMISING PATHWAYS TO INNOVATION AND SUSTAINABILITY IN STEM EDUCATION

✷NORC

16. In response to COVID-19, did your graduate programs make any of the following changes?

Graduate Schools Respond to COVID-19:	No	Yes	We did this pre-COVID
Use remote proctoring for online course exams or quizzes	○	○	○
Allow online administration of qualifying exams	○	○	○
Allow online administration of thesis defenses	○	○	○
Allow online administration of doctoral exams (preliminary and final exams)	○	○	○
Allow online dissertation proposals	○	○	○
Allow online dissertation defenses	○	○	○
Changed established timelines for degree completion for master's students (extended timelines)	○	○	○
Changed established timelines for degree completion for PhD students (extended timelines)	○	○	○
Automatically extended funding for master's students	○	○	○
Automatically extended funding for PhD students	○	○	○
Other, please specify _____	○	○	○

17. Please rate your agreement with the following statements about online dissertation defenses:

	Strongly Disagree	Disagree	Agree	Strongly Agree
Online defenses produce greater participation from guests and the public	○	○	○	○
Conducting defenses online improves the civility level of the defense	○	○	○	○
Online defenses should be expanded	○	○	○	○

✳NORC

18. Please indicate your level of agreement with the following statement: In light of our COVID-19 experiences, our institution is considering ways to expand our use of <u>formative</u> evaluation of graduate student academic and research performance **(e.g., more real-time feedback and low stakes early assessments)**.

   ○ Disagree

   ○ Somewhat disagree

   ○ Somewhat agree

   ○ Agree

19. Regarding formative evaluations, are there new or innovative approaches that were used during the COVID-19 crisis that you may continue or institutionalize in the future? If so, please briefly identify them here.

20. Please indicate your level of agreement with each of the following statements regarding advising/ mentoring during COVID-19:

	Disagree	Somewhat Disagree	Somewhat Agree	Agree
Graduate students received consistent advising and/or mentoring from graduate faculty	○	○	○	○
Virtual advising (e.g., Zoom) has been an adequate replacement for in-person contact	○	○	○	○

21. Regarding graduate academic policies and practices, are there new or innovative approaches that were used during the COVID-19 crisis that you may continue or institutionalize in the future? If so, please briefly identify them here.

RESEARCH

22. Which statement <u>best</u> represents the status of your institution's STEM laboratories <u>during COVID-19</u>?

   ○ All the laboratories remained open and operated as usual

   ○ All the laboratories remained open but with physical distancing and other enhanced safety measures put in place

   ○ Some of the laboratories closed and some remained open (including any that may have remained open with physical distancing and other enhanced safety measures)

   ○ Only laboratories designated as doing essential work remained open

   ○ All laboratories closed when the campus closed

   ○ Other, please specify _____

✷NORC

23. a. What proportion of STEM research at your institution was delayed or discontinued **due to COVID-19**?

b. [RESDELAY_FAL20] What proportion of STEM research at your institution do you anticipate will be delayed or discontinued in **Fall 2020**?

24. At your institution, how would you rate the overall impact of delayed or discontinued research on STEM **graduate student progress** within the following fields?

	No impact	Minor impact	Major impact	N/A – No programs in this area
Biological, agricultural, and environmental life sciences	○	○	○	○
Computer & information sciences	○	○	○	○
Engineering	○	○	○	○
Mathematics & statistics	○	○	○	○
Physical sciences, geosciences, atmospheric, and ocean sciences	○	○	○	○
Social, behavioral, & economic sciences	○	○	○	○

25. **During COVID-19**, to what extent was laboratory and field-based research able to use online, virtual, or distance formats to remain productive while labs or field sites were inaccessible?

○ Not at all

○ A small extent

○ A moderate extent

○ A great extent

○ N/A - All labs and field sites remained accessible during COVID-19

26. Were any STEM graduate students deemed "essential" at your institution for purposes of maintaining laboratory or field research activities (**excluding** teaching or instruction)?

○ No

○ Yes

✳NORC

27. Approximately, what percent of STEM graduate students were deemed "essential" for purposes of maintaining research or laboratory activities? (Please provide your best estimate.)

28. Did graduate students performing these essential activities receive hazard pay or extra compensation?

    ○ No

    ○ Some - Decisions were made on a departmental or case-by-case basis

    ○ Yes, all received extra compensation

29. Does your institution have any mechanism or process (e.g., website, hotline, or ombuds office) that allows graduate students to **confidentially or anonymously** report actions or directives that could endanger an individual's health or safety?

    ○ No

    ○ Yes, we had an established process prior to COVID-19

    ○ Yes, we implemented a process after the onset of COVID-19

30. When resuming lab/field activities, must any of the following requirements be met?

	No	Labs only	Field work only	Both labs & field work
Limiting the number of personnel in lab or field setting	○	○	○	○
Scheduling personnel to work on alternating dates/times	○	○	○	○
Use of personal protective equipment (PPE), such as masks, to prevent the spread of COVID-19	○	○	○	○
Other, please specify: _____	○	○	○	○

31. Has COVID-19 prompted a greater interest in taking steps to reduce the dependence of graduate students upon individual PIs for their funding, research, or academic progress? Examples might include mentoring networks, committee-based advising, or central pool funding vs. direct funding from PIs.

    ○ No

    ○ Yes

32. Regarding laboratory and field-based research, are there new or innovative approaches that were used during the COVID-19 crisis that you may continue or institutionalize in the future? If so, please briefly identify them here.

Well-Being

33. Understanding that students will respond in different ways, what impact, overall, has COVID-19 had on the following aspects of your graduate students' well-being?

	No impact at all	Small impact	Moderate impact	Large impact
Access to housing (e.g., needing to leave campus housing, inability to pay rent)	○	○	○	○
Food insecurity	○	○	○	○
Physical health concerns	○	○	○	○
Feelings of loneliness / social isolation	○	○	○	○
Other mental health concerns	○	○	○	○
Other, please specify_____	○	○	○	○

34. Please indicate if your institution and/or graduate students themselves are coordinating any of the following to help maintain a sense of community during COVID-19. *Select all that apply for each.*

	No	Yes, institution coordinating	Yes, students coordinating
Increased frequency of general communications via special newsletters, email blasts, etc.	○	○	○
Hosting virtual coffee breaks, happy hours, or other social gatherings (e.g., book club)	○	○	○
Hosting virtual academic meetings (e.g., speaker series, research presentations)	○	○	○
Coordinating meetings about wellness topics (e.g., mental health, stress, exercise)	○	○	○
Coordinating support groups	○	○	○
Other, please specify _____	○	○	○

✳NORC

35. What impact, overall, has COVID-19 had on current __international__ graduate students at your institution in each of the following areas?

	No impact at all	Small impact	Moderate impact	Large impact
Finances	○	○	○	○
Housing	○	○	○	○
Optional Practical Training (OPT)	○	○	○	○
Ability to return to home country	○	○	○	○
Ability to re-enter the United States after returning to home country	○	○	○	○
Other, please specify_____	○	○	○	○

36. Regarding support and assistance for __international__ graduate students, are there new or innovative approaches that were used during the COVID-19 crisis that you may continue or institutionalize in the future? If so, please briefly identify them here.

37. What impact, overall, has COVID-19 had on your institution's graduate students __with families__ in each of the following areas?

	No impact at all	Small impact	Moderate impact	Large impact
Finances	○	○	○	○
Child care	○	○	○	○
Home schooling	○	○	○	○
Access to health care for family	○	○	○	○
Other, please specify_____	○	○	○	○

38. What impact, overall, has COVID-19 had on graduate students **with disabilities** at your institution in each of the following areas?

	No impact at all	Small impact	Moderate impact	Large impact
Finances	○	○	○	○
Accessibility of online/distance courses	○	○	○	○
Accessibility of campus disability support services	○	○	○	○
Accessibility of community-based services	○	○	○	○
Other, please specify_____	○	○	○	○

39. **Prior to COVID-19**, did your institution provide **mental** health services that were accessible to the graduate students?

○ No

○ Yes

40. Has your institution continued to provide mental health services to graduate students during COVID-19? (These could be offered as in-person or as virtual/tele-counseling sessions.)

○ No, we suspended all mental health services

○ Yes, but we're offering services for students **in crisis only**

○ Yes, we're continuing to offer mental health services to all students in need

41. Regarding graduate student well-being, are there new or innovative approaches that were used during the COVID-19 crisis that you may continue or institutionalize in the future? If so, please briefly identify them here.

FINANCE

42. As a result of COVID-19, do you anticipate your institution will cut the budget of the graduate school/ graduate programs?

○ No

○ Yes

✳NORC

43. How great do you anticipate budget cuts will be on the following aspects of graduate education?

	No change	Minor cuts	Major cuts
Student funding/assistantships	○	○	○
Recruitment of faculty	○	○	○
Recruitment of students	○	○	○
Faculty research	○	○	○
Student research	○	○	○
Diversity, equity, and inclusion efforts	○	○	○
Professional development for students	○	○	○
Other, please specify _____	○	○	○

✳NORC

44. As a result of COVID-19, what will be the impact in the following areas on <u>graduate programs</u> at your institution?

	Substantially smaller	Somewhat smaller	About the same	Somewhat larger	Substantially larger	Unknown or Under Discussion
The size of the **incoming** cohort of students (Fall 2020)	○	○	○	○	○	○
The size of **future** cohorts of students (Fall 2021+)	○	○	○	○	○	○
The **number** of financial packages for students	○	○	○	○	○	○
The **value** of financial packages for students	○	○	○	○	○	○
The number of courses available to graduate students	○	○	○	○	○	○
The number of research assistantships available to graduate students	○	○	○	○	○	○
The number of teaching assistantships available to graduate students	○	○	○	○	○	○
The number of professional development opportunities for graduate students	○	○	○	○	○	○

NORC

45. Is your institution providing any financial support to graduate students this summer?

○ No

○ Yes, summer support was already included in their packages

○ Yes, we provided new or additional support for the summer

46. Will **domestic** graduate students, who are unwilling or unable to be physically present on campus this fall, be able to continue an assistantship?

	No	Yes	Depends on the nature of the work	N/A – We don't offer this type of assistantship
Research assistantship	○	○	○	○
Graduate assistantship	○	○	○	○
Teaching assistantship	○	○	○	○

47. Will **international** graduate students **residing abroad**, who are unwilling or unable to be physically present on campus this fall, be able to continue an assistantship?

	No	Yes	Depends on the nature of the work	N/A – We don't offer this type of assistantship
Research assistantship	○	○	○	○
Graduate assistantship	○	○	○	○
Teaching assistantship	○	○	○	○

48. Will **international** graduate students **residing in the US**, who are unwilling or unable to be physically present on campus this fall, be able to continue an assistantship?

	No	Yes	Depends on the nature of the work	N/A – We don't offer this type of assistantship
Research assistantship	○	○	○	○
Graduate assistantship	○	○	○	○
Teaching assistantship	○	○	○	○

44 | **Graduate Schools Respond to COVID-19:**
PROMISING PATHWAYS TO INNOVATION AND SUSTAINABILITY IN STEM EDUCATION

✴NORC

49. COVID-related financial impacts on graduate students, are there new or innovative approaches that were used during the COVID-19 crisis that you may continue or institutionalize in the future? If so, please briefly identify them here.

CONTINUITY

50. In response to COVID-19, did you make any of the following changes to your admissions requirements or criteria? Please answer "Yes" only if the change applied to all students and not granted as an exception or on a case-by-case basis.

	No	Yes	In place prior to COVID-19	N/A / Not a part of our criteria
Extended applications deadline	○	○	○	○
Waived standardized test requirement (eg, GRE)	○	○	○	○
Waived English proficiency exam	○	○	○	○
Expanded consideration of Pass/Fail or Credit/No Credit courses in evaluating transcripts	○	○	○	○
Expanded holistic review of applicants	○	○	○	○
Waived campus visits/interviews	○	○	○	○
Conducted virtual interviews	○	○	○	○
Other, please specify _____	○	○	○	○

51. What do you foresee will be the effect of <u>**COVID-related changes in your admissions processes**</u> on your incoming STEM graduate cohorts in the following areas?

	Negative effect	No effect	Positive effect
Racial/ethnic diversity of incoming students	○	○	○
Gender diversity of incoming students	○	○	○
Socio-economic diversity of incoming students	○	○	○
Overall strength of incoming students	○	○	○

✳NORC

52. Compared to before COVID, how would you characterize your institution's overall efforts to ensure that newly admitted graduate students enroll for the Fall 2020 term?

- ○ Substantially less effort
- ○ Somewhat less effort
- ○ No change
- ○ Somewhat more effort
- ○ Substantially more effort

53. For each of the following time periods, please identify how orientation of new graduate students at your institution was (or will be) conducted.

	Completely online	Completely in-person	Mixture of online and in-person	Varies by department or program
Before COVID	○	○	○	○
This fall	○	○	○	○
After COVID has passed	○	○	○	○

54. Compared to prior years, how much of a change in **retention** do you anticipate **in Fall 2020** for…

	Large decrease	Moderate decrease	No Change	Moderate increase	Large increase
Domestic students?	○	○	○	○	○
International students?	○	○	○	○	○

55. Regarding recruitment and retention of **international** graduate students, are there new or innovative approaches that were used during the COVID-19 crisis that you may continue or institutionalize in the future? If so, please briefly identify them here.

56. Regarding recruitment and retention of **domestic** graduate students, are there new or innovative approaches that were used during the COVID-19 crisis that you may continue or institutionalize in the future? If so, please briefly identify them here.

46 | **Graduate Schools Respond to COVID-19:**
PROMISING PATHWAYS TO INNOVATION AND SUSTAINABILITY IN STEM EDUCATION

✷NORC

57. As a result of COVID-19, how many graduate students at your institution:

	None or virtually none	A few	Some	Many	I don't know
Chose to delay their program completion	○	○	○	○	○
Were **forced** to delay their program completion	○	○	○	○	○
Had an internship, practicum or other **experiential learning** activity cancelled or withdrawn	○	○	○	○	○

58. Overall, what do you anticipate the impact of COVID-19 will be on job placements for graduating students?

	Significantly fewer placements	Slightly fewer placements	No impact	Slightly more placements	Significantly more placements
Masters students	○	○	○	○	○
PhD students in positions within academe	○	○	○	○	○
PhD students in positions outside of academe	○	○	○	○	○

59. With regard to job placements, have certain STEM fields been negatively impacted more than others for masters graduates?

○ No

○ Yes, please specify the fields most affected _____

60. With regard to job placements, have certain STEM fields been negatively impacted more than others for PhD graduates?

○ No

○ Yes, please specify the field most affected_____

61. Regarding the overall health and sustainability of your STEM graduate programs moving forward, are there new or innovative approaches that were used during the COVID-19 crisis that you may continue or institutionalize in the future? If so, please briefly identify them here.

Graduate Schools Respond to COVID-19:
PROMISING PATHWAYS TO INNOVATION AND SUSTAINABILITY IN STEM EDUCATION

✳NORC

62. What do you believe your top 3 challenges will be in the 2020-21 academic year?
Please enter 1 for the greatest challenge, 2 for the second greatest, and 3 for the third greatest. Please only identify your top 3.

	Rank
Providing more online education	
Maintaining academic progress of current students	
Assisting international students specifically	
Opening labs with necessary safety and precaution measures	
Resuming field work	
Student well-being issues	
Retention of current students	
Recruitment of new students	
Other, please specify _____	

63. Looking ahead to the 2021-22 academic year and beyond, what impact will COVID-19 have on STEM graduate programs at your university overall?

○ Extremely negative

○ Negative

○ Somewhat negative

○ No impact

○ Somewhat positive

○ Positive

○ Extremely positive

64. Please explain why you believe COVID-19 will ultimately have impact on your graduate programs overall?

65. If there is any other information you would like to provide pertaining the topics covered in this survey, please use the space below.

Thank you for your participation in our survey! If you have any questions or concerns, you may contact the research team at nsfcovid19survey@norc.org. You can also visit the following website for additional information: https://www.norc.org/Research/Projects/Pages/ensuring-the-success-of-stem-graduate-students-and-research-programs-during-the-COVID-19-crisis.aspx

48 | **Graduate Schools Respond to COVID-19:**
PROMISING PATHWAYS TO INNOVATION AND SUSTAINABILITY IN STEM EDUCATION

✳NORC

NORC