

EXTERNAL  
EVALUATION OF THE  
GEO-LAUNCHPAD  
PROGRAM,  
FRCC AND UNAVCO,  
2019

Geoscience opportunities for community college students

Heather Thiry, Ph.D  
Golden Evaluation & Policy Research  
August 26, 2019

## Table of Contents

|   |    |
|---|----|
| Executive Summary .....   | 3  |
| Introduction .....  | 6  |
| Evaluation Design and Methods .....                               | 6  |
| Evaluation Questions.....   | 7  |
| Evaluation Instruments.....                                       | 7  |
| Analysis Methods.....   | 8  |
| Evaluation Findings.....  | 9  |
| Student Demographics .....  | 9  |
| Students' motivations for participating in the internship.....    | 10 |
| Student Outcomes.....   | 11 |
| GLP Summer Internship.....  | 11 |
| GLP interns: Technical Skills .....                               | 12 |
| GLP Interns: Career Knowledge.....                                | 14 |
| GLP Interns: Organizational Skills .....                          | 17 |
| GLP interns: Intellectual Gains.....                              | 18 |
| GLP interns: Scientific Communication Skills.....                 | 19 |
| GLP Interns: Career Preparation .....                             | 20 |
| GLP interns: Collaboration/Networking .....                       | 22 |
| GLP Interns: Influence on Career Intentions.....                  | 24 |
| GEO 210 Outcomes.....   | 25 |
| GEO 210: Career Preparation.....                                  | 26 |
| GEO 210: Career Knowledge .....                                   | 27 |
| GEO 210: Career Preparation.....                                  | 28 |
| GEO 210: Scientific Communication Skills .....                    | 29 |
| GEO 210: Influence on Students' Educational and Career Paths..... | 30 |
| GEO 210: Most Important Thing Learned from Course .....           | 31 |
| Advice for future implementation .....                            | 31 |
| Conclusion .....  | 33 |

## Table of Figures

|  |    |
|--|----|
| Figure 1. GLP Interns' Skills and Knowledge Gains.....   | 12 |
| Figure 2. "I know how to use the major instrumentation in geoscience" pre- and post-survey<br>.....    | 13 |
| Figure 3. Interns' Gains in Career Knowledge, pre- and post-survey.....                                | 14 |
| Figure 4. "I understand the resources to learn about geoscience careers" pre- and post-<br>survey..... | 15 |
| Figure 5. Interns' Gains in Organizational Skills, pre- and post-survey.....                           | 17 |
| Figure 6. Interns' Intellectual Gains, pre- and post-survey.....                                       | 18 |
| Figure 7. Scientific Communication Gains, GLP interns.....   | 20 |
| Figure 8. Interns' Career Preparation Gains, pre- and post-survey.....                                 | 21 |
| Figure 9. Interns' Collaboration and Networking Gains, pre- and post-survey.....                       | 23 |
| Figure 10. Student Gains, GEO 210.....   | 26 |
| Figure 11. GEO 210 Students' Gains in Career Knowledge, pre- and post-survey.....                      | 28 |
| Figure 12. GEO 210 Students' Gains in Career Preparation, pre- and post-survey.....                    | 29 |
| Figure 13. GEO 210 Students' Gains in Scientific Communication Skills, pre- and post-<br>survey.....   | 30 |

## Executive Summary

Women and some minority groups are persistently underrepresented in geoscience. The Geo-Launchpad (GLP) summer internship program seeks to broaden participation in geoscience by engaging community college students in immersive, technical experiences while also providing mentorship, professional development and career guidance. The external evaluation of the GLP program used mixed-methods measures, including pre-post surveys and interviews to assess the impact of the program on students' aspirations, knowledge, and skills. In addition to the GLP internship, a geoscience careers course (GEO 210) is offered at Front Range Community College in the spring semester.

Key evaluation findings are:

### **GLP internship**

GLP interns were diverse in several ways. Five of six student survey respondents were women, meeting the program goal of broadening participation in geoscience to women, among other underrepresented groups. Additionally, 1/3 were the first in their family to go to college and 2/3 work outside their studies. Nearly all plan to transfer to a 4-year degree program in science. Finally, five of the six were white and one was Asian/Pacific Islander. Notably, one student did not complete the survey so these demographics do not reflect the overall demographics of the GLP interns, rather they only reflect the demographics of the survey respondents. Moreover, survey findings only reflect the outcomes for students who completed the survey and, therefore, the student who did not complete the survey is not included in survey results. This student did, however, participate in the focus group interview so the interview findings reflect the outcomes for all internship participants.

In surveys and the end-of-internship interview, GLP interns reflected on their learning from the internship. Their strongest growth was in gaining knowledge about career options available in geoscience, gaining an understanding of the major instrumentation in geoscience, and gaining project management and organizational skills. Evaluation highlights are as follows:

### **Technical and Instrumentation skills**

Students demonstrated the strongest growth in their awareness of and ability to use major instrumentation in the discipline.

- Only 33% of students felt they knew how to use the major instrumentation in geoscience before the internship, while 60% did so after the internship.

- 60% felt they were aware of the major geoscience instrumentation before the internship, while 80% were aware of the major instrumentation at the end of the internship.

### **Career Knowledge**

Students gained insight into geoscience career paths as well as the skills and experiences that they need to enter geoscience careers. Students also gained a better understanding of the available resources to learn about geoscience careers.

- The proportion of students who felt they were aware of geoscience career paths rose from 50% to 100% from the beginning to the end of the internship.
- The proportion of students who were aware of geoscience career resources rose from 40% to 100%.

### **Organizational Skills**

Interns learned how to manage their time and stay on track of a project work flow because of the large, extended projects that they were responsible for during the internship.

- By the end of the internship, 100% of interns felt that they could manage their project tasks and complete their work by deadline.
- At the beginning of the internship, 60% of students felt they had strong project management skills, while 100% felt so at the end of the internship.

### **Career Preparation**

Interns felt more prepared for advanced study in geoscience disciplines and a geoscience career at the end of the internship. The primary reason underlying this growth was students' glimpse into the life and work of geoscientists during the internship.

- The percent of students who understood the everyday work of geoscientists rose from 33% to 80%.
- 

### **Intellectual Skills**

Students demonstrated growth in many areas related to scientific thinking and their capacity to conduct research.

- Student readiness to conduct research in geoscience fields rose from 33% at the beginning of the internship to 100% at the end.
- Students also gained greater understanding of the link between professional science and their coursework, as only 66% “agreed” or “strongly agreed” at the

beginning of the internship that they understood this connection, while 100% of interns “strongly agreed” at the end of the internship.

- Students also gained substantial understanding of the important concepts in geoscience (rising from 50% to 100%).

### **Scientific Communication Skills**

Interns gained greater ability to communicate scientific findings in a variety of formats.

- The most significant gain for interns was their ability to prepare and present a scientific poster (rising from 66% to 100%).

### **GEO 210 course**

From the GEO 210 course, students gained knowledge about career options and paths within geoscience. Students also gained an understanding of the different requirements to enter a geoscience career and/or education and to feel prepared that they could succeed in a geoscience career. Students also gained ability to write a scientific report.

### **Gains in Career Knowledge and Preparation from GEO 210**

Students learned the most in this area regarding how to develop a resume for their discipline. Students also became much more confident in their preparedness to study geoscience at a university.

- 40% of students could develop a geoscience resume at the beginning of the course, while 100% could do so at the end of the course.
- Students made strong strides in understanding the actual work and experiences of professional geoscientists (increasing from 40% of 100% of students who understand the everyday work of geoscientist).

### **Gains in Scientific Communication Skills from GEO 210**

The GEO 210 course strengthen students’ scientific communication skills, especially in the area of scientific writing. Students also gained ability to communicate scientific ideas and to critically analyze a scientific paper.

- Students made great strides in knowing how to write a scientific report (40% could do so at the beginning of the course and 100% could do so by the end of the course).
- 60% of students could critically analyze a scientific paper at the beginning of the course and 100% could do so at the end.

## **Introduction**

The geosciences have stubbornly low participation rates of women, low-income students, and underrepresented minority groups. To provide equitable access to STEM careers and to meet national workforce needs, participation in the geosciences must be broadened to women and students from traditionally underserved populations. Geo-Launchpad is an 8-week summer internship program for Colorado community college students that has been offered for the past four years. Some of the important goals of the Geo-Launchpad internship program are to: 1) engage students in an extended technical project, 2) introduce students to instrumentation in the geosciences, 3) provide students with an overview of geoscience careers, 4) develop students' professional networks and skills, and to 5) enhance students' mentoring relationship with a faculty member at their home institution. In addition to technical field experiences at UNAVCO and USGS, the GLP internship program offers career seminars (Career circles), communication seminars, technical seminars, and opportunities to network with working scientists and student researchers from the Research Experiences in Solid Earth Science for Students (RESESS) program, also run by UNAVCO. In addition to the internship, Front Range Community College developed curriculum for a 1-credit course (GEO 210) focusing on geoscience internships and careers as another mechanism to boost the career knowledge and professional skills of community college students in the geosciences. The course has been approved by the Colorado Department of Higher Education to be delivered at community colleges in the state of Colorado. The GEO 210 course introduces students to current research and tools in the geosciences and provides an overview of various career paths and internship opportunities in the discipline.

## **Evaluation Design and Methods**

Similar to previous years, the external evaluation of the Geo-Launchpad program contains formative and summative elements. Formative evaluation is designed to provide recommendations to modify the program for future implementations, and summative evaluation is designed to assess whether the program has met its goals and milestones. The evaluation uses mixed-methods measures, including pre-post surveys and interviews.

## Evaluation Questions

The external evaluation was guided by the following questions:

1. Has students' interest in geoscience careers, their knowledge about career options, and their capacity to pursue these careers increased from their participation in the GLP internship and GEO 210 course?
2. Have students' technical, networking, and scientific communication skills increased from their participation in the GLP internship and GEO 210 course?
3. What are the essential program elements that contributed to desired outcomes in the internship or course, and which elements might be modified in the future, if needed, to improve outcomes?

## Evaluation Instruments

Data were collected using a modified version of the Undergraduate Research Student Self-Assessment (URSSA) instrument (Hunter, Weston, Laursen & Thiry, 2009). The URSSA was developed with funding from the National Science Foundation to assess students' personal, professional, and intellectual outcomes from participating in undergraduate research, including REU experiences. Because the Geo-Launchpad internship is not strictly a research experience, items were adapted to better fit the technical, scientific and field work of the Geo-Launchpad internship. The survey gains scales items are rated on a 5-point Likert scale (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree). Survey scales include *networking/collaboration*, *intellectual gains*, *scientific communication*, *organizational skills*, *technical skills*, *career knowledge and career preparation*. The networking/collaboration scale was added specifically for the Geo-Launchpad internship to align with the program focus on professional networking and scientific collaboration. The survey also measures other aspects of the internship experience, including the impact of the internships on students' educational and career aspirations. The survey was further adapted for use with students in the FRCC GEO 210 course to place more emphasis on the career preparation aspects of the survey and to delete the aspects of the survey related to the development of research-based or inquiry-based skills.

The survey was administered in a pre-post manner to students in the FRCC GEO 210 course and in the summer internship. Surveys were administered at the beginning and the end of the course and the internship. Surveys were sent to students' e-mails through SurveyMonkey. E-mail reminders were sent every four days to students who had not responded. A total of four reminders were sent after the initial survey distribution for the course and internship pre- and post-surveys. Almost all students in the course and the internship responded to the pre- and the post-survey. One student in the course and one student in the internship did not complete both the pre- and post-survey. Otherwise, all students completed both the pre- and post-survey. GLP internship students were also interviewed in a focus group format at the end of the summer program. The interview protocol addressed the scientific and professional benefits from participating in the GLP internship, mentoring, networking, and advice for future implementation.

Community college faculty mentors of the GLP interns were interviewed as a group at the end of the summer internship to triangulate students' self-reports about their gains from the program, to learn more about the faculty mentorship provided in the program, and to assess the mentors' plans for mentorship of the student in the coming academic year. The mentor focus group lasted about 45 minutes. The intern focus group lasted about 75 minutes. In contrast to the survey, all interns participated in the focus group interview. Interviews were recorded and transcribed for data analysis.

## **Analysis Methods**

The analytic methods described in this section apply to all data collected for this report. The quantitative data were organized in a Microsoft Excel spreadsheet where descriptive statistics were computed. Frequencies and means are reported for most of the items. Groups of items were clustered into scales to assess student outcomes in a given domain. The average of the individual items that comprise each scale was computed for the scale mean. Items were rated on a 5-point Likert scale. Tests of statistical significance, such as t-tests or one-way ANOVAs, were not conducted due to the small sample of participants.

Write-in responses to open-ended survey questions and interview transcripts were entered into *NVivo* qualitative analysis software and coded using procedures developed by Spradley (1980). Each new idea raised in a written response was given

a unique code name. As these same ideas were raised by later respondents, each segment was added to an existing code reflecting that idea. At times, participants' responses were brief and represented a single category, but more frequently, responses contained ideas that fit under multiple categories, and these were coded into each category separately. Codes were organized into larger, descriptive categories, or "domains." Domains were generated deductively, from the program goals, and inductively, from the data itself. The domains and codes within them reflect the major themes that manifested in the interviews.

## **Evaluation Findings**

This section reports findings from the data collected from the GLP program in 2018-19. The section first describes who participated in the GLP program, presenting demographic information about student participants in the GLP internship and the GEO 210 course. Next, personal, professional, and career outcomes for GLP interns are reported. Finally, outcomes for GEO 210 students and advice for implementation of the course and the internship are discussed.

### **Student Demographics**

#### *Demographics of GLP interns*

Five GLP students were summer interns at the United States Geological Survey (USGS) and one student worked at Droplet Measurement Technologies for the Geo Launch Pad program in 2019. One student did not complete either survey so demographic information for that student is not included in the report. Another student completed the pre-survey but not the post-survey. This student did not complete the full summer internship. Internship outcomes are only reported for the five students who completed the post-survey.

The students represented five different Colorado community colleges. The interns were from diverse backgrounds and women comprised the vast majority of students. Their backgrounds and demographic information of the survey respondents are:

- 1/3 were the first in their family to go to college
- 2/3 work outside of their studies
- Five of the interns were women and one was a man.
- Five students were white and one was Asian/Pacific Islander.

- Five of the students intend to transfer to a 4-year degree program in the sciences or geosciences.

### *Demographics of students in GEO 210*

Six students enrolled in the GEO 210 course in spring of 2019. Five students completed the pre-survey and four students completed the post-survey. Their backgrounds and demographics information is based on the information collected from the five students who completed the pre-survey. Students' backgrounds are as follows:

- All five students attend college full-time.
- Students had completed anywhere from 16 to 60+ credit hours of coursework (two students had completed more than 60 hours).
- Four of the five students plan to complete an A.S. degree. All were Geography majors or planned to complete a G.I.S. certificate.
- Four planned to transfer to a 4-year degree program.
- Four students worked outside of their studies. Students' work hours ranged from less than 10 to more than 30 hours of outside work.
- 40% of enrolled students were women; 60% were men.
- Four students were white and one was African-American.

### **Students' motivations for participating in the internship**

Students had varied reasons for choosing the GLP internship in their responses to the open-ended survey question. Three students noted that they applied to the program because they wanted to build research or professional skills in the geosciences. One of these students was also motivated to decide on a career path. Two of these students wanted to learn about career paths in the geosciences. One student was motivated by interest in science. The other two students were motivated by others, one by a faculty member and one by a former GLP intern who had spoken highly of the program. The GLP internship is now well-established enough that students are beginning to hear about it from word-of-mouth through peers.

In interviews, the students expanded on their motivation for wanting to pursue the GLP internship. Several of the students commented that it would be helpful for transferring to a 4-year degree program in the geosciences.

Some students used the internship to find their career direction and interests and most students commented that it was a benefit that the internship provided housing and a stipend. Students were also motivated by the fact that the internship was competitive. One student described working harder during the academic year because the student was not admitted to the program the year before. Other students were also motivated by mentorship. Sample comments are below.

*I think it's a good sort of pivoting point going from the community college to transferring. It speeds us up just a little bit so we have more tangible skills, professional skills to start working at a little bit higher course work. It seems like a good transition.*

*For me I used it like a direction. I was just trying to figure out where I wanted to go with my school if I wanted to keep studying what I am studying. It was just a cool way to poke my head around into different areas to study.*

*When I looked into it, it just seems a good thing to do with my summer. There's good financial compensation and there's housing. It would be something that would help my career.*

*For me it's the opportunity for my internship that comes with it to was really important because no one in my family is very scientific. So having a lot of people around me who wanted to do Science and where encouraging me to do Science is really helpful.*

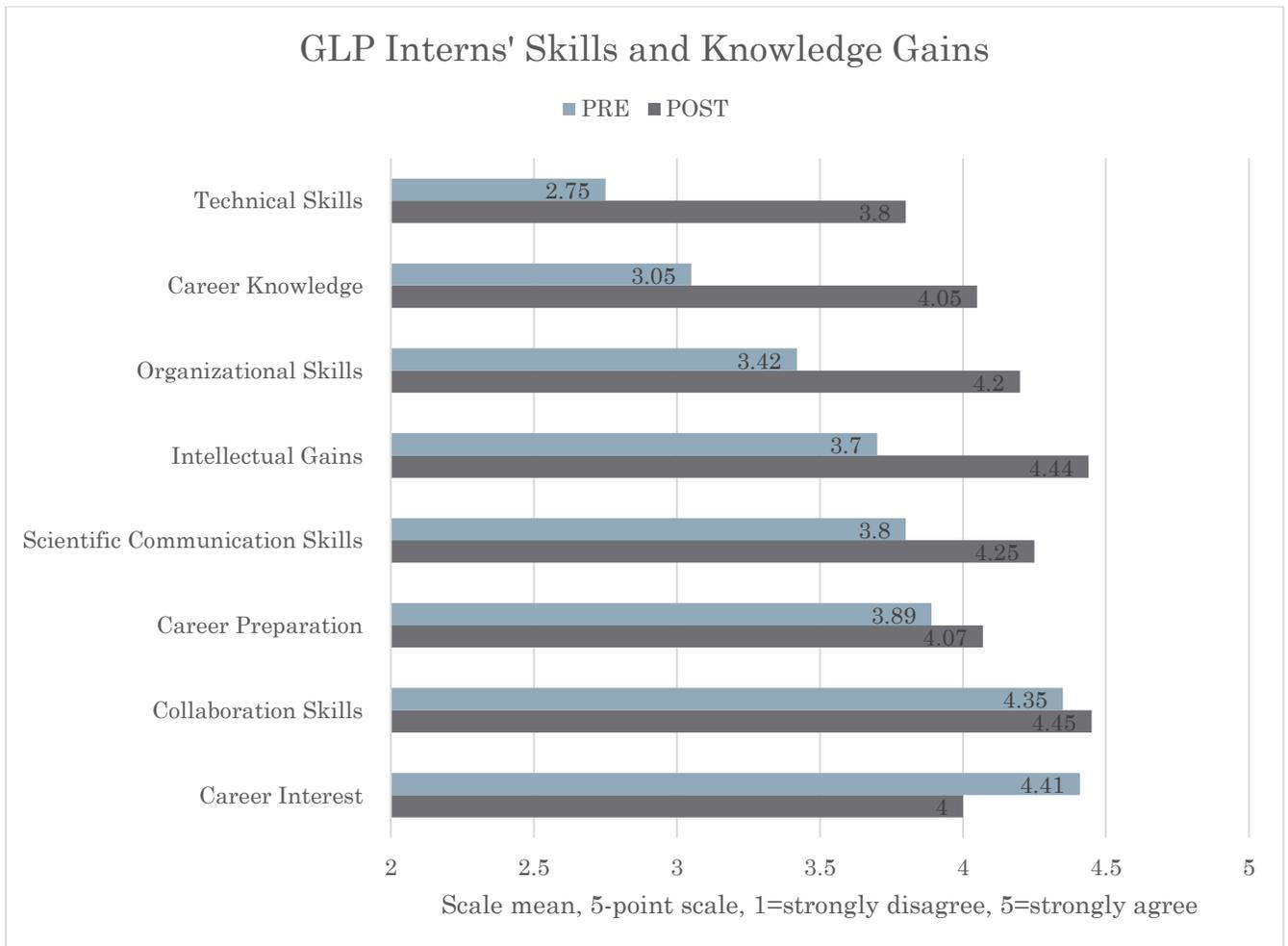
## **Student Outcomes**

### **GLP Summer Internship**

Similar to previous years, interns demonstrated the strongest growth in technical skills and their understanding of and ability to use instrumentation in the geosciences. Students also made great strides in understanding the range of geoscience career options and educational paths available to them. While interns in previous years have entered the program with very high organizational skills, the interns this past summer made strong growth in organizational and project management skills. Students also gained ability to ask research questions and to use and analyze data. Students made gains in scientific communication skills as well.

Students generally felt more prepared geoscience careers and educational paths. Students entered the internship with very strong perceived collaboration skills, so they made a little progress in this area, but there was not much room to grow. Students' interest in geoscience careers declined slightly, but this was because some of them decided to pursue other career paths in the sciences and because they entered the internship with such high interest in science careers that there was little room to grow.

Figure 1. GLP Interns' Skills and Knowledge Gains

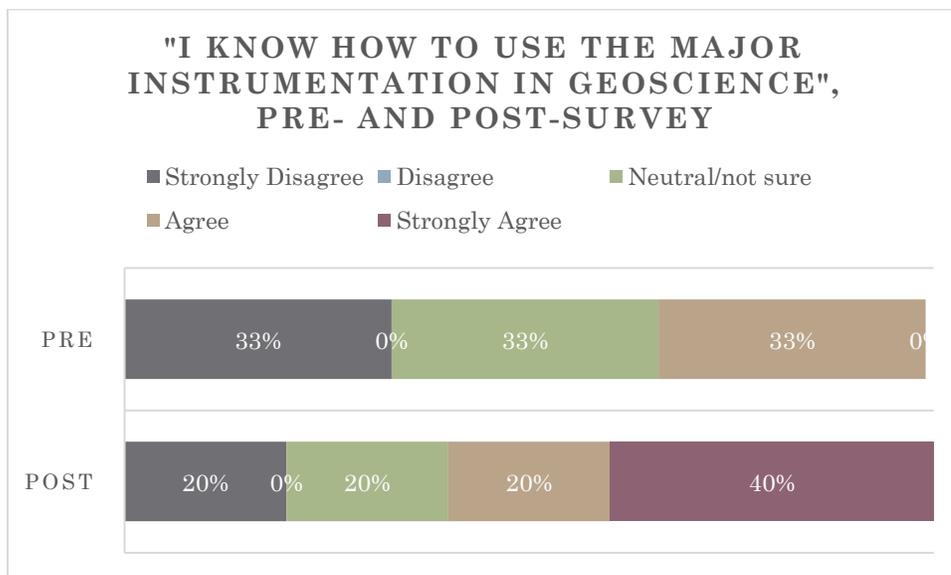


### GLP interns: Technical Skills

Overall, students showed strong growth in their understanding of scientific instrumentation and in their ability to use important instrumentation. However, students' technical gains were varied as some projects incorporated more technical and instrumentation work into the project goals and tasks. Overall, though, only 33%

of students felt they knew how to use the major instrumentation in geoscience before the internship, while 60% did so after the internship. Likewise, students gained awareness of the general instrumentation in their discipline: 60% felt they were aware of the major geoscience instrumentation before the internship, while 80% were aware of the major instrumentation at the end of the internship. Moreover, all of the students who agreed prior to the internship that they were aware of major instrumentation, moved from “agree” to “strongly agree” over the course of the instrumentation, so they still demonstrated growth in knowledge of technical instrumentation.

Figure 2. “I know how to use the major instrumentation in geoscience” pre- and post-survey



In the interviews, students described gaining important technical skills, such as coding or data analytics, that could be used on future research projects or even in other disciplines or careers. Students perceived that these were transferrable skills that would bolster their skillset and benefit them in future research projects, education endeavors, and careers.

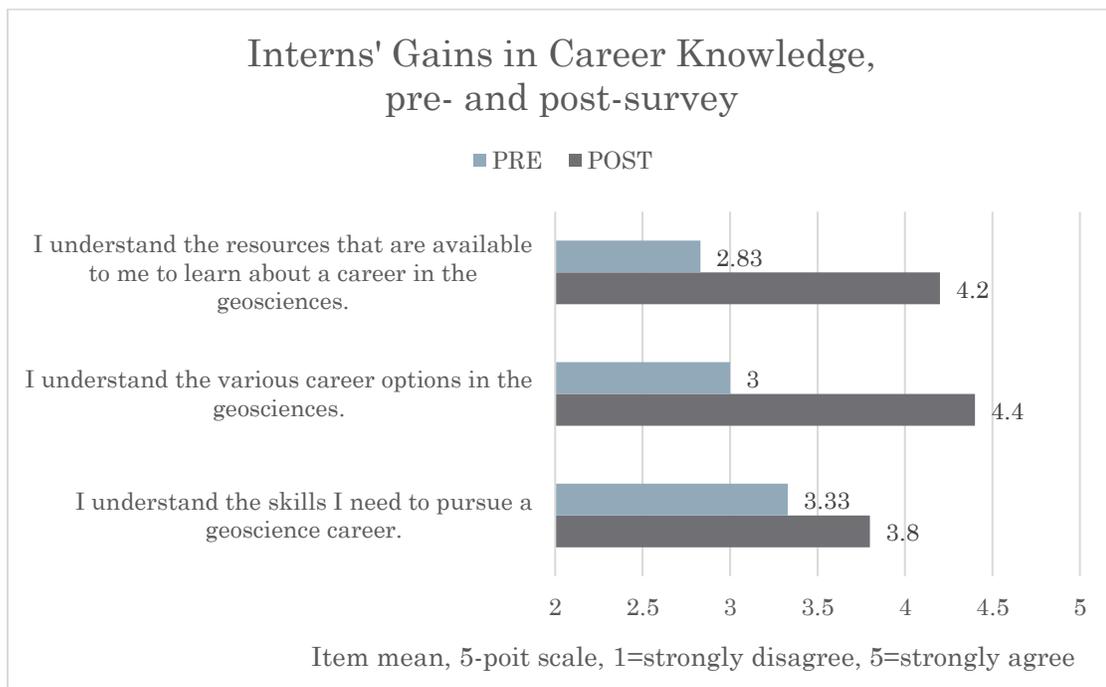
*It was a really, really good opportunity to learn how to one, code and use different software like that into learning how pivotal it is to keep track of all your metadata and make sure everything is open access and it's easy to understand and navigate as possible.*

*Then at the end of it you're also sitting there with metadata management skills, database, collation skills and things along those lines that are pretty much essential skills for almost any scientific research now.*

### GLP Interns: Career Knowledge

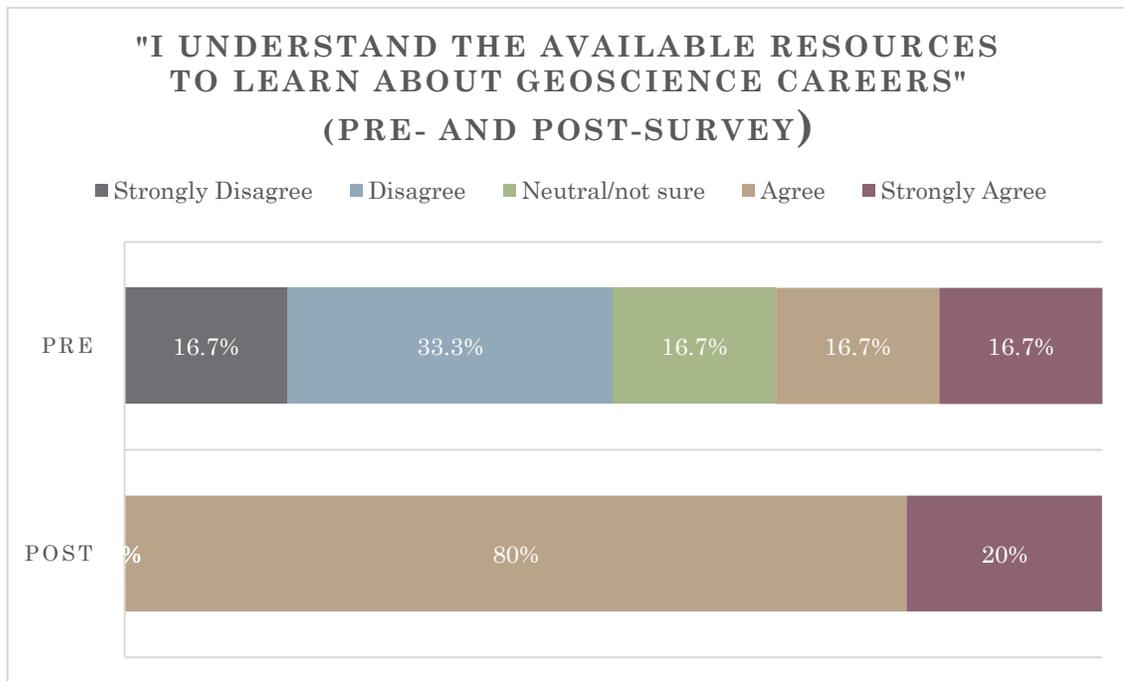
Overall, interns learned about career paths in the geosciences and gained resources for navigating their own educational and career pathways. Interns benefited from the substantive focus on career paths in the GLP program through Career Circles and other supplemental programming. Interns also learned about career paths and the day-to-day work of scientists from their everyday work on their internship projects. From the Career Circles, interns learned about the career options that are available in the geosciences and the educational background or credentials needed to enter those careers.

Figure 3. Interns' Gains in Career Knowledge, pre- and post-survey



Similar to previous years, students made the strongest growth in their understanding of the resources available to them to learn about geoscience careers. Students also increased their understanding of the career options within geoscience: The proportion of students who felt they were aware of geoscience career paths rose from 50% to 100%.

Figure 4. "I understand the resources to learn about geoscience careers" pre- and post-survey



In interviews, students highly valued learning about graduate school from the internship, in addition to learning about the array of geoscience careers. Some students commented that learning about graduate school was the most valuable aspect of the internship for them, especially because they had previously not had anyone to turn to for guidance or advice about graduate school. Subsequently, the path to graduate school seemed more manageable and feasible for some of the interns.

*Student #1: One thing that I would say probably one of the most useful things I got out of this internship was the professional development and the ability to talk to your mentors about stuff like grad school. I learned so much about grad school that everyone just thinks it's obvious but as someone who knows no one in grad school it was life changing.*

*Student #2: I had no idea that you could get a different master's degree from what you got your undergrad in.*

Other students solidified their career direction from their participation in the GLP internship. For instance, a student on the bird conservation project affirmed a love for wildlife and discovered that this would be a good career direction.

*The project that I was working on actually, that opened my eyes a little bit more. This is the direction that I'd probably prefer to go into and I fell in love with that project even though it kind of wasn't related to the Geology.*

Students with other interests also discovered the intersection of those interests and affirmed that they could find a career that would nurture both interests, such as combining science and art. The student discovered this when they visited the Ice Core lab and were able to see the artistic patterns in the ice crystals.

Students also learned about the variety of career options in science. They also learned that a career path does not necessarily have to be linear and that a career path is an ongoing process of discovery. The Career Circles were vital in helping students to understanding the wide array of career options and the nature of scientific career paths. Students commented:

*Student #3: There's a lot of options in science that's the best part. It doesn't have to be just plain and simple like, 'Oh you're either an engineer or you're a Meteorologist or Geologist.' There's so many different pathways you can go down in Science.*

*Student #4: That's something I didn't know before too, is that all of my mentors had all of this crazy background and it all came together and they were like yeah you can basically do whatever you want. This one degree doesn't just lead to being a Geologist, it leads to being anything you want. It was really cool to see that.*

*Student #2: There's this huge spectrum of what being a scientist is and I think UNAVCO did a really good job of touching on a few of those different things within that spectrum. And the career circle also did a really good job of showing how people transition in the scientific*

*community through their career. Someone that may have started out working in the oil industry may end up on the other side doing EPA administration. It was really cool to just see people's pathways through their careers.*

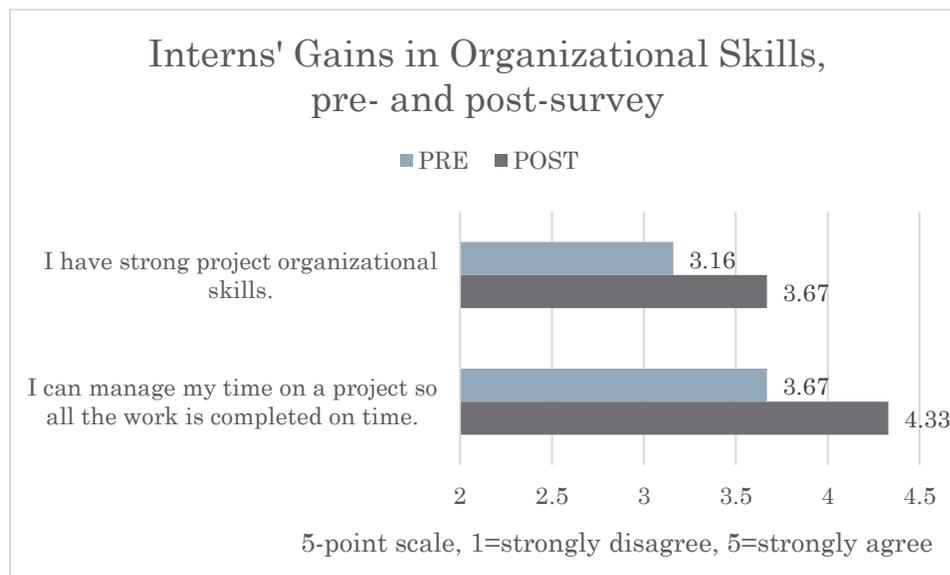
Students summarized their gains in career knowledge and resources as the most important parts of the program. Students summed up the internship:

*I loved this experience. ...It was perfect all in all. I'm taking away all of the professional development just knowing that there are so many different paths and opportunities that I can go into, and knowing that there are resources for funding and support and mentorship and just guidance.*

#### GLP Interns: Organizational Skills

Interns learned how to manage their time and stay on track of a project work flow from the large-scale, extended projects that they were responsible for during the internship. Students also gained the ability to manage projects and complete their work on time, a valuable skill in any career that some students felt they were lacking at the beginning of the internship. By the end of the internship, 100% of interns felt that they could manage their project tasks and complete their work by deadline.

Figure 5. Interns' Gains in Organizational Skills, pre- and post-survey

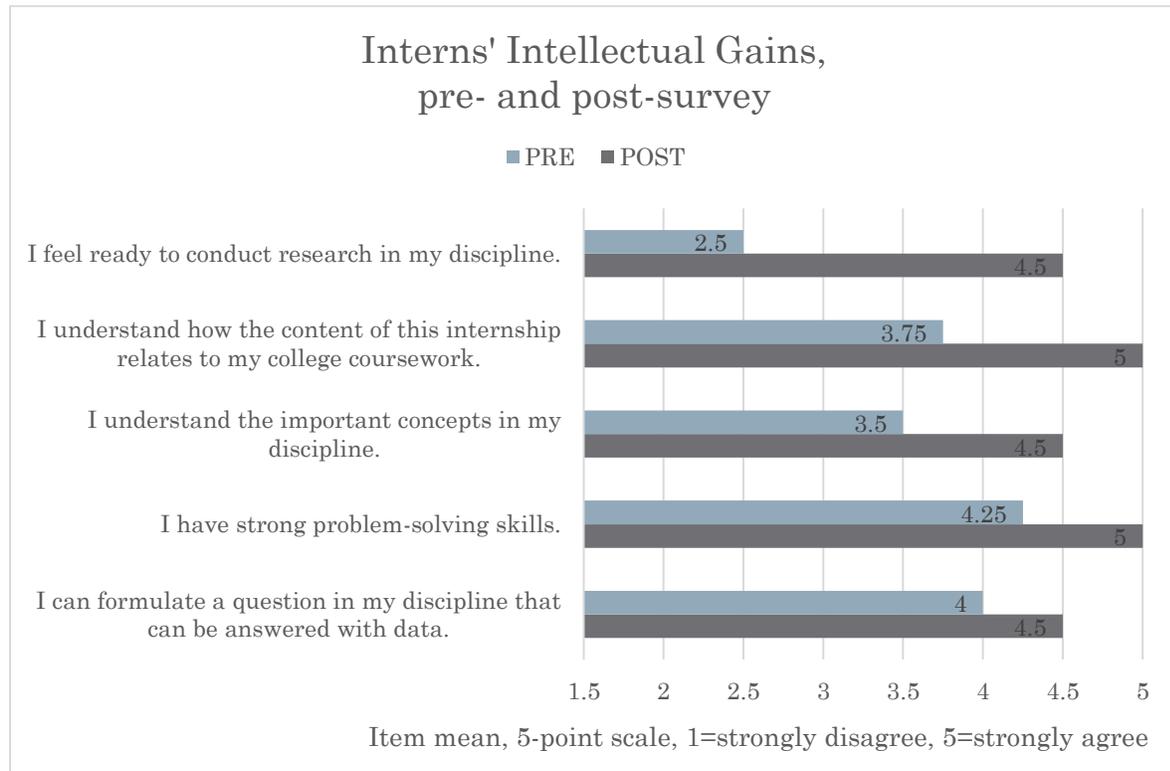


In interviews, faculty mentors commended the realistic expectations and project-based work of the internship. In fact, 100% of the mentors felt that the development of “soft skills” such as organization and communication was one of the most important elements of the internship experience for students. As one of the mentors commented, “Building those soft skills is so critical and one of the reasons that I think programs like this are so important.”

**GLP interns: Intellectual Gains**

Students demonstrated growth in many areas related to scientific thinking and their capacity to conduct research. Students made the most progress in their feelings of preparedness to conduct research in geoscience fields (rising from 33% to 100%). Students also gained greater understanding of the link between professional science and their coursework, as 100% of interns “strongly agreed” at the end of the internship that they understood this connection. Students also gained substantial understanding of the important concepts in geoscience (rising from 50% to 100%).

Figure 6. Interns’ Intellectual Gains, pre- and post-survey



Faculty mentors commented in interviews that interns had gained an understanding of what research will be like. They learned to work with data, validate

data, and interpret results. Students also learned the importance of being precise in research and other extended projects in their discipline.

Not only did students feel more prepared for research, but they gained insight into the process of scientific research. All students commented that they were excited and intrigued by the discovery process of research.

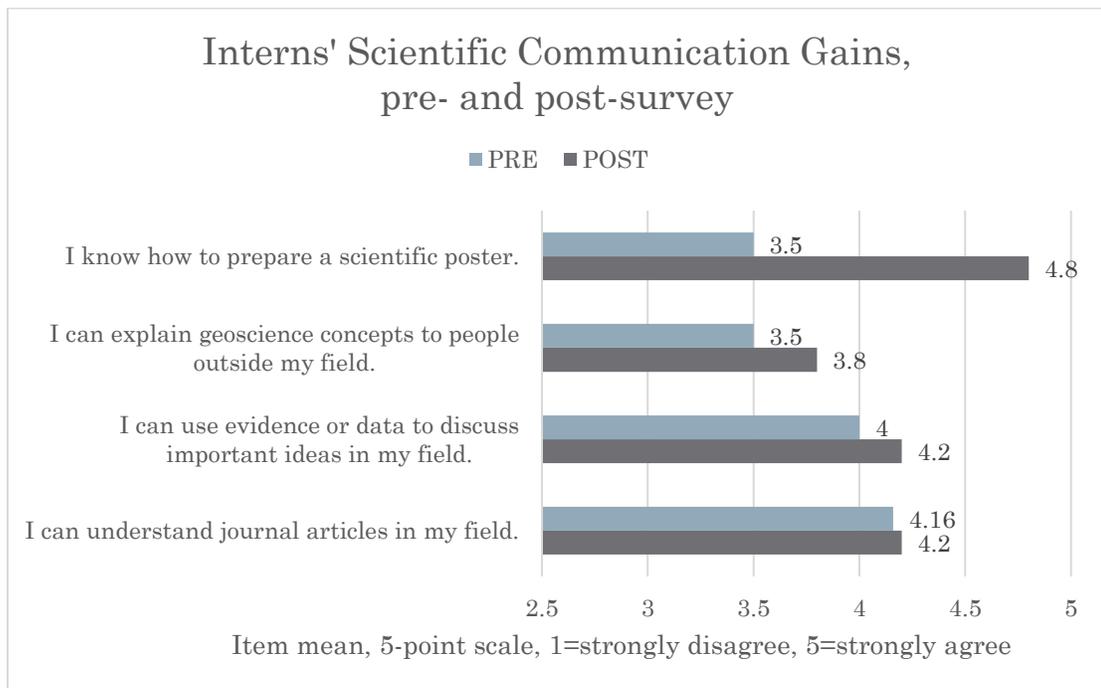
*Student #1: The cool thing about science too is the most exciting elements are things that no one come up with yet. It's what you come up with and bring into the field that really contributes to it and that's how you create your place within the scientific community is you take research that other people might of done and in a lot of different places and you advance it forward in a way that other people hadn't considered. It was kind of cool to see that in action.*

*Student #5: I think that's what we kind of came away with this summer. Everyone at UNAVCO made us feel like our projects and our work were important or meaningful or tangible skills. So it was really exciting to say I'm doing real Science. This is my story that I'm telling.*

### **GLP interns: Scientific Communication Skills**

Interns gained greater ability to communicate scientific findings in a variety of formats. The most significant gain for interns was their ability to prepare and present a scientific poster (rising from 66% to 100%). Other methods of scientific communication, such as their ability to present geoscience concepts to a general audience, remained relatively steady during the internship. The scientific poster was the primary scientific communication format in which interns engaged so it is to be expected that their primary gains were in poster preparation.

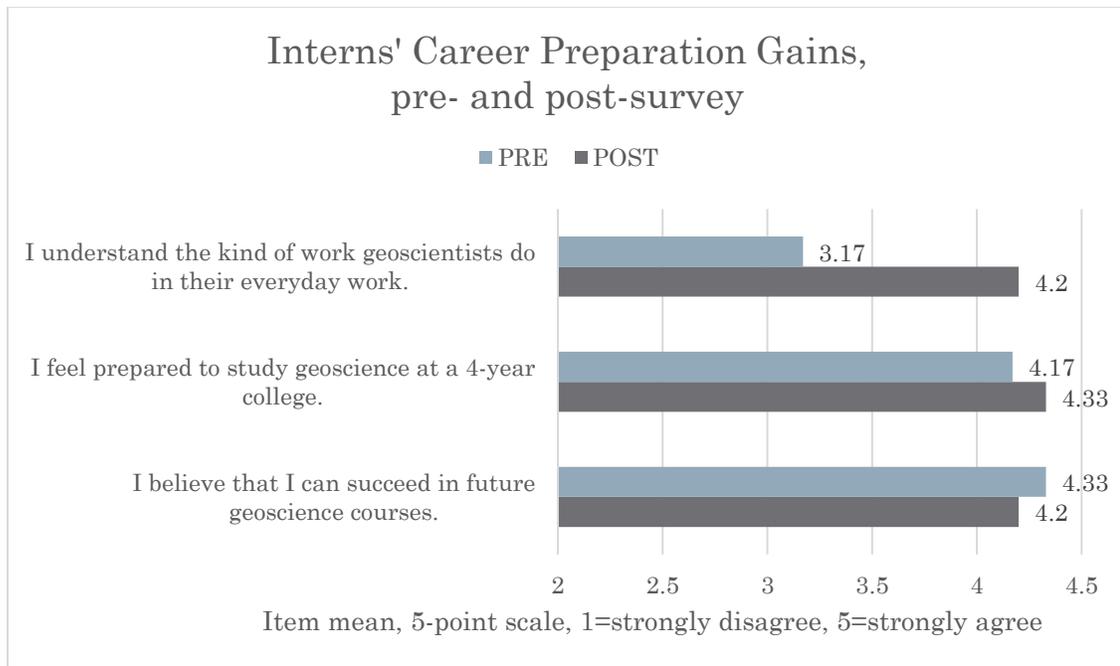
Figure 7. Scientific Communication Gains, GLP interns



#### GLP Interns: Career Preparation

Overwhelmingly, interns' largest gain in career preparation was in understanding the real work of professional scientists. Interns made slight strides in feeling prepared to study geoscience at a 4-year college or university, but they entered the internship feeling relatively well prepared in this area. Likewise, students' belief that they can succeed in geoscience stayed steady throughout the internship. Students entered the program with pretty strong self-efficacy in geoscience, so it is positive that their self-efficacy remained constant during the internship.

Figure 8. Interns' Career Preparation Gains, pre- and post-survey



In interviews, both students and faculty mentors commented on their increased preparation for advanced geoscience education and careers. The first thing that faculty mentors unanimously noticed upon meeting with the students at the end of the summer was their increased professionalism, confidence, and readiness for a career. Two of the mentors commented:

*Mentor #1: He looks the part: the mannerisms, the persona, the confidence. I mean, I walked in that room, and he lit up, and I'm like, "Look at you. You grew up. You flew." So that was just awesome for me to see.*

*Mentor # 2: She looks professional. She's had some self-confidence issues and I don't see that as much anymore. So clearly, it's been helpful there.*

*The people around here at UNAVCO that I've only met once or twice were singing her research praises to me. So, she clearly impressed them.*

Mentors also praised the program for increasing access to research for low-income and other underserved students, commenting that the GLP program provided exposure to research and science, and allowed students to focus all of their efforts on learning because it was a paid internship. Because so many of the students work outside their studies, they may have had difficulty in gaining the full educational benefit of the internship if they were not paid.

*Mentor #1: But this a unique way to get ... I mean, even though it's a small number of students, but at least it's providing those students with a real authentic experience of what it's like to do science without having to worry about "Am I making rent? Can I buy groceries?"*

*Mentor #4: For a lot of them, if their real goal is researchers down the road, they should be doing research their freshman and sophomore summers.*

In interviews, students highlighted the career preparation aspects of the program as one of their most important areas of professional growth over the summer. Students highlighted the seminars, Career Circles, and other professional activities and tasks as important to their growth and development as professionals. All students also commented on the helpfulness of UNAVCO GLP program staff in their professional development, such as checking in with them about the progress of the internship and helping them with professional tasks, such as applying for jobs.

In the interview, students discussed the importance of the informational interview for developing important professional skills and career knowledge.

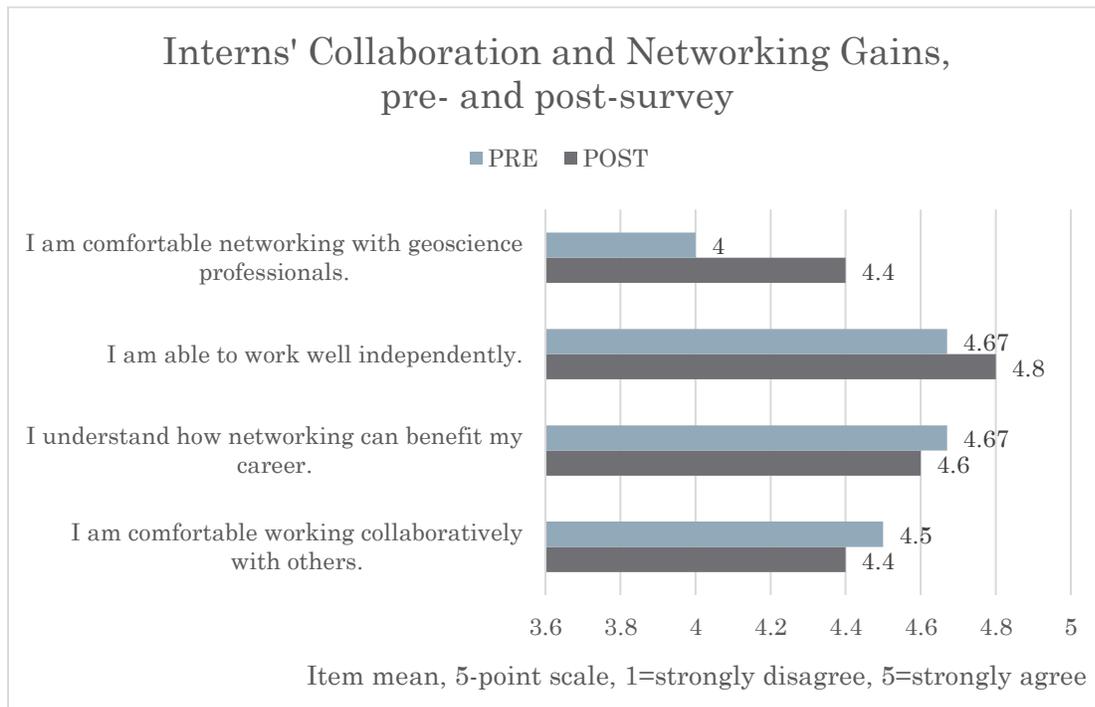
*Speaker #3: I loved that they made us go out and do a informational interview and just cold call someone. I really liked that, that was a really useful skill and I think that was probably the best thing.*

### **GLP interns: Collaboration/Networking**

For the most part, students remained steady in their collaboration skills, yet they made the most substantial gains in their ability to network with science

professionals. Unlike working collaboratively on a group project or task, most of the interns had little actual networking experience prior to the internship, particularly with professional scientists.

Figure 9. Interns' Collaboration and Networking Gains, pre- and post-survey



Students' growth in collaboration and networking extended beyond just the team projects that they worked on during the summer. Students credited the professional development workshops and other activities with team building and creating a community amongst the interns.

*Those workshops, the professional development days, we just kept getting closer and closer and closer. I guess instead of just being a weird bunch of kids we started to respect each other and be each other's colleagues. So that setup in that sort of structure of the program was spot on.*

Students received mentoring from their assigned mentors on their projects who provided advice, guidance, and answered questions. Students noted that the process

worked better if there were multiple mentors so that there was always someone available if one of the mentors was away on vacation or at a conference. Students also benefited from networking with USGS scientists during the internship. In particular, students noted that the head of the Ice Core lab had been very helpful for them in answering their questions and providing guidance. Students viewed her as a very helpful career resource. Students were also intrigued by her interdisciplinary scientific background.

One of the most important things cited by students that they will take away from the internship is the ability and confidence to network with professional scientists.

*I think I'm going to take a lot of the professional development away from this. It was nice to relearn how to navigate in academia and in science. Just how to communicate how to get in touch with people. How to keep those relationships alive, which I think is really useful.*

#### **GLP Interns: Influence on Career Intentions**

In interviews, both interns and faculty mentors described the impact of the GLP internship program on students' career and education aspirations. Both groups agreed that it helped students to narrow and clarify their career paths and future directions. For instance one of the mentors commented:

*[My mentee] mentioned specifically that the variety of experiences that they had this summer really helped confirm some things for her, like "Yes, I really do want to go this direction," and then there's other things. She's like "Yeah, I do not want to do that." So I think that was definitely valuable.*

Mentors also observed the development of a science-oriented identity in the interns. Not all interns felt that they belonged in science or at the university prior to the internship as some of them were returning college students or did not have high confidence in their skills. After experiencing success and a tight-knit community through the internship, mentors noted an increased sense of belonging in science in their students. As they commented:

*Mentor #2: Some students deal with imposter syndrome a lot to begin with, and then you add the people that are coming back around. They deal with it even more, like "Do I really belong here?" That's what I saw improve in her.*

*Mentor # 3: Same. I would agree with that. Yeah, developing that identity as a student and a scientist, not just one or the other.*

Another mentor summarized the overall professional impact of the experience in affirming belonging and commitment to geoscience and in developing overall professionalism in students.

*The professional experience, seeing the research in action and knowing what it actually is. There's a lot of people that like the results of science and can't do the tedium to get there, and they shouldn't be in a professional career before they figure that out. Again, what we said about overcoming the imposter syndrome for community college students, in particular, that I do belong here, I can do this. - Mentor*

Students themselves also discussed the impact of the internship on their sense of belonging in the discipline. They reported that they benefited greatly from learning about issues such as imposter syndrome and it helped their sense of belonging and fit in science. For example, a student commented:

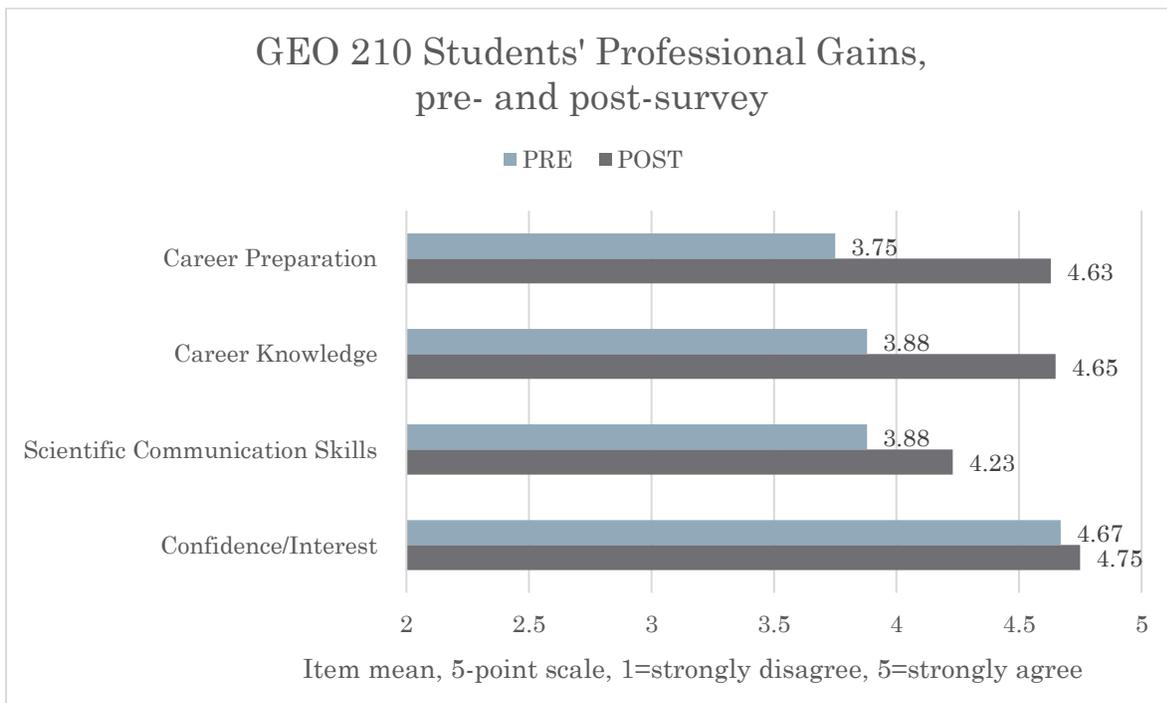
*One of the favorite things that we ever did was, we did this whole thing on imposter syndrome and they had everyone go up to the board and write something they had thought about why they might not have deserved to be where they are and that was probably one of the most powerful things we did because I remember looking around this room and being like God everyone here is smarter than me. And then someone who I thought was way smarter than me and went up to the board and wrote everyone here is smarter than me. I feel so much better.*

## **GEO 210 Outcomes**

From the GEO 210 course, students gained knowledge about career options and paths within geoscience. Students also gained an understanding of the different

requirements to enter a geoscience career and/or education and to feel prepared that they could succeed in a geoscience career. Students also gained some expertise in reading and understanding scientific journal articles and in the nature of scientific writing and communication. Students made slight gains in their confidence that they can succeed in geoscience and in their interest in a geoscience career, largely because they entered the course with very high levels of confidence and interest.

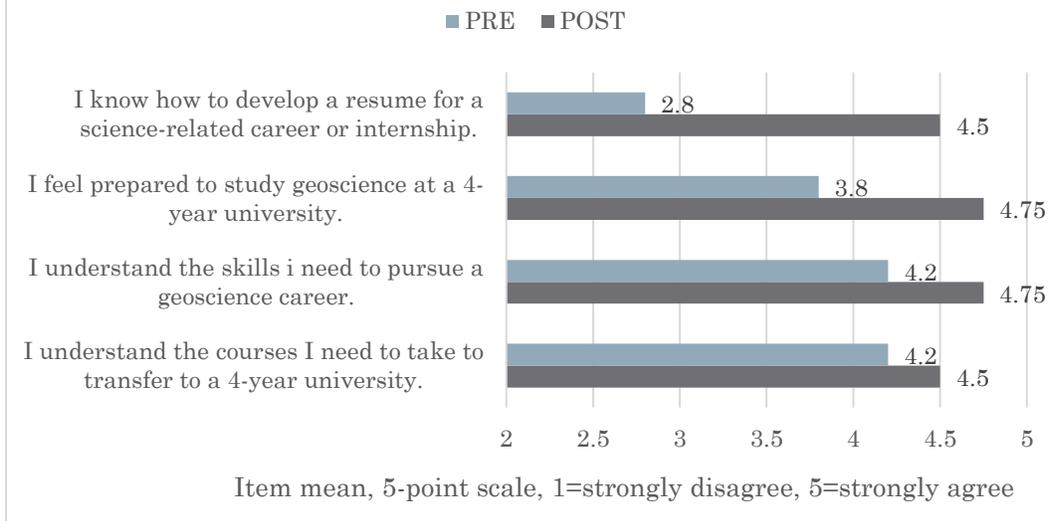
Figure 10. Student Gains, GEO 210



### GEO 210: Career Preparation

Students demonstrated the largest growth in feeling prepared for a career in geoscience. Students’ responses to the items on the career preparation scale had a mean of 3.88 at the beginning of the course (between “not sure” and “agree” with the items about preparedness) and a mean of 4.65 at the end of the course (between “agree” and “strongly agree”). Students learned the most in this area regarding how to develop a resume for their discipline (rose from 40% to 100% had the ability to develop a resume in the sciences). Students also became much more confident in their preparedness to study geoscience at a university (mean rose from 3.8 to 4.75 out of 5).

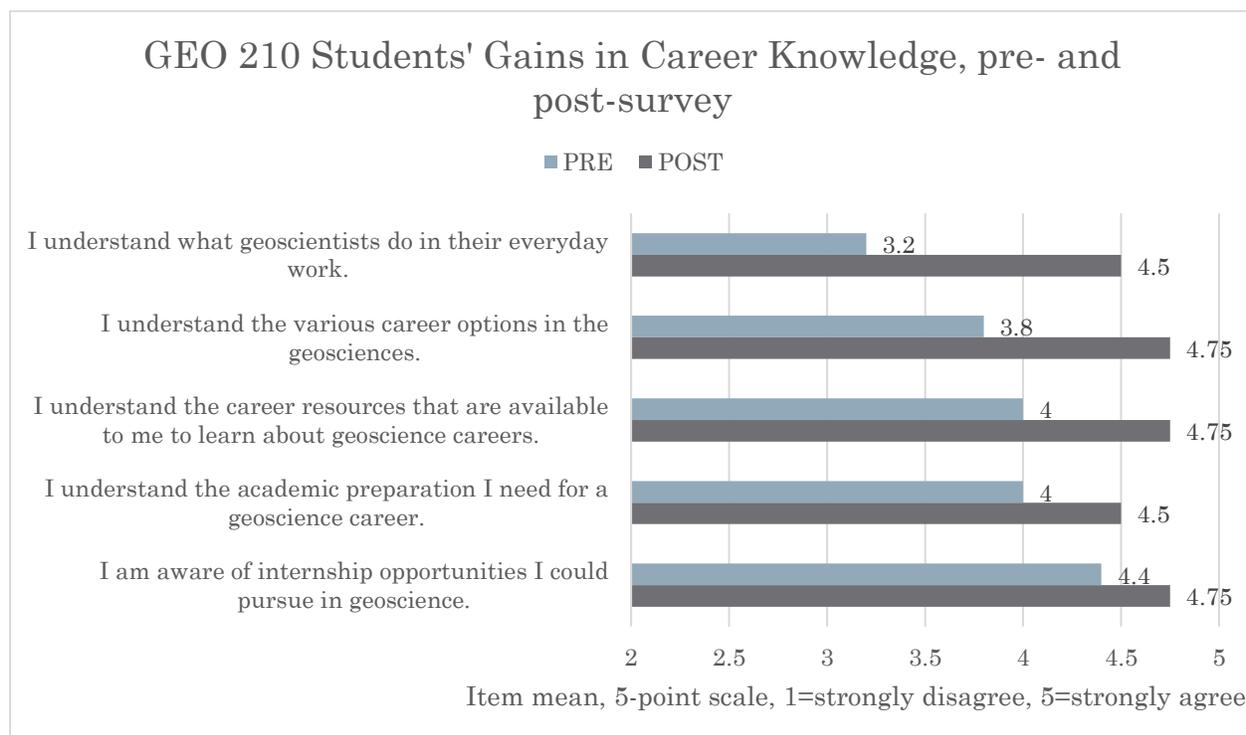
## GEO 210 Students' Gains in Career Preparation, pre- and post-survey



### GEO 210: Career Knowledge

Students made substantial gains in all areas related to their knowledge of geoscience careers. In particular, students made strong strides in understanding the actual work and experiences of professional geoscientists (rose from 40% of 100% of students who understand the everyday work of geoscientist). Students also gained a broader understanding of the different types of careers available to them in geoscience. Finally, students also learned a lot about the resources available to learn more about geoscience careers and the type of academic preparation that they need for a geoscience career. Across the board, students learned about geoscience careers and gained a more comprehensive understanding of the career paths available to them.

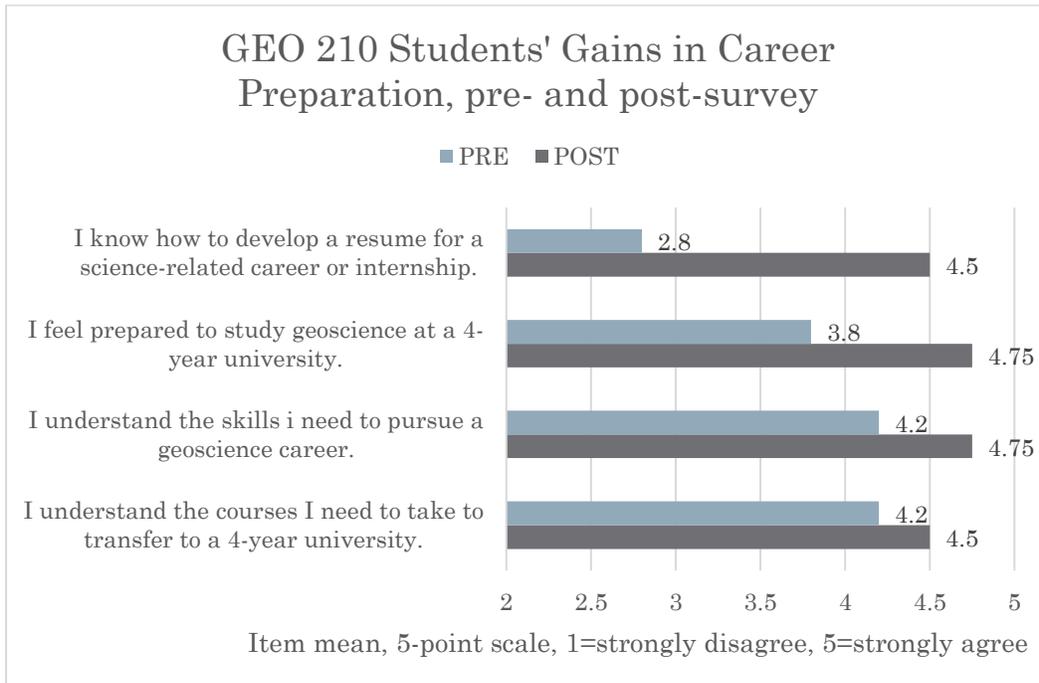
Figure 11. GEO 210 Students' Gains in Career Knowledge, pre- and post-survey



### GEO 210: Career Preparation

Students felt more prepared to navigate their educational and career pathway in the geosciences after the course. Students entered the GEO 210 course with a higher level of career preparation than they did last year, yet they still demonstrated growth in their knowledge and preparation for geoscience careers. For instance, prior to the course, 40% knew how to develop a resume for a science-related internship or job, yet 100% could do so at the end of the course. Students also gained a better understanding of the skill set required to succeed in geoscience careers. Students felt more confident that they could succeed in advanced coursework in geoscience. Students demonstrated less growth in career interest or knowledge of transfer pathways in geoscience, but this was only because their incoming knowledge was so high.

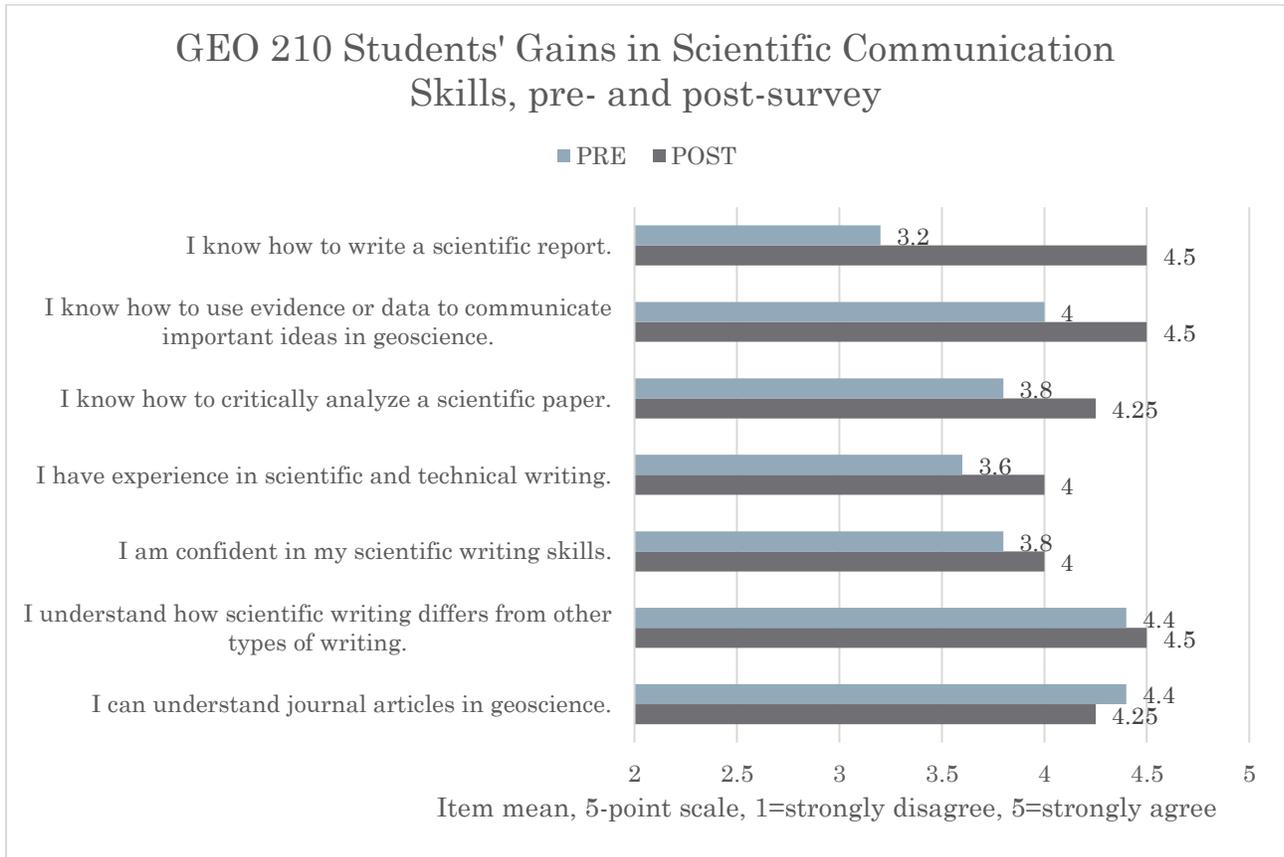
Figure 12. GEO 210 Students' Gains in Career Preparation, pre- and post-survey



### GEO 210: Scientific Communication Skills

The GEO 210 course also strengthened students' scientific communication skills, especially in the area of scientific writing. For instance, students made great strides in knowing how to write a scientific report (e.g., 40% of students reported they had the ability at the beginning of the semester and 100% did at the end of the semester). Students also demonstrated progress in their ability to use data to communicate ideas in their discipline. Students also developed their ability to critically analyze a scientific paper (60% could do so at the beginning of the semester and 100% at the end of the semester). Students gained a bit of confidence in their scientific writing skills. Students entered the course with some ability to understand journal articles in their discipline, so this skill remained steady during the course.

Figure 13. GEO 210 Students' Gains in Scientific Communication Skills, pre- and post-survey



### GEO 210: Influence on Students' Educational and Career Paths

Three of the four GEO 210 students stated that the course had positively influenced their educational and career paths. The other student expressed a strong commitment to a geoscience career upon entering the course and wrote, “It did not influence my plans as I was already very committed to a career in the geosciences world.” The other students expressed that the course helped them to understand career and educational paths, stating:

*It helped me understand different careers in the Geo sciences – GEO 210 student*

*It helped me to understand what fields were available within the Geosciences and networking. – GEO 210 student*

*It helped me consider other schools. I had not previously considered CU.  
– GEO 210 student*

### **GEO 210: Most Important Thing Learned from Course**

Students largely reported that the most important thing they learned from the GEO 210 course were professional skills, such as job searching, resume development, and networking. Students learned that the geoscience community is interconnected, and it is important to network with scientists to expand professional opportunities and to fully participate in the discipline. Students also had the opportunity to actually network with geoscience professionals which they appreciated. Student comments are as follows:

*Getting the chance to speak one-on-one with the head of the Geography department at CSU, Dr. Sibold. – GEO 210 student*

*How to network within the geo science community. – GEO 210 student*

*The most important thing I learned was how interconnected the entire Geoscience world was in Colorado and how to get plugged into that world. – GEO 210 student*

*How to find jobs in geosciences and resume building. – GEO 210 student*

### **Advice for future implementation**

As in previous years, students were very positive about the GLP offerings—internship and GEO 210—and the many benefits to students from these opportunities. The essential components of the GLP program continue to be exposure to career knowledge and pathways within the geosciences, professional development seminars and workshops, and exposure to scientific networking and professional skills, for both the internship and the GEO 210 course.

#### **GLP internship**

Faculty mentors thought it would be helpful to have mandatory mid-internship check-in with their students. Mentors noted that they were willing and interested in meeting with or hearing from students at the mid-point of the internship. Several mentors commented that they reached out to students, but the students must have been too busy to respond with an update. A mandatory mid-point check-in would ensure that there is some ongoing communication

over the summer. Mentors also commented that they were interested in having the option of joining the interns on field trips so that they could see them, connect, and learn more about what the interns are doing in the GLP internship. Mentors noted that they would appreciate the opportunity to meet the group at the field trip site to join in the activity for the day.

Now that formal funding for the program has ended, mentors suggested that the GLP program could require institutions to provide some support for their students to participate in the internship (e.g., institution could pay \$5000 towards the total cost of supporting an intern for the summer). They also suggested that the GLP program could invite upper administration to the poster session so that they see the value in the program.

Mentors requested that it would be helpful to provide the expectations for mentoring and workshops/trainings, even in abbreviated form, at the beginning of the summer so they have a better idea of the expectation of the program from the beginning. Likewise, interns suggested that they would like more information about the projects that they would work on prior to the start of the internship.

The opportunity to create and present a scientific poster is an essential element of the GLP program. Interns requested that they would like more feedback on their posters ahead of time. For instance, they would like to participate in a formal practice session, even if it is short, to receive feedback on their poster and rehearse their talking points.

Though none of the interns had issues with their project mentors, some mentors were more available than others throughout the summer. Interns thought it would be helpful if their project mentors were also required to have a weekly check-in with the GLP program to increase accountability and make sure the projects and mentors are meeting expectations.

## GEO 210

In an open-ended question, three out of four GEO 210 students stated that they would appreciate a longer course. These students suggested that the material was so interesting and important that it could be a semester-long course.

## Conclusion

The GLP program has become an important part of the geoscience pathway for community college students in the state of Colorado. Evaluation results show a myriad of benefits to students from the GLP offerings, including the GEO 210 course and the summer internship. Through the GEO 210 course, students are introduced to professional skills, gain access to networking opportunities and learn about the range of geoscience careers. The internship program has expanded its reach to more local community colleges, and the internship program continues to provide ample benefits for students. Students gained knowledge about career paths and how best to prepare for a scientific career. Students gained confidence and comfort in their ability to network with scientific professionals. Students also reflected on their own career paths and gained insight into their interests and future direction. Through Career Circles, seminars and other professional development opportunities, students also gained valuable professional skills, such as information interviewing, that will benefit them in any career they choose. Perhaps most importantly, students gained a sense of belonging in science and the belief that they can succeed in a geoscience or scientific career.

