Pandemic Impacts on Geoscience Graduate Students

Leila M. Gonzales & Christopher M. Keane
American Geosciences Institute

23 May 2022
CGS Research & Policy Forum

Funding for this project is provided by the National Science Foundation (Award #2029570). The results and interpretation of the survey are the views of the American Geosciences Institute and not those of the National Science Foundation.
Project Goals

1. Assess pandemic impacts
2. Establish baseline for workplace and instructional environments
3. Analyze magnitude and permanency of changes
4. Inform response and recovery planning for future disasters and disruptions
COVID-Impacts Survey Design

Participant Consent

- Employer
- Academic Dept
- Academic faculty
- K-12 faculty
- Student
- Post-doctoral fellow
- Non-academic geoscientist
- Unemployed
- Retired

Benchmark (Feb 2020)

- Employer
- Academic Dept
- Individual

Next Update

- Employer
- Academic Dept
- Individual
<table>
<thead>
<tr>
<th>Data Type</th>
<th>Consent</th>
<th>Benchmark</th>
<th>Next Update</th>
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</thead>
<tbody>
<tr>
<td>Participant Type</td>
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<tr>
<td>Employment / Enrollment Status</td>
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<td>Job-seeking Activities</td>
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<td>Retiree Activities</td>
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<td>Work / Learning Environment</td>
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<td>Business Operations</td>
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Survey Design

Multi-cohort longitudinal survey

Continuous onboarding
May 2020 – Dec 2021

Participants are not required
to answer every survey

Survey sent every 2 weeks
Survey participation by major cohort

Participants by major cohort

<table>
<thead>
<tr>
<th>Participants</th>
<th>Total participants</th>
<th>Active participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals</td>
<td>1,659</td>
<td>1,420</td>
</tr>
<tr>
<td>Academic departments</td>
<td>103</td>
<td>89</td>
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<tr>
<td>Geoscience employers</td>
<td>123</td>
<td>99</td>
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</table>
Pandemic impacts on graduate students

- How have academic programs changed?
  - Enrollment and degree trends
  - Instructional modes, including virtual
  - Degree programs and requirements
  - Graduate research impacts
- How have graduate-degree recipients fared?
- How have technical and virtual skills changed?
- What are the current trends for hiring?
Enrollments

Recent enrollment declines from:
- Contraction of oil and gas sector
- Increase in online programs
- Declines in on-campus majors

Graduate enrollment trend likely related to pandemic impacts to degree completion
Degrees

Recent declines due to:
  lower enrollments
  pandemic impacts on completion
  soft job market
Lecture courses

Just over half of departments offering only in-person course formats.

The other half offer in-person formats with either virtual or hybrid options.
Lab instruction has also predominantly returned to only in-person instruction.
Local sites continue to be the primary field instructional format.

Increase in remote field instruction since Fall 2021.
Looking ahead, virtual instructional activities are more likely to be used in lecture courses and labs.
Graduate research activities were more likely to be deferred than cancelled.

Shuffling / changing of research mode to computational / literature review where possible.
Increasing impacts related to delays in research project tasks and deferral of defenses/graduation.
Delays in dissertation/thesis project tasks was top impact reported by graduate students.

1/5 of graduate students reported no impacts to degree completion.
Adaptations to degree requirements

Changes to degree requirements due to the pandemic

Permanent changes to degree requirements because of the pandemic

No permanent changes have been made
Flexibility in mode of defense
Substitutions of alternate courses in other departments / institutions
Acceptance of waivers for prerequisites

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Impacts to course taking

Continuing students had less of an issue with taking required courses than did graduating students.

What percentage of geoscience majors in your department were unable to take required courses during the 2021-2022 academic year?

- None
- Less than 10%
- 10% to 25%
- 25% to 50%
- More than 50%

- Continuing students
- Graduating students
Field instructional activities (field courses or field components of courses) were more likely to have not been taken.

Impacts to course taking

What types of courses were students not able to take?

- Field components to courses
- Field courses
- Lab sections / courses
- Lecture courses

Academic departments

- Continuing students
- Graduating students
Most graduates acquiring skills via self-taught instruction or via on-the-job training.
Pandemic impacts on graduate students

- How have academic programs changed?
- **How have graduate-degree recipients fared?**
  - Career trajectories
  - Work environments
- How have technical and virtual skills changed?
- What are the current trends for hiring?
Relatively stable employment for those graduating prior to 2014.

Slight increase in retirements for those working in non-academic careers (i.e., "professional" category)
Career trajectories

Most movement is for post-docs finding jobs in academia and in non-academic positions.

Some temporary increase in unemployment.
Career trajectories

Growth in post-doc and non-academic professions.

Some increase in unemployed graduates.
Remote work persists even with a return to in-office / on-campus work, although not as a primary work modality.
Remote work remains a primary work option for most employees with over half of employees reporting working more than half-time from home.
Remote work productivity

Productivity working from home with select activities
graduate degree holders graduating before 2014

Productivity working from home with select activities
graduate degree holders, Classes 2014-2022

- Ability to focus on work activities
- Research activities
- Collaboration with colleagues
- Meetings

Legend:
- Moderately to extremely productive
- Somewhat productive
- Not productive to slightly productive
- No response
Pandemic impacts on graduate students

- How have academic programs changed?
- How have graduate-degree recipients fared?
- **How have technical and virtual skills changed?**
  - Importance vs. proficiency
  - Academic program integration / expectations
  - New hire skillset expectations
- What are the current trends for hiring?
Importance of skills to the profession

Importance of select technical skills, academic departments

Importance of select technical skills, graduate degree holders, Classes 2014-2022

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Most skills taught either in the department or outside of department.

Business skills are generally not included in the curriculum, despite departments reporting these skills as continuing in importance to the profession.
Most departments expect graduate students to have working proficiency with data visualization, programming and graphic design.

### Expected proficiency of graduate students upon graduation

<table>
<thead>
<tr>
<th>Academic departments</th>
<th>Expected proficiency upon graduation, graduate students</th>
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<tbody>
<tr>
<td>Data visualization and mapping software</td>
<td>Data science / ML/AI</td>
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<tr>
<td>Expected proficiency</td>
<td>0%</td>
</tr>
<tr>
<td>Basic</td>
<td>60</td>
</tr>
<tr>
<td>Novice</td>
<td>40</td>
</tr>
<tr>
<td>Intermediate</td>
<td>20</td>
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<tr>
<td>Advanced</td>
<td>10</td>
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<tr>
<td>Expert</td>
<td>0</td>
</tr>
<tr>
<td>Not applicable</td>
<td>0</td>
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<tr>
<td>No response</td>
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</tbody>
</table>
Skills graduating students wished they had prior to graduation:

- Data science
- Programming
- Data visualization
- Database management / development
Employees are most proficient with data visualization, business, and database skills.
Increased proficiency across all categories.

Most improvement in project collaboration.
Skills employers want in new hires

Top required skills:
- field skills
- proficiency with virtual platforms

Proficiency with virtual platforms is becoming increasingly important.
Geoscience employers have traditionally hired at the bachelor’s and master’s level.

During the pandemic there has been an increase in hiring at the doctorate level.
Pandemic impacts on graduate students

• How have academic programs changed?
• How have graduate-degree recipients fared?
• How have technical and virtual skills changed?
• What are the current trends for hiring?
  • Job openings and active hiring
  • Challenges with hiring and onboarding
  • Pandemic vs. pre-pandemic hires
Hiring picked up in mid-2021 and then again in late 2021.

Job openings remained relatively steady, with an increase in late 2021.
Increases in the percentage of employers reporting no challenges with finding and hiring talent.

Recruitment continues to be an issue for employers.

Onboarding new staff, especially into remote working environments, remains a challenge.
How are pandemic new hires doing?

Pandemic hires vs. pre-pandemic hires

Employers

- Productivity
- Technical skills
- Geoscience knowledge
- Interpersonal / soft skills

- Better
- About the same
- Worse
- No response
Thank you!

Leila Gonzales
lmg@americangeosciences.org

Christopher Keane
keane@americangeosciences.org