# Identifying Alignment and Gaps in Skills Development for Students and New Graduates

# Insights from the Geoscience COVID-19 Impacts Study

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American Geosciences Institute

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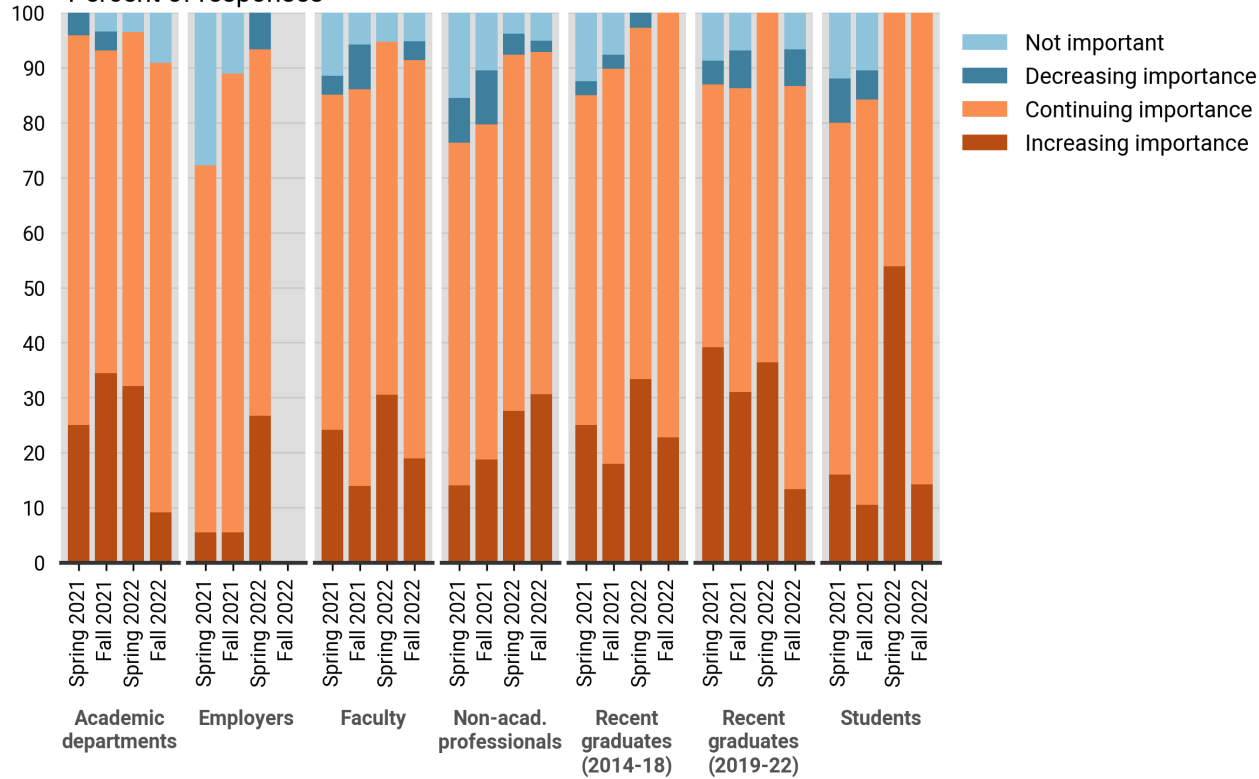
# Roadmap

- How important and proficient are cohorts with selected skills?
- How are skills being integrated into the curriculum?
- What are the skills employers are looking for in new hires?
- Have preferred / required skills changed since pre-pandemic times?
- Are there skills / knowledge gaps in pandemic-era graduates?
- What are employers, departments, recent grads doing to address these gaps?

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# Graphic design
## A rising skill for all groups

### Importance of graphic design skills to the geoscience profession
Percent of responses



Legend:
- Not important
- Decreasing importance
- Continuing importance
- Increasing importance

Groups: Academic departments, Employers, Faculty, Non-acad. professionals, Recent graduates (2014-18), Recent graduates (2019-22), Students

### Proficiency with graphic design skills
Percent of responses



Legend:
- Not applicable
- Expert (recognized authority)
- Advanced (applied theory)
- Intermediate (practical application)
- Novice (limited experience)
- Basic (fundamental awareness)

Groups: Depts: Grads expected proficiency, Depts: Undergrads expected proficiency, Employers view of employees, Faculty, Non-acad. professionals, Recent grads (2014-18), Recent grads (2019-22), Students: Currently enrolled

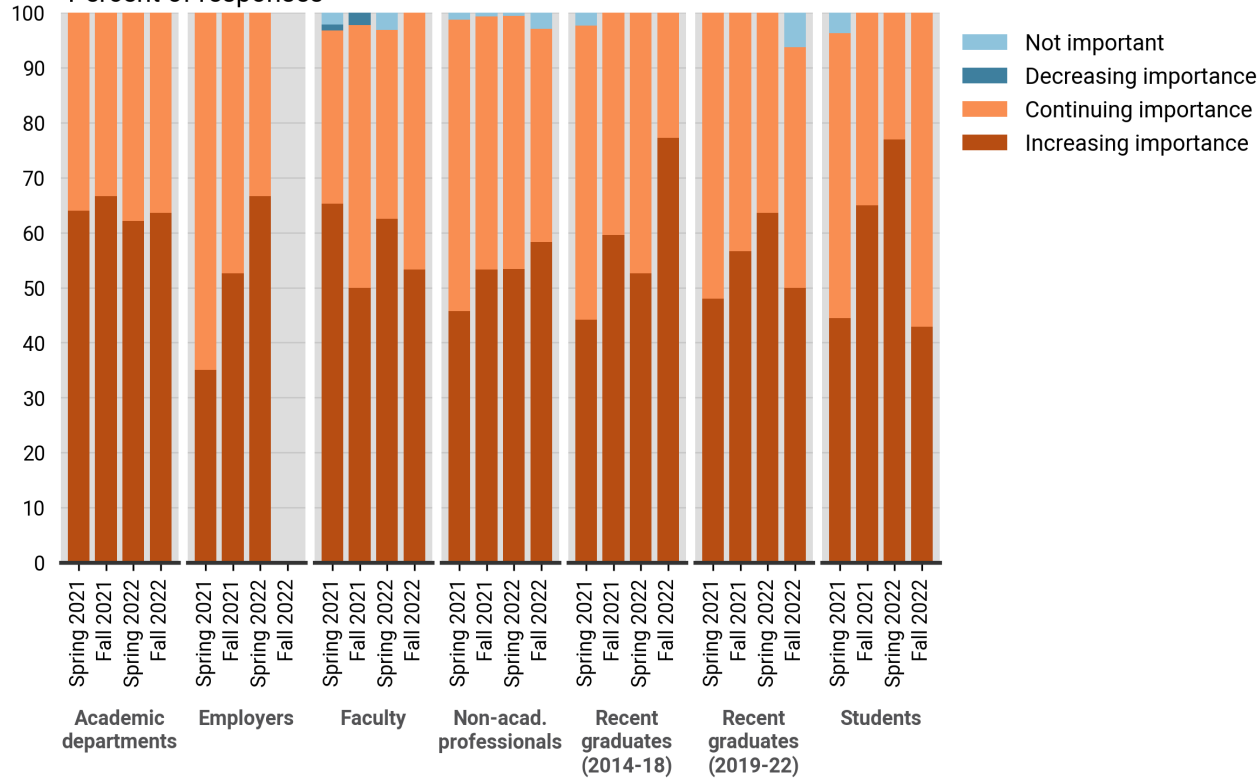american geosciences institute | connecting earth, science, and people

# Data visualization / mapping software
## The top recognized skill, students & employers most proficient



**Importance of data visualization skills to the geoscience profession**
Percent of responses

Legend:
- Not important
- Decreasing importance
- Continuing importance
- Increasing importance

Categories (x-axis): Academic departments, Employers, Faculty, Non-acad. professionals, Recent graduates (2014-18), Recent graduates (2019-22), Students — each with Spring 2021, Fall 2021, Spring 2022, Fall 2022

**Proficiency with data visualization skills**
Percent of responses

Legend:
- Not applicable
- Expert (recognized authority)
- Advanced (applied theory)
- Intermediate (practical application)
- Novice (limited experience)
- Basic (fundamental awareness)

Categories (x-axis): Depts: Grads expected proficiency, Depts: Undergrads expected proficiency, Employers view of employees, Faculty, Non-acad. professionals, Recent grads (2014-18), Recent grads (2019-22), Students: Currently enrolled — each with Spring 2021, Fall 2021, Spring 2022, Fall 2022

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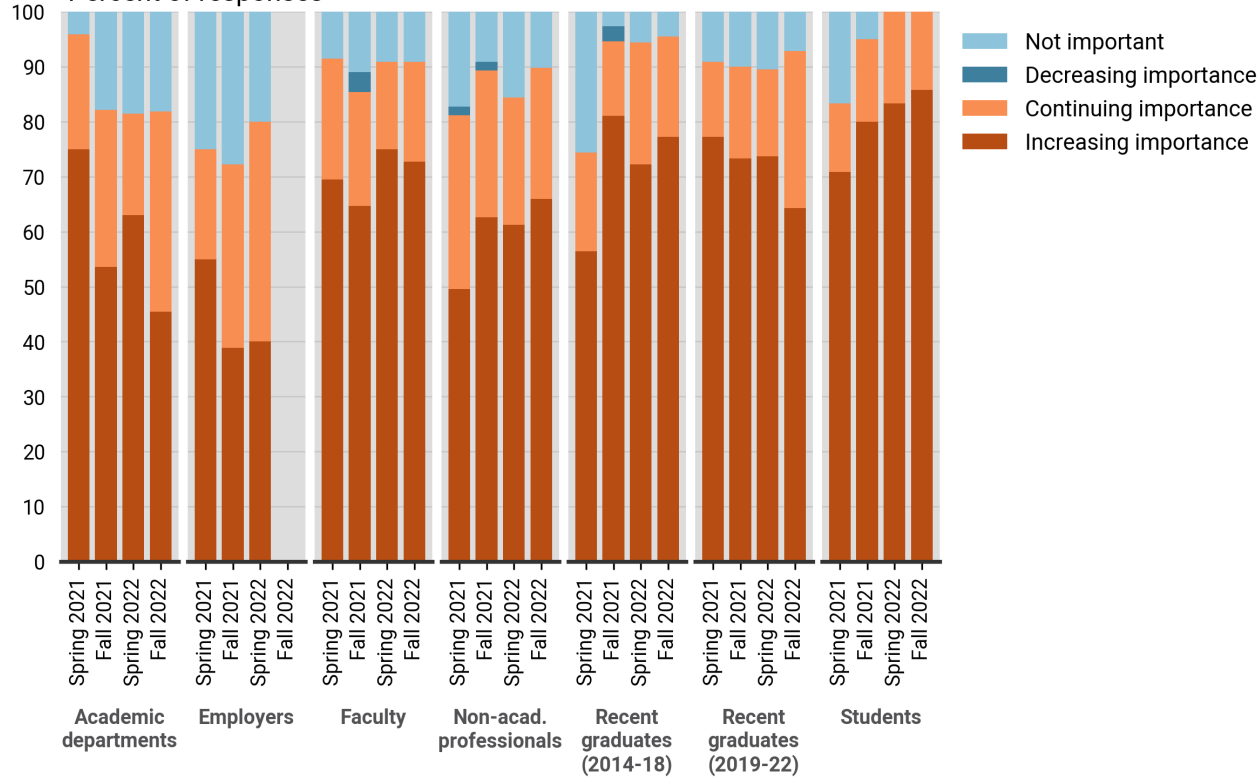american geosciences institute | connecting earth, science, and people

# Data science / ML / AI
## A fast rising skill with emerging proficiency in the community



Importance of data science and ML/AI skills to the geoscience profession
Percent of responses

Legend:
- Not important
- Decreasing importance
- Continuing importance
- Increasing importance

Categories: Academic departments, Employers, Faculty, Non-acad. professionals, Recent graduates (2014-18), Recent graduates (2019-22), Students — each across Spring 2021, Fall 2021, Spring 2022, Fall 2022

Proficiency with data science and ML/AI skills
Percent of responses

Legend:
- Not applicable
- Expert (recognized authority)
- Advanced (applied theory)
- Intermediate (practical application)
- Novice (limited experience)
- Basic (fundamental awareness)

Categories: Depts: Grads expected proficiency, Depts: Undergrads expected proficiency, Employers view of employees, Faculty, Non-acad. professionals, Recent grads (2014-18), Recent grads (2019-22), Students: Currently enrolled — each across Spring 2021, Fall 2021, Spring 2022, Fall 2022

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# Programming
## A rising skill for faculty and students, rising proficiency in the workplace

**Importance of programming skills to the geoscience profession**
Percent of responses



Legend:
- Not important
- Decreasing importance
- Continuing importance
- Increasing importance

Categories (x-axis): Academic departments, Employers, Faculty, Non-acad. professionals, Recent graduates (2014-18), Recent graduates (2019-22), Students — each with Spring 2021, Fall 2021, Spring 2022, Fall 2022

**Proficiency with programming skills**
Percent of responses



Legend:
- Not applicable
- Expert (recognized authority)
- Advanced (applied theory)
- Intermediate (practical application)
- Novice (limited experience)
- Basic (fundamental awareness)

Categories (x-axis): Depts: Grads expected proficiency, Depts: Undergrads expected proficiency, Employers view of employees, Faculty, Non-acad. professionals, Recent grads (2014-18), Recent grads (2019-22), Students: Currently enrolled — each with Spring 2021, Fall 2021, Spring 2022, Fall 2022

# Database management
## Universal demand, strong demands from employers



**Importance of database management skills to the geoscience profession**
Percent of responses
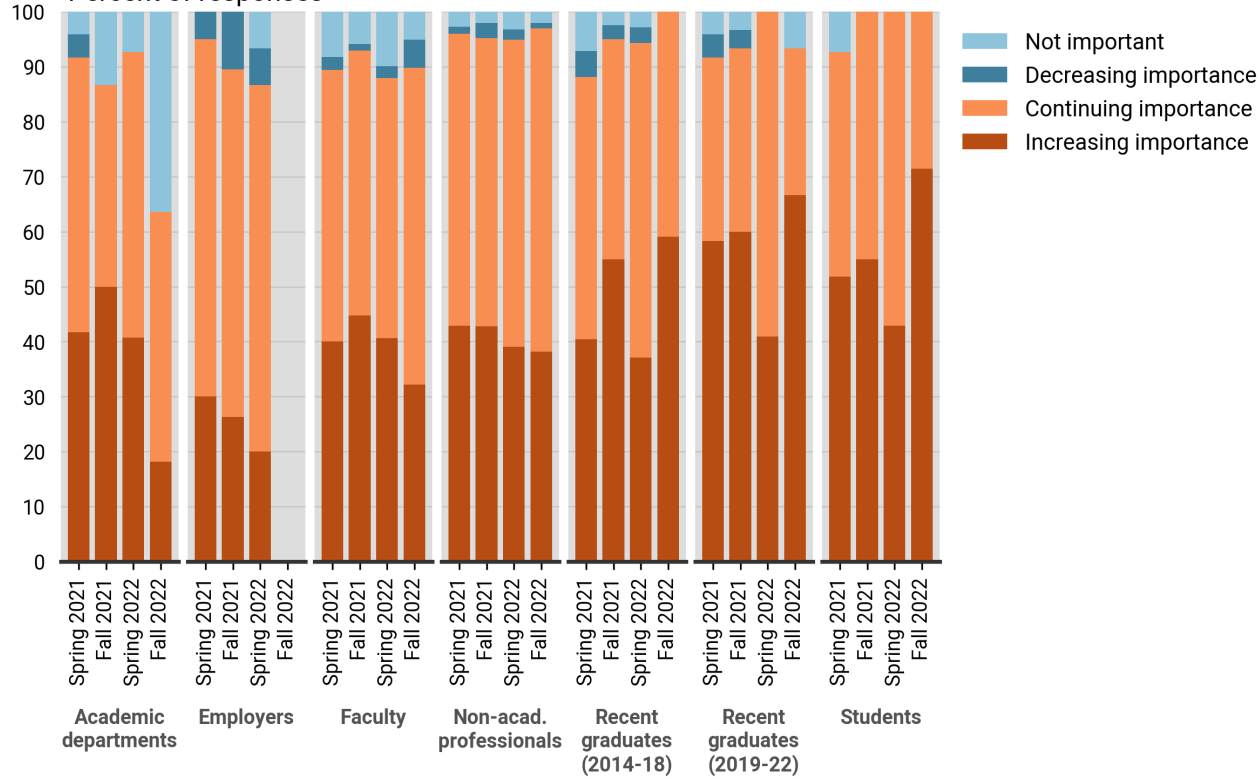
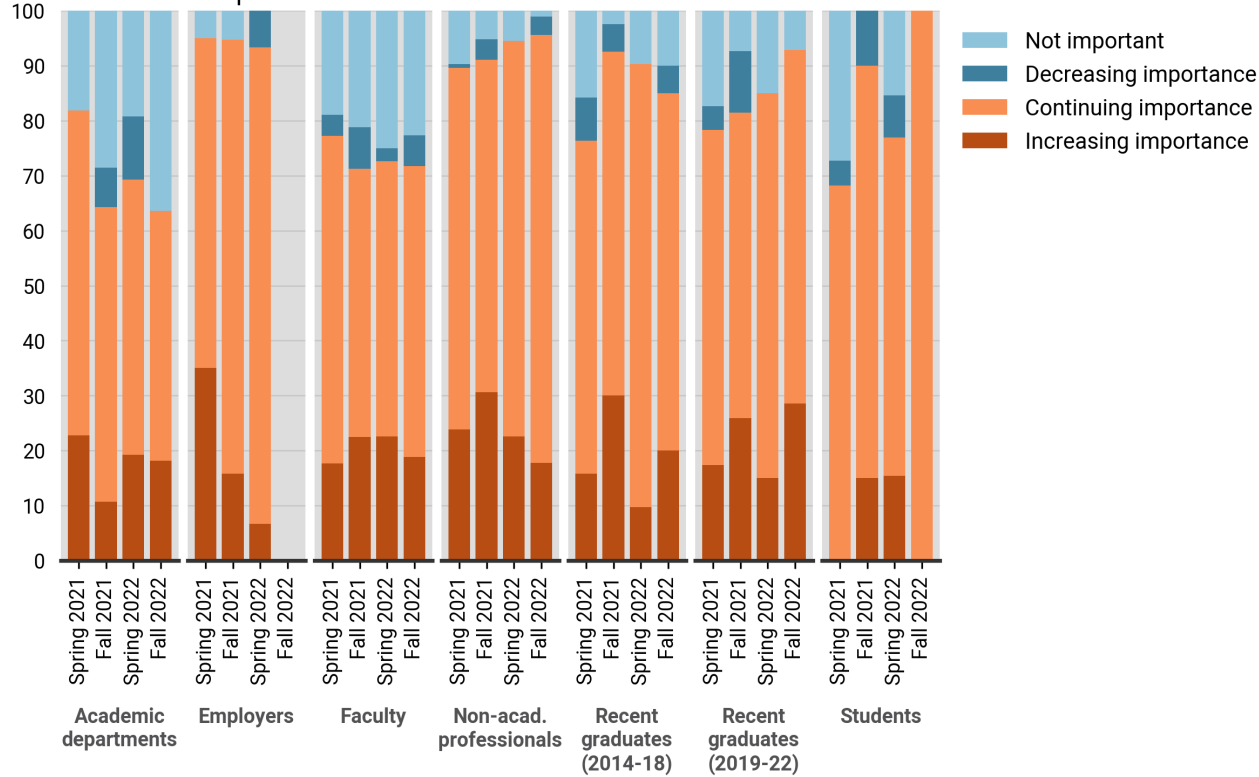**Proficiency with programming skills**
Percent of responses
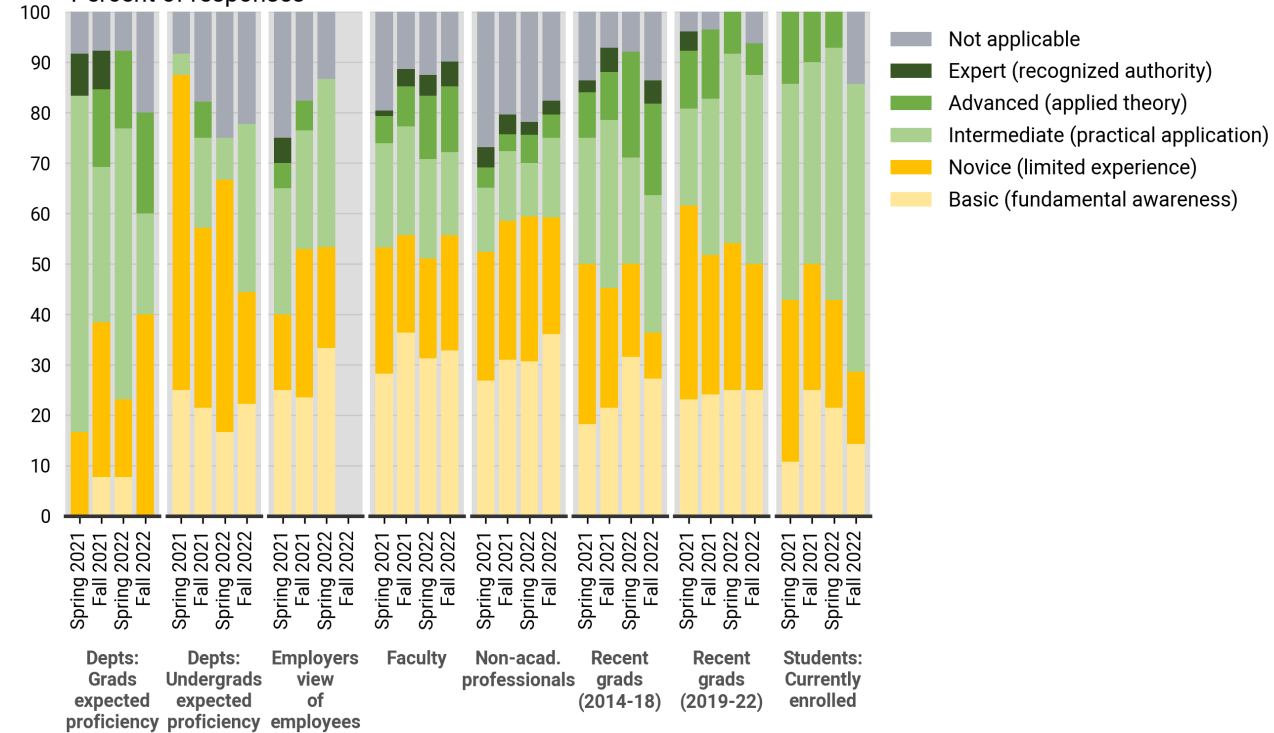
# Business skills
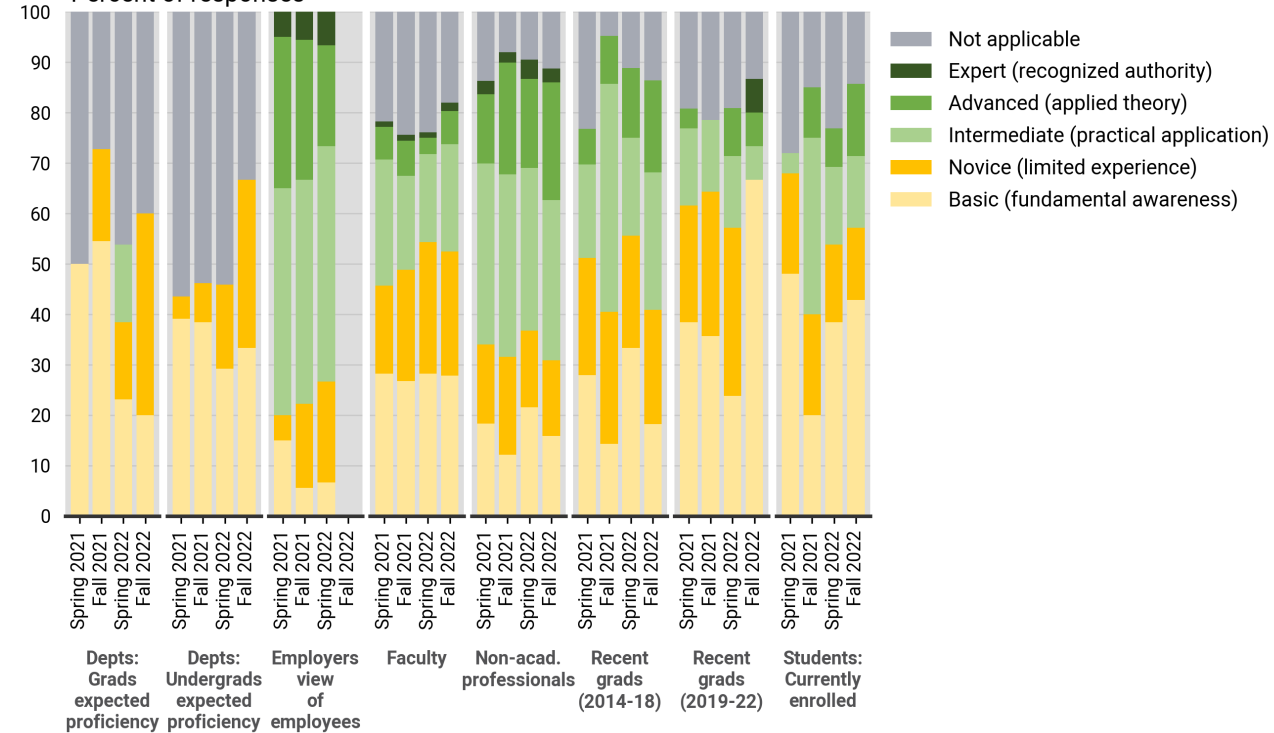## A recognized skill, with experience comes proficiency



**Importance of business skills to the geoscience profession**
Percent of responses

**Proficiency with business skills**
Percent of responses

Legend (left chart):
- Not important
- Decreasing importance
- Continuing importance
- Increasing importance

Legend (right chart):
- Not applicable
- Expert (recognized authority)
- Advanced (applied theory)
- Intermediate (practical application)
- Novice (limited experience)
- Basic (fundamental awareness)

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# How are skills integrated into curriculum?



**Intergration of selected skills into academic curriculum**
Percent of undergraduate degree-granting geoscience academic departments
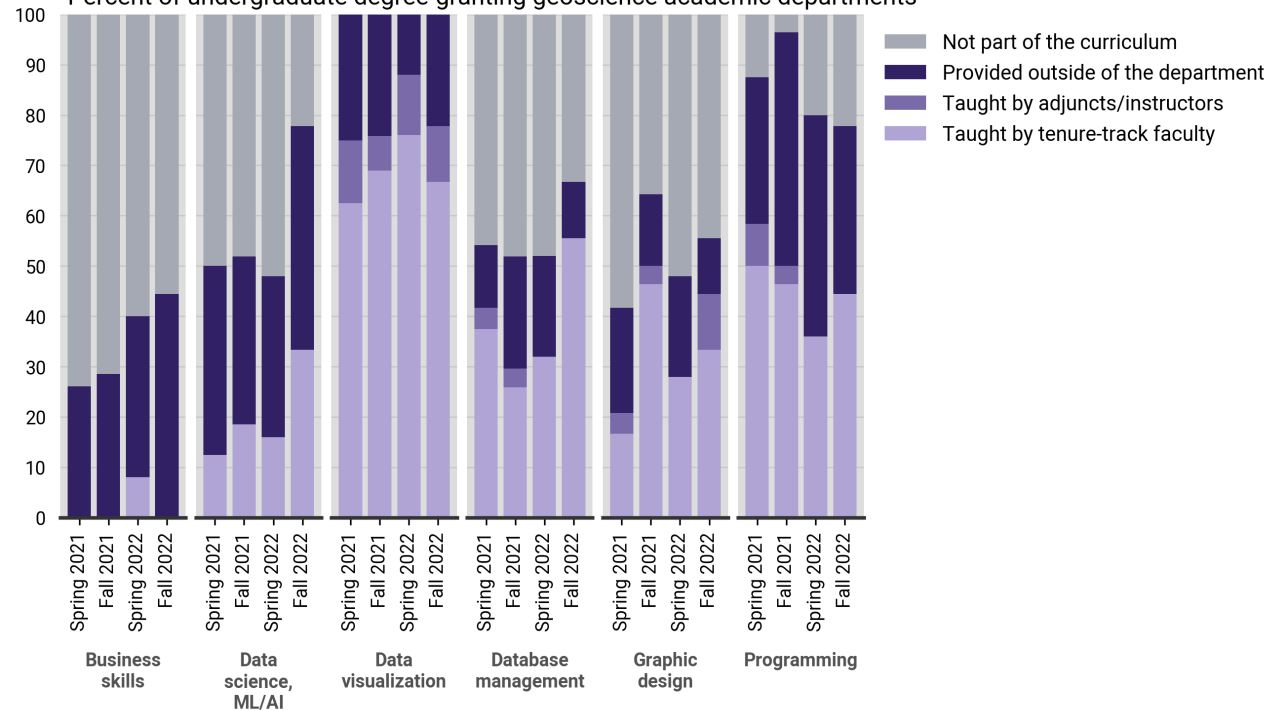
**Intergration of selected skills into academic curriculum**
Percent of graduate degree-granting geoscience academic departments

Legend:
- Not part of the curriculum
- Provided outside of the department
- Taught by adjuncts/instructors
- Taught by tenure-track faculty
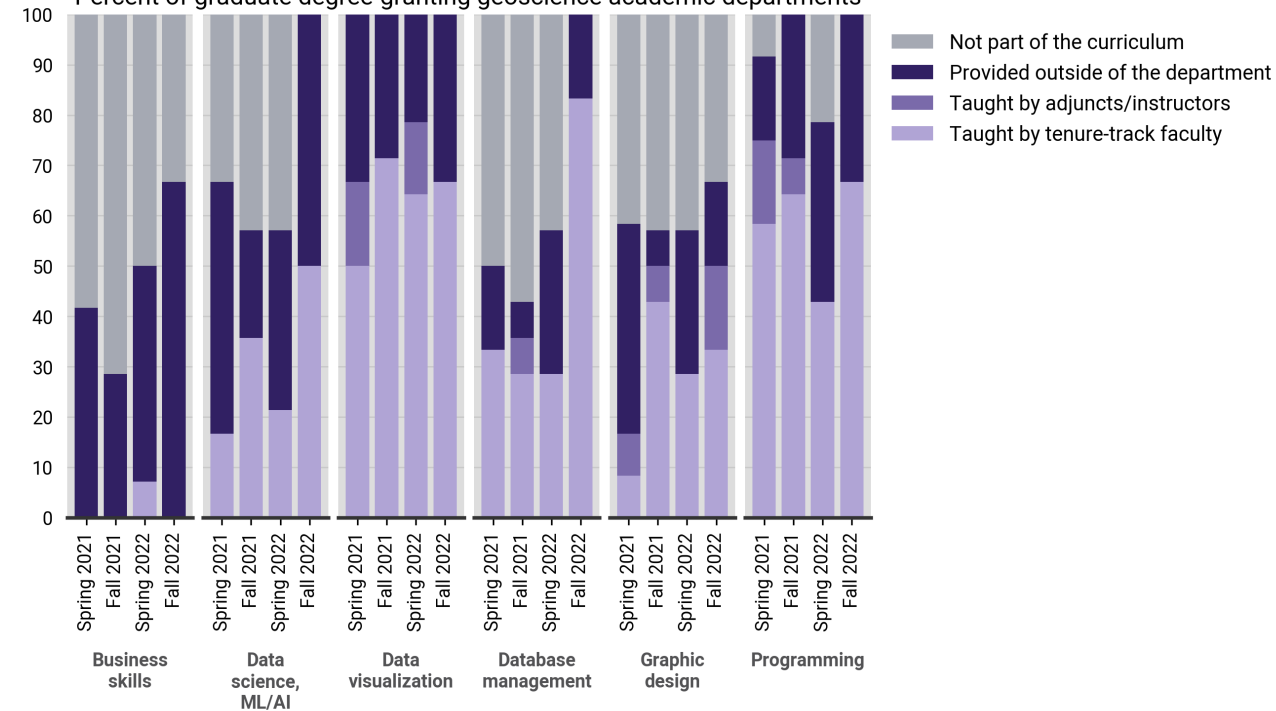
**Business skills:** not highly valued by depts, but increasingly offered outside of departments
**Data science:** new skill, increasingly being incorporated into the curriculum
**Data visualization:** rated top skill by all cohorts, integrated into all programs
**Database skills:** important, but only integrated into about half of programs
**Graphic design:** becoming more important, and increasingly being integrated into undergrad programs
**Programming:** increasing importance among academics & students, decline in inclusion in undergrad curriculum

# Skills / knowledge gaps noted by departments

With the exception of Winter 2022, over half of departments reported no graduating students missing required coursework.
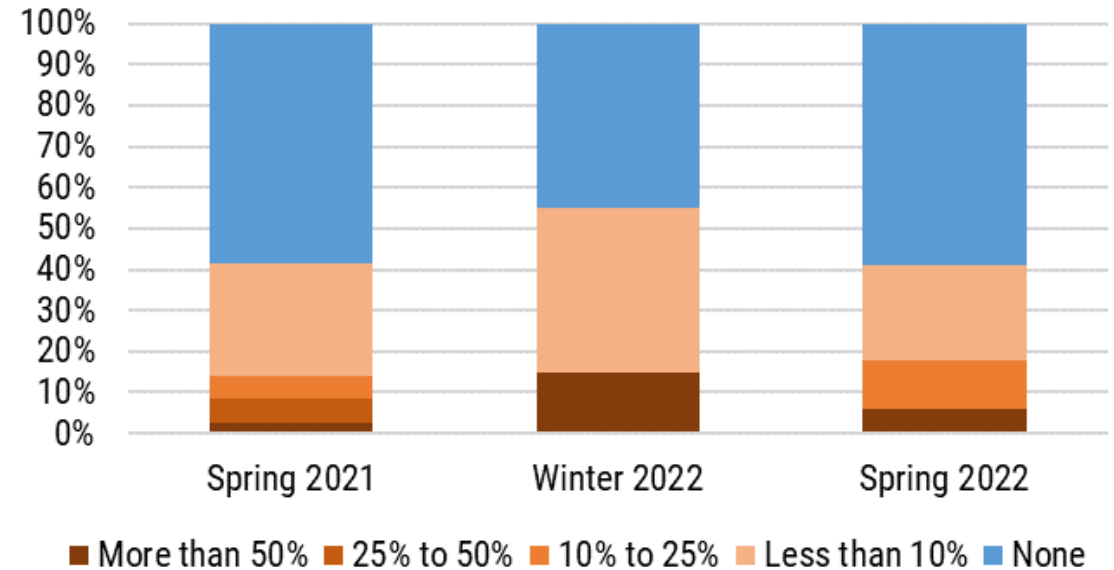
Of those departments reporting graduating students missing coursework, the majority mentioned that graduating students failed to complete **field courses or field components of courses**.

**Assistance for graduating students:**
Course substitutions, virtual instruction alternatives, waivers for courses / requirements, additional or independent studies to fulfill requirements



**Percentage of graduating geoscience majors unable to take required coursework**

Percentage of academic departments

Legend: ■ More than 50% ■ 25% to 50% ■ 10% to 25% ■ Less than 10% ■ None

Categories: Spring 2021, Winter 2022, Spring 2022



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# Skills / knowledge gaps noted by departments

"One of the biggest things I've been beating my head against is not a geoscience skill per se. It's a writing skill. My students won't cite their sources to save their lives…" – *geoscience faculty*

"The reading, writing, arithmetic, all the discipline skills, the book skills were all there, but putting those to good use and the things that they don't teach you in college that you need to know when you get in the real world, we're missing." – *department head*

"They have extraordinarily poor social skills right now. And I think that can be seen at all levels of the institution. And I'm not just talking about students. I'm talking about staff and coworkers. It's everybody, right? We need to learn how to talk again to others … especially in large groups, because when you're in large groups, you're working off of other people's facial cues of when to stop and went to go. And when cameras are off, you don't have those social cues to work with." – *geoscience faculty*

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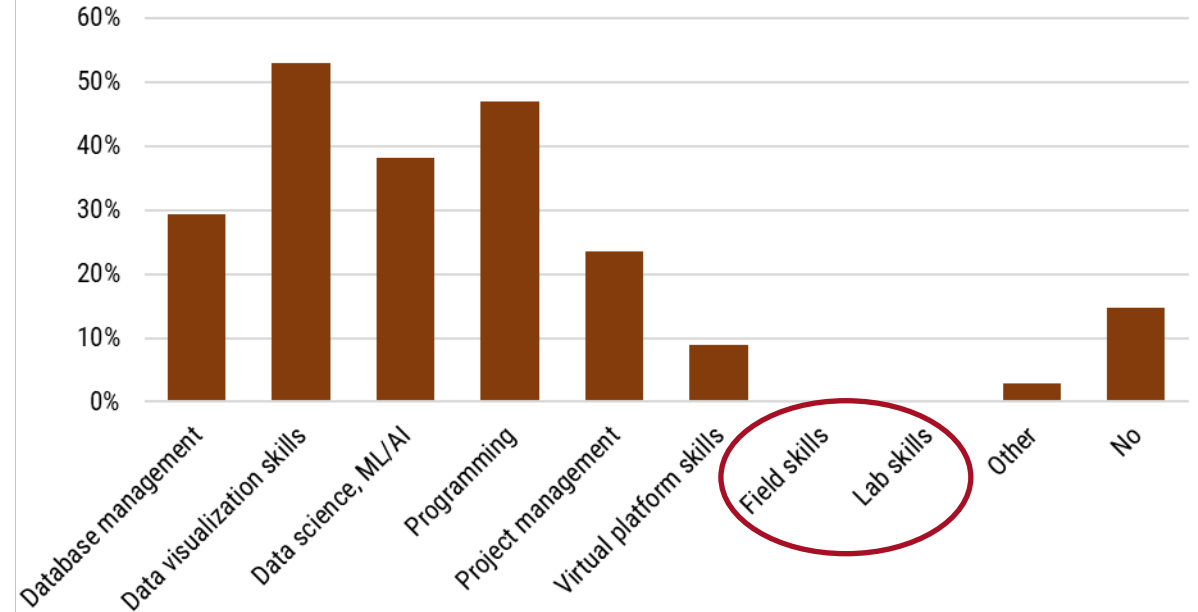# Skills / knowledge gaps noted by graduates

Regarding learning Python:
"I do wonder if it would have been nice to have some, maybe in-person workshop type sessions that maybe would have happened, rather than kind of the trial by fire, it would have been more advantageous to kind of sit down with someone in a conference room, for an hour or two and learn the process, kind of first-hand learn by doing rather than learn by seeing over Zoom with all these other distractions going on." – *recent graduate*

"I got to play with my data more so, and I since I wasn't working on other things, I got to give myself some skills that I didn't have before. So I played more with coding and stuff like this. " – *recent graduate*

**What skills/knowledge do you wish you had acquired prior to graduation?**
Percentage of pandemic-era graduates

# Filling skills / knowledge gaps:
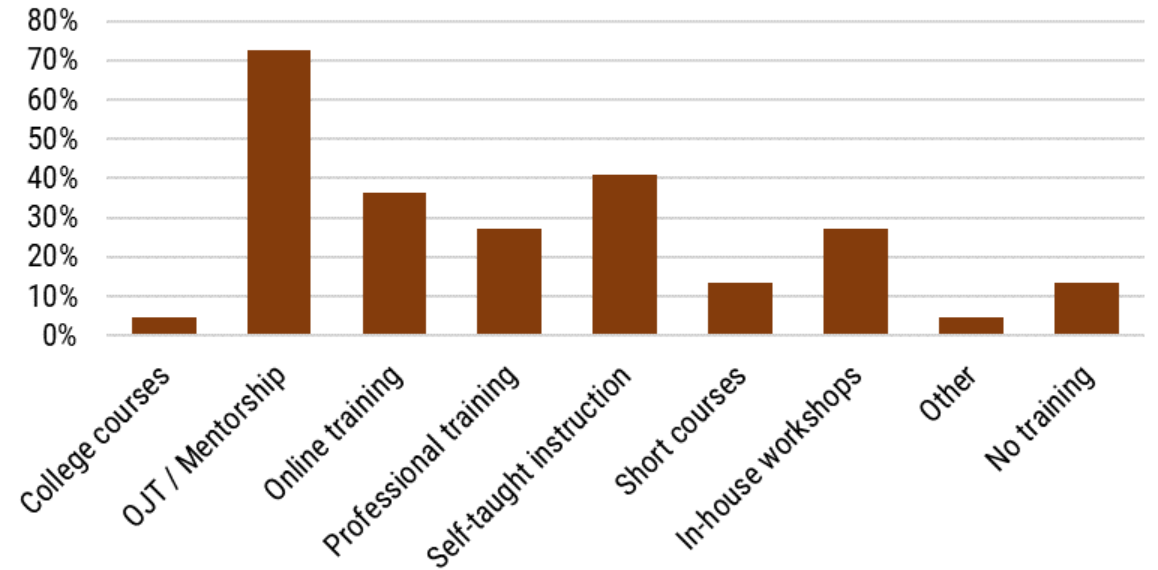## Self-taught instruction and on-the-job training (OJT)

**How are you acquiring these skills/knowledge?**
Percentage of pandemic-era graduates
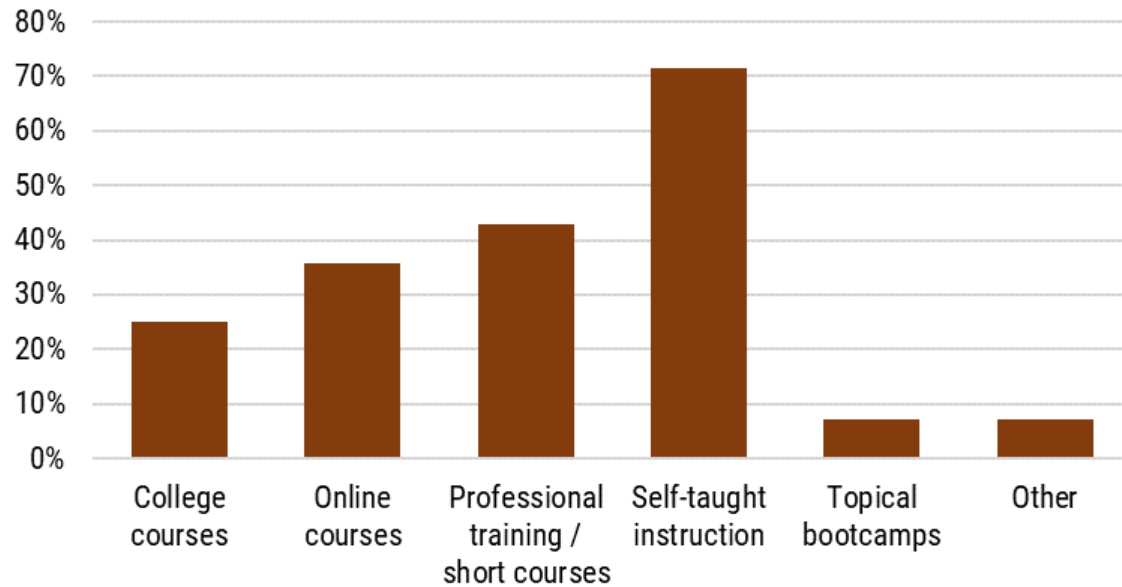
**Did your employer provide skills development training during your new hire onboarding?**
Percentage of pandemic-era graduates

# What degree levels are employers hiring?

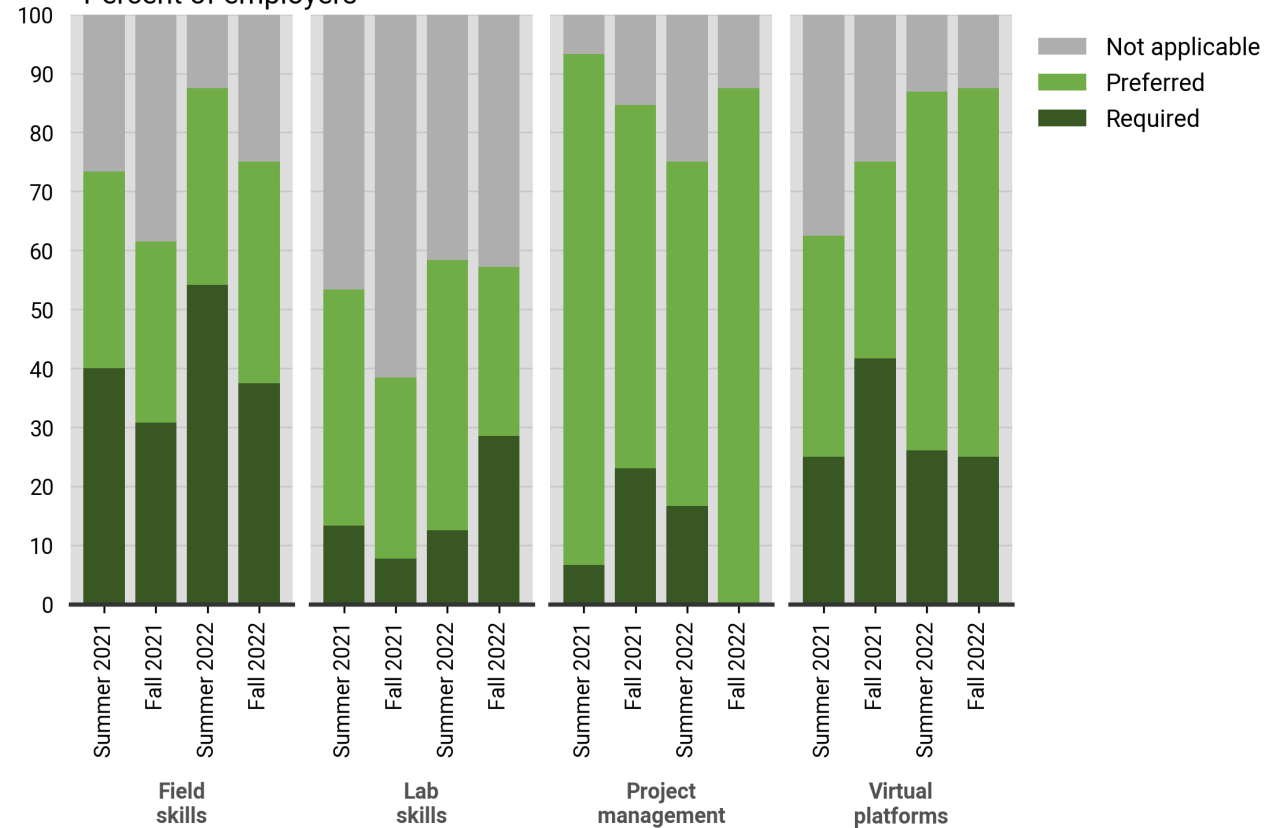Employers continue to primarily hire at the Bachelor's and Master's degree level.

During Summer 2021, just over half of employers reported hiring at the doctorate level, with this percentage declining in Fall 2021 and rebounding after.

**Degree levels for full-time geoscience new hires**
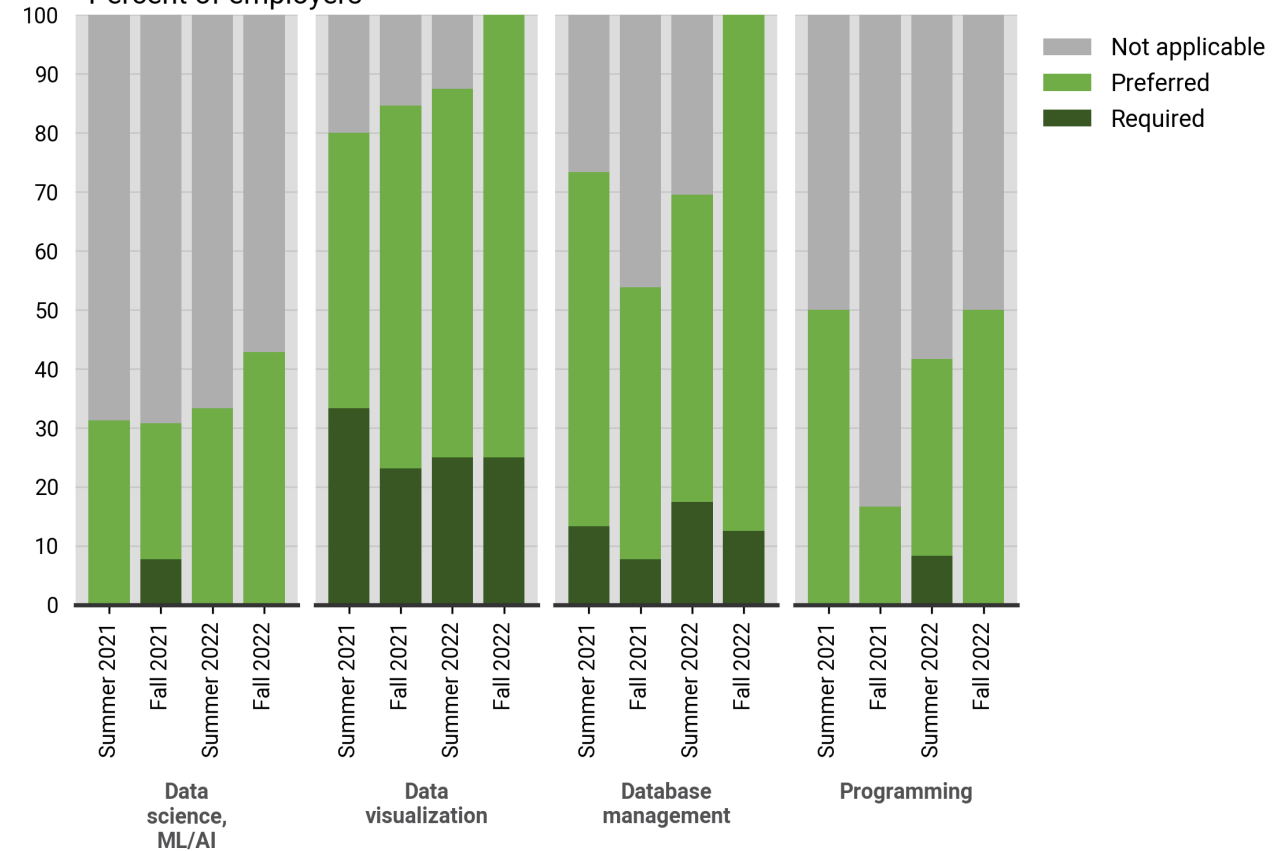Percentage of employers



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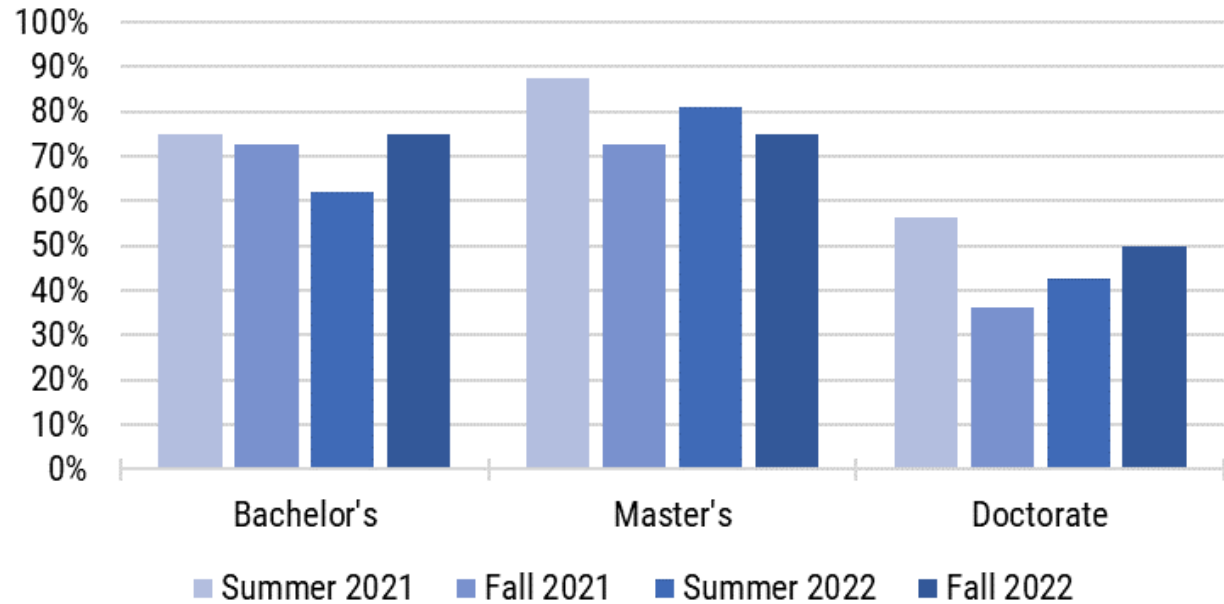
# What skills are employers looking for?

**Skills employers are looking for in geoscience new hires**
Percent of employers



Legend: Not applicable (grey), Preferred (light green), Required (dark green)

Categories: Field skills, Lab skills, Project management, Virtual platforms (Summer 2021, Fall 2021, Summer 2022, Fall 2022)

**Skills employers are looking for in geoscience new hires**
Percent of employers



Legend: Not applicable (grey), Preferred (light green), Required (dark green)

Categories: Data science, ML/AI; Data visualization; Database management; Programming (Summer 2021, Fall 2021, Summer 2022, Fall 2022)

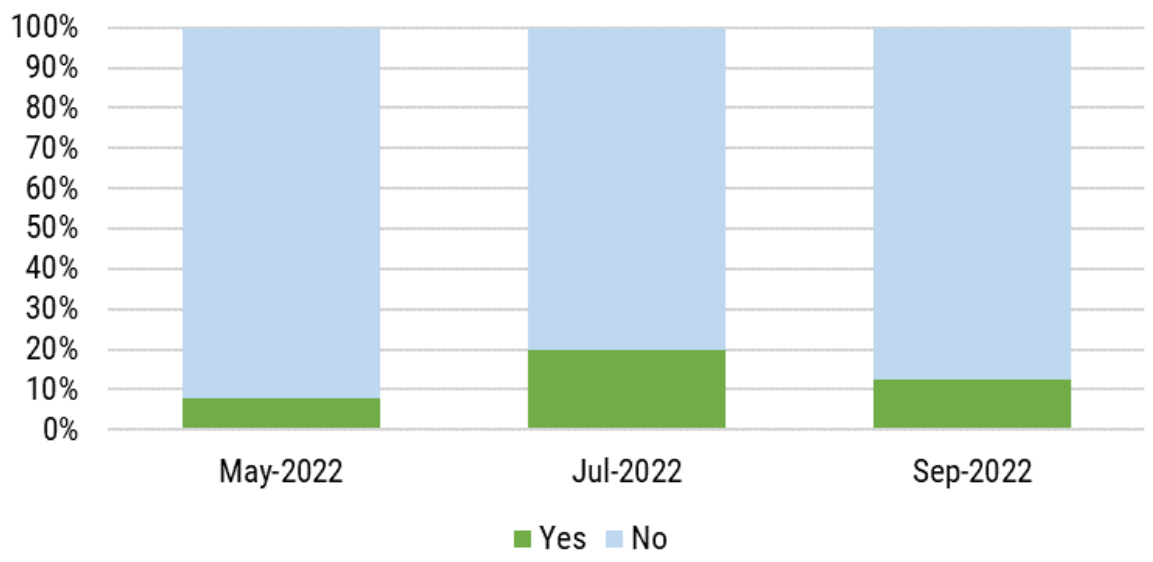american geosciences institute | connecting earth, science, and people

# Change in what employers are looking for?



**Has what you are looking for in new hires changed?**
Percentage of employers
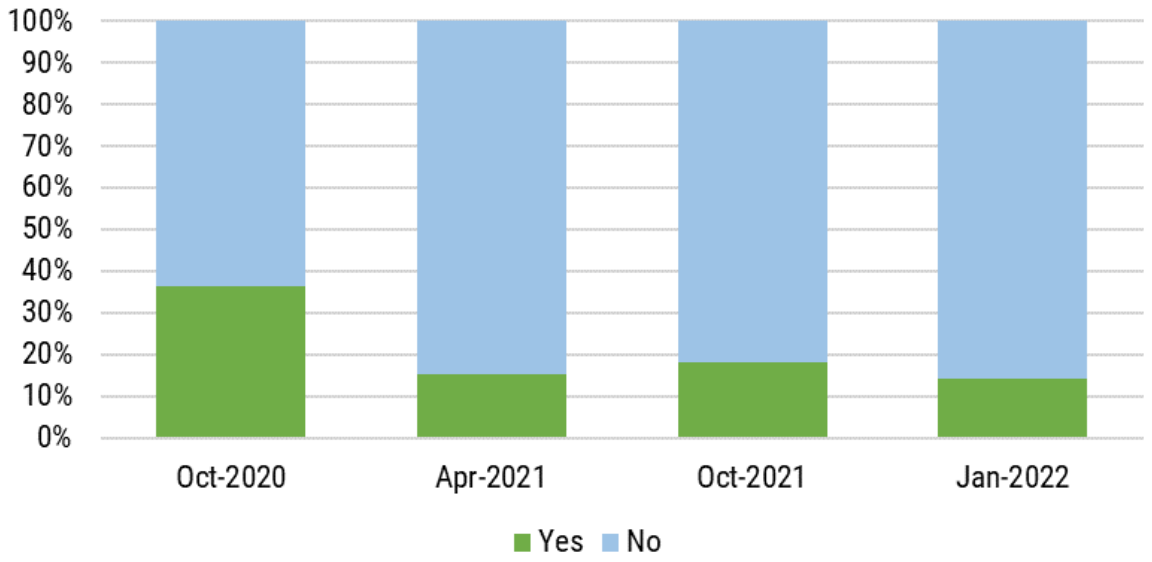
**Are the skillsets for new hires different than pre-pandemic?**
Percentage of employers

# Are there skills / knowledge gaps?

"It is essential for those coming into the hydrogeology field to be able to communicate well and have good writing skills on top of the basic foundational geology skills they get from a college program." – *geoscience manager*

"I got to play with my data more so, and I since I wasn't working on other things, I got to give myself some skills that I didn't have before. So I played more with coding and stuff like this. " – *recent graduate*

**Skills / knowledge gaps in pandemic-era graduates**
Percentage of employers



■ Apr-May 2022   ■ Jun-22   ■ Aug-22
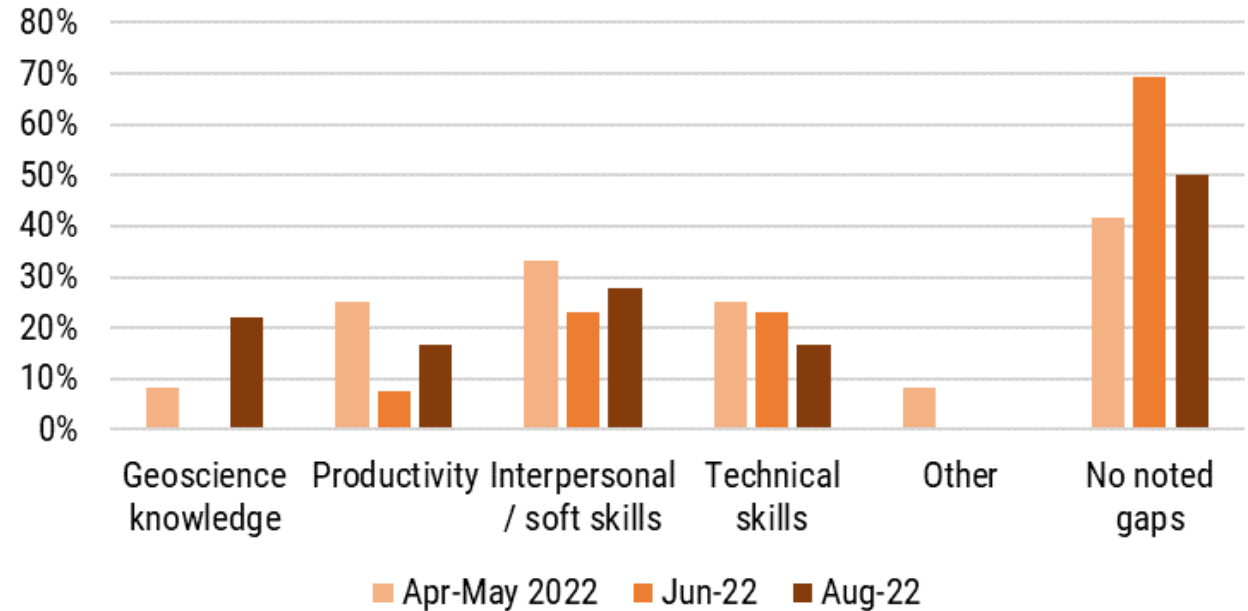
# What are employers doing to address gaps?

- Augment internal / on-site training

- Increased opportunities for social interaction outside of work

- Move to in-work meetings

- Enhancing mentoring / tutoring between new and senior staff

- Longer on-boarding

- Setting up new training both technical and client-relationship focused

- Virtual training using pre-recorded courses and personal training by experienced staff

"We were lucky in that we had some what I'd call old school senior folks. And so we paired up new hires with mentors. And we gave them an opportunity to use a mentor protege program to try and short circuit that and get as much as they could. It's not perfect but getting 73% of that through a mentor is better than saying, hey, you're gonna have to wait two years until we have the opportunity again." – *department head*

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# Alignments and gaps

- Alignment in core geoscience knowledge and skills
- Gaps in writing, communication, presentation, interpersonal skills
- Students want more skills development in programming-related areas
- Addressing the gaps
  - Departments: More in-person instruction with emphasis on field work, team work
  - Employers: Longer on-boarding, more mentoring
  - Graduates: Self-taught instruction to fill gaps

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# Thank you!

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