

EXTERNAL EVALUATION OF THE GEO- LAUNCHPAD INTERNSHIP PROGRAM, FRCC AND UNAVCO, 2016

Heather Thiry, Ph.D, Golden Evaluation & Policy Research

August 17, 2016

*Geoscience
opportunities
for community
college
students*

Table of Contents

Executive Summary	3
Introduction.....	4
Evaluation Design and Methods.....	4
Evaluation Questions	4
Evaluation Instruments	5
Analysis Methods	5
Evaluation Results	6
Recruitment.....	6
Student Demographics	7
Student Outcomes	7
Career Knowledge.....	8
Technical Skills/Instrumentation	10
Communication Skills	12
Organizational and Project Management Skills	12
Career Preparation	13
Intellectual Gains.....	15
Preparation for research.....	17
Collaboration, Networking and Mentoring.....	17
Mentoring.....	18
Influence on Career Intentions	19
Faculty Outcomes.....	20
Program implementation: Recommendations from students and faculty	21
Advice for future implementation.....	22
Engaging faculty to be mentors.....	22
Skills and communication seminars	22
Recruiting students	22
Conclusion	23

Table of Figures

Figure 1. Pre-post means on survey scales, GLP interns (n=4).....	8
Figure 2. Pre-post means, Individual items, Career knowledge scale.....	9
Figure 3. Pre-post individual item means, Technical skills scale.....	10
Figure 4. Pre-post means, Individual items, Scientific communication skills scale	12
Figure 5. Pre-post item means, Organizational skills scale.....	13
Figure 6. Pre-post item means, Career preparation scale.	14
Figure 7. Pre-post means, Individual items, Intellectual Gains scale	16
Figure 8. Pre-post means, Individual items, Collaboration/Networking scale.....	18

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 diverse community college students in immersive, technical experiences while also providing mentorship 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.

Key evaluation findings from summer 2016 are:

Career knowledge and preparation

- Students displayed the most growth in career knowledge (survey mean on career knowledge scale rose from 3.0 to 4.19 on a 5-point scale).
- All 4 students reported that the GLP program had strengthened their commitment to their pre-existing goals, including pursuing a bachelor's degree and/or graduate study in geoscience and a future geoscience career.
- All students reported that their knowledge about geoscience career options increased substantially (e.g., survey mean increased from 2.75 to 4.25 on a 5-point scale).
- All students felt more prepared to study geoscience at a 4-year institution (e.g., survey mean increased from 3.75 to 4.25 on a 5-point scale).
- Three students reported that they are more interested in pursuing graduate school because of the GLP internship.

Technical and research skills gains

- Students made very strong growth in technical skills/instrumentation (survey mean rose from 2.62 to 3.38 on a 5-point scale).
- Students benefited from working side-by-side with UNAVCO scientists on real-world, engaging projects that involved trouble-shooting and problem solving.

Scientific communication skills

- Students also made strong gains in scientific communication skills (survey mean rose from 3.6 to 4.25 on a 5-point scale).
- Students' knowledge of how to prepare a scientific poster increased markedly (survey mean rose from 3.0 to 4.5 on a 5-point scale).

Introduction

The geosciences have low participation rates of women 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 underrepresented minorities. Geo-Launchpad is a 8-week summer internship program for Colorado community college students. After a rigorous application and selection process, five students were selected for the summer internship in 2016. Some of the essential elements 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) introduce students to geoscience concepts, 4) provide students with an overview of geoscience careers, and 5) enhance students' mentoring relationship with a faculty member at their home institution. In addition to field experiences, the GLP program offered career seminars (Career circles), communication seminars, technical seminars, and opportunities to network with working scientists at UNAVCO as well as student researchers from the Research Experiences in Solid Earth Science for Students (RESESS) program, also housed at UNAVCO.

Evaluation Design and Methods

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 benchmarks. The evaluation uses mixed-methods measures, including pre-post intern surveys and student and faculty interviews. Due to a reduction in external evaluation budget, the application and recruitment process were not evaluated this year. Additionally, observations of program activities were not conducted.

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?
2. Have students' technical, networking, and scientific communication skills increased from their participation in the GLP internship?
3. What are the essential program elements that contributed to desired outcomes, 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 is not strictly a research internship, items were adapted to better fit the technical 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 survey also measures other aspects of the internship experience, including the impact of the internships on students' educational and career aspirations.

Faculty were interviewed individually at the end of the program to triangulate students' self-reports about their gains from the program and to assess the impact of the program on faculty mentor's careers and professional abilities. Students participated in a focus group interview at the end of the program to gain further detail about the impact of the program on their intellectual, technical, communication, professional skills, and educational and career goals.

Analysis Methods

The analytic methods described in this section apply to all data collected for this report. The quantitative data were entered into the statistical software package SPSS 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 *N'Vivo* 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 Results

This section begins with an overview of recruitment strategies and student motivations for participating in the GLP internship. Student outcomes are then discussed, followed by a brief section on faculty outcomes, and program recommendations.

Recruitment

In contrast to last year, the GLP program for the current grant cycle exclusively serves Colorado community college students. Thus, personal connections and networks proved to be more valuable recruiting tools this year than national conferences or other venues. Faculty mentors became involved with the program through various means. One of the mentors was a PI of the program. One of the mentors heard about it through a colleague who had seen a presentation about the GLP program and the other two mentors learned about the program through the PIs. One of these mentors was approached by a student, although she had heard of the program previously. Two other faculty members shared information about the program with their classes and students and were pleased when students chose to apply. One of the other faculty members specifically encouraged several students to apply. Therefore, of the three faculty who presented the program to their students, one specifically selected several top students to approach, while the other two faculty members cast a wider net and shared the information with all students hoping to interest a student who is not necessarily a top-tier student but who may really benefit from the program.

Faculty mentors encouraged their students to apply because they felt the program would complement students' coursework by exposing them to real-world applications of geoscience concepts, as suggested in the comment below.

This was a fantastic opportunity for students to learn the full breadth of what geospatial science is about in a different setting. Learning about all these different types of things that you can do with science with that geospatial component is more than what we can do in class.

This past year, all of the students learned about the GLP program through faculty at Front Range Community College, demonstrating that professors are important in promoting the program and recruiting students. Students wanted to learn more about the actual work of geoscientists and to learn more about their discipline, as suggested in the following two quotes from students.

I was exploring a new major track and my professor had just recommended it was a good way to see what geoscientists do in the field and on a day to day basis. Plus, it was a different setting for the summer, new people, new places.

I was really interested in it because I thought that UNAVCO itself was really interesting and their Plate Boundary Observatory and stuff, so, it just sounded like something I'd really enjoy doing.

Student Demographics

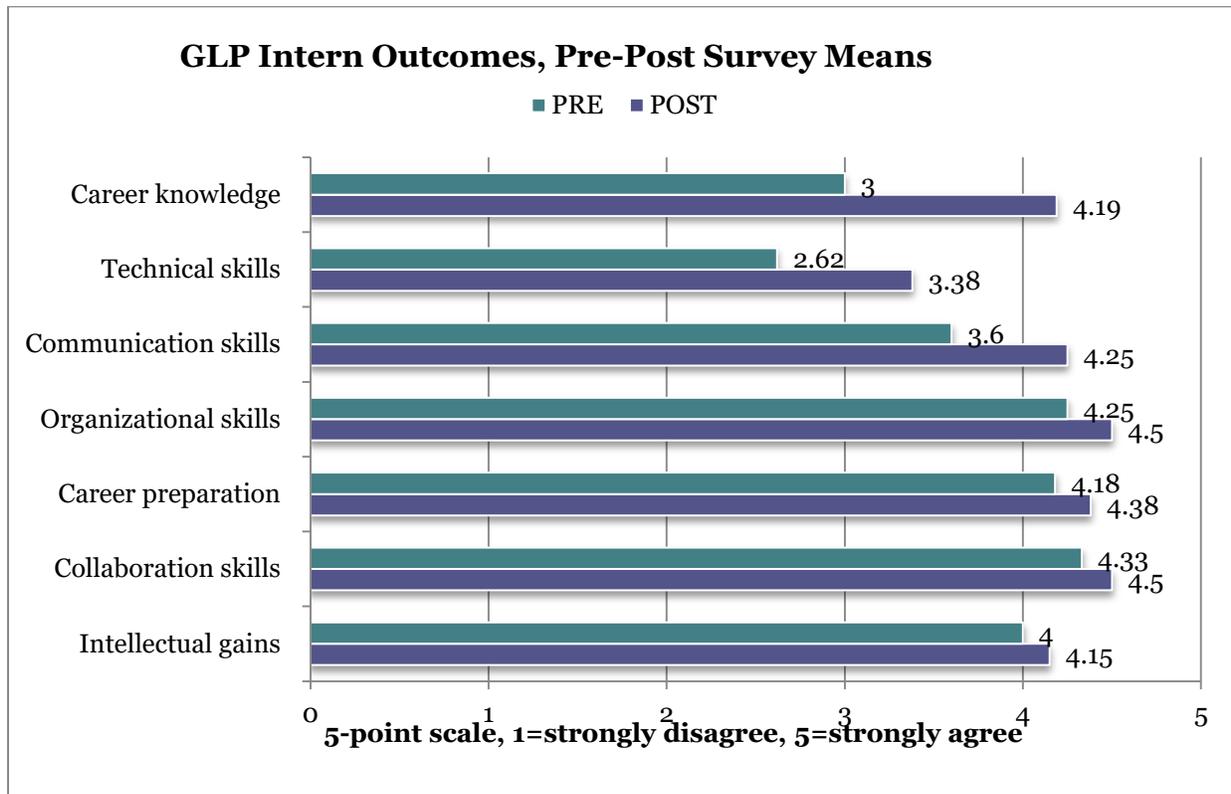
Four students participated in the entire GLP program because one of the original five students was unable to complete the summer internship. Their demographic backgrounds are as follows:

- Two of the students were male and two were female.
- One of the students is a first-generation college student. One student did not report his parent's education levels. One student reported that his parents both hold graduate degrees. The other student reported that one parent is a high school graduate, while the other holds an associate's degree.
- One of the students works outside his studies.
- Two of the students were enrolled part-time at their institutions, while the other two were full-time students.
- Three of the community college students plan to transfer to 4-year institutions. One of the students is attending community college to earn a certificate to complement her existing bachelor's degree.
- All four students reported that they are White/Caucasian.

Student Outcomes

Student surveys and interviews demonstrate moderate to strong growth in all areas, with especially strong learning gains in the areas targeted by the GLP internship, including communication skills, technical/instrumental skills, and knowledge of geoscience careers. Students' strongest reported growth on the pre-post survey was in knowledge of geoscience careers (see figure 1). Students also reported strong growth in technical/instrumentation skills and communication skills. Students made moderate growth in other areas, such as organizational skills, intellectual gains, and career preparation, largely because they entered the program with stronger views of their skills/knowledge in these areas, as demonstrated by the high pre-survey means in those areas.

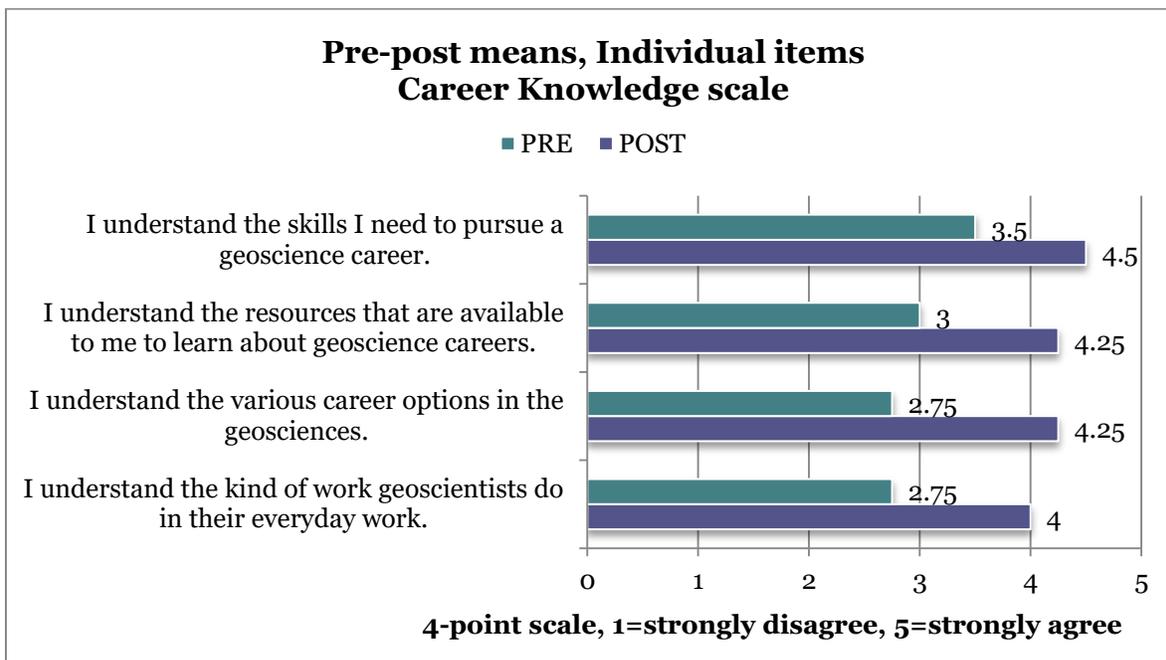
Figure 1. Pre-post means on survey scales, GLP interns (n=4)



Career Knowledge

Students' strongest growth over the summer was in their knowledge of the career options available in the geosciences. One of the primary goals of the GLP internship is to introduce students to the range of careers available to geoscientists and to provide students with the resources to learn more about those careers. Students reported their highest gains from the internship in career knowledge, particularly in understanding geoscience career options and their ability to find the resources needed to learn more about careers (see figure 2). Students also reported strong gains in understanding the daily activities and work of geoscience professionals.

Figure 2. Pre-post means, Individual items, Career knowledge scale



Faculty mentors and students both thought that one of the most valuable aspects of the GLP internship was the interaction that students had with a variety of geoscience professionals and the opportunity to learn more about their work and career paths. Mentors felt that students' career options had been broadened and that students might be encouraged to pursue career paths that they may not have previously considered.

She has been exposed to something different, she might have had an idea of what she wanted to do with her degree, but now that's been broadened a little bit. When she goes to look for a job, she knows that she can look farther and wider for a job and she has a little bit more experience to be able to do that.

It sounds like she's starting to learn more about career options and thinking more about what comes after her Bachelor's degree. Right now, that's the immediate goal. After that, it sounds like she's been networking really well and learning more about those options beyond.

Students also felt that they benefited the most during the internship from the opportunity to learn about geoscience career paths during the Career Circles and to work side-by-side with the field engineers at UNAVCO. The students particularly appreciated gaining a better understanding of the breadth of geoscience careers available and the often indirect paths that professionals followed to their current careers, as demonstrated by the following exchange during the focus group interview.

Speaker #1: I think what was really beneficial was the ability to just, like, ask people who worked in their fields, all kinds of questions from their education to day-to-day, and it gives you a better idea of, maybe you knew about the job, vaguely, but now you know more details.

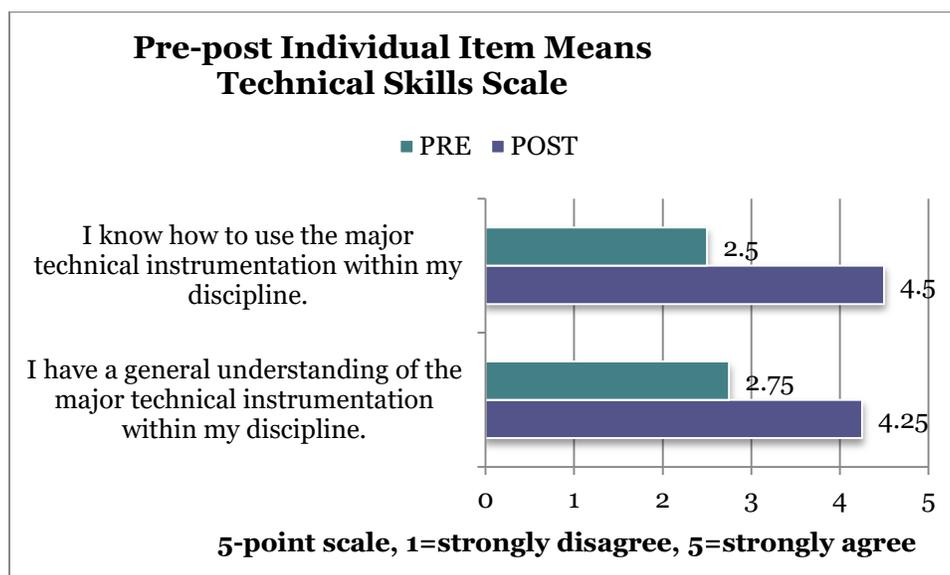
Speaker #2: How they got there, the complex and indirect routes that they took to get where they're at. It's not a straight line.

Speaker #3: But I definitely learned more about what each one of them did. They talked about everything that they do, and it was very enlightening, and that's where you would want to go if you'd want to pursue that.

Technical Skills/Instrumentation

Students' second strongest gains were in their ability to use instrumentation in geosciences. Students felt that they also gained a better awareness of the major instruments that are used in geoscience. Thus, students became more aware of the common instrumentation used in the discipline and gained the confidence and ability to use it (see figure 3).

Figure 3. Pre-post individual item means, Technical skills scale



Technical skills were students' second largest gains according to the survey, and students' extensively discussed their growth in technical skills and abilities during the focus group interview. Students reported that working with the instrumentation available at UNAVCO provided a real-world context for the science that they had learned about in coursework. Most importantly, the GLP internship offered opportunities that they would not have in their coursework to apply their geoscience knowledge, as mentioned in the following comment from a faculty mentor.

I guess being exposed to such a highly technical field, which is very different from what we did in the intro GIS class this fall. Being exposed and having this opportunity to learn all these techniques that can be used for pretty complex research. We never do anything like that in any of our classes really. Having this opportunity gave her the chance to learn things that she never could learn from us. How excited she was about it as well.

He talked about the survey he had been doing at Saint Mary's Glacier, which was really cool, and spending time in the shop here, working on things and learning how this technology works was totally exciting. We had talked about similar things in geology class so, he said that was good. Just the time being around these folks who are so knowledgeable. He'd never had any experience with that, so that was a great opportunity for him.

Students reported that the opportunity to learn about a variety of instruments and to actually use them in the field was the most beneficial aspect of the GLP internship.

I learned an awful lot about a wide variety of instrumentation, it's applicable for any field I go, any direction I go from here. We had the opportunity to help the field engineers quite a bit in preparing for their upcoming season, so we got a lot of hands on with a wide variety of the different things that they will use out there.

Another student commented on the value of working on the TLS team because it offered the opportunity to not only learn new instrumentation but to learn how the data are used and applied in a real-world context.

I was on the TLS team which was the Terrestrial Laser Scan team, and learning about that instrument was really interesting. We also used differential GPS, so we were working with several different types of GPS, and one of the really interesting parts was working with Trimble, seeing how they gather all the GPS data, and actually work with it and turn it into something they can use. That was really cool.

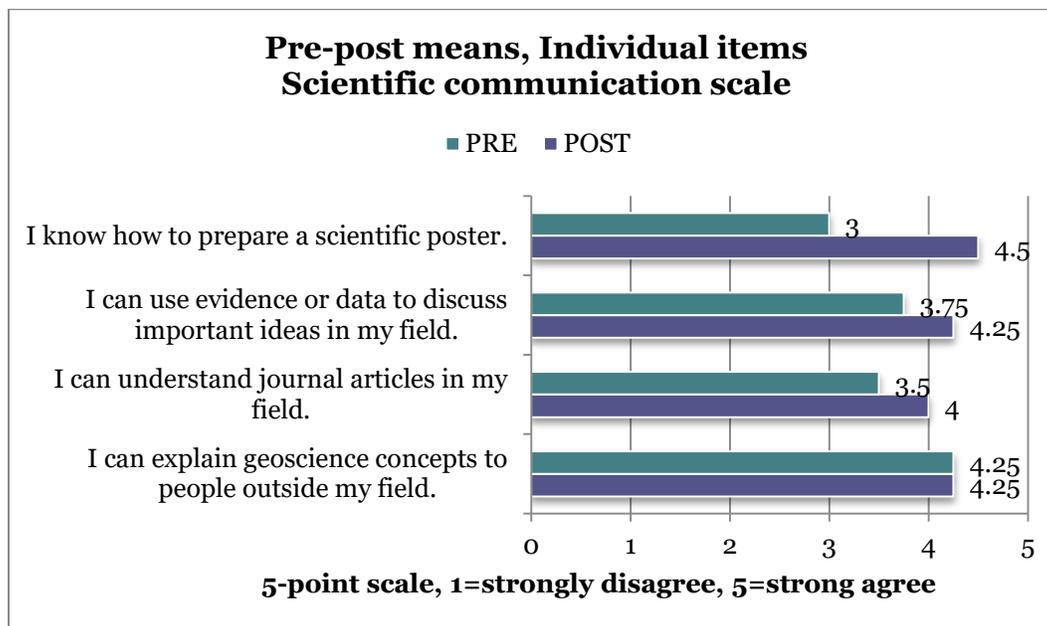
Students appreciated the trust that the field engineers had in them to use important and valuable equipment. This, in turn, boosted their confidence that they could use such equipment in the future and be successful in a geoscience career.

The actual hands-on research helps you, at first you're like 'this is a really expensive piece of equipment,' but working with it and they trusted us with it, and you just prove to yourself that you can figure it out and get there and get some self-confidence. And just the value of working with the field engineers and hearing their stories was great.

Communication Skills

Students reported very strong growth in communication skills from the GLP internship, especially in areas most related to the activities that they engaged in during the GLP internship. Similar to last year, students' highest reported communication gains were in their ability to prepare a scientific poster (see figure 4). Students also reported strong growth in using data to discuss ideas in geosciences and understanding journal articles in geoscience.

Figure 4. Pre-post means, Individual items, Scientific communication skills scale



Although students' gains in scientific communication skills were one of the most robust outcomes from the student survey, they discussed scientific communication much less during the focus group, even when prompted. Nevertheless, students commented that learning the processes of developing a scientific poster, communicating scientific findings, and using Adobe Illustrator were beneficial professionally, as noted in the following comment from the focus group.

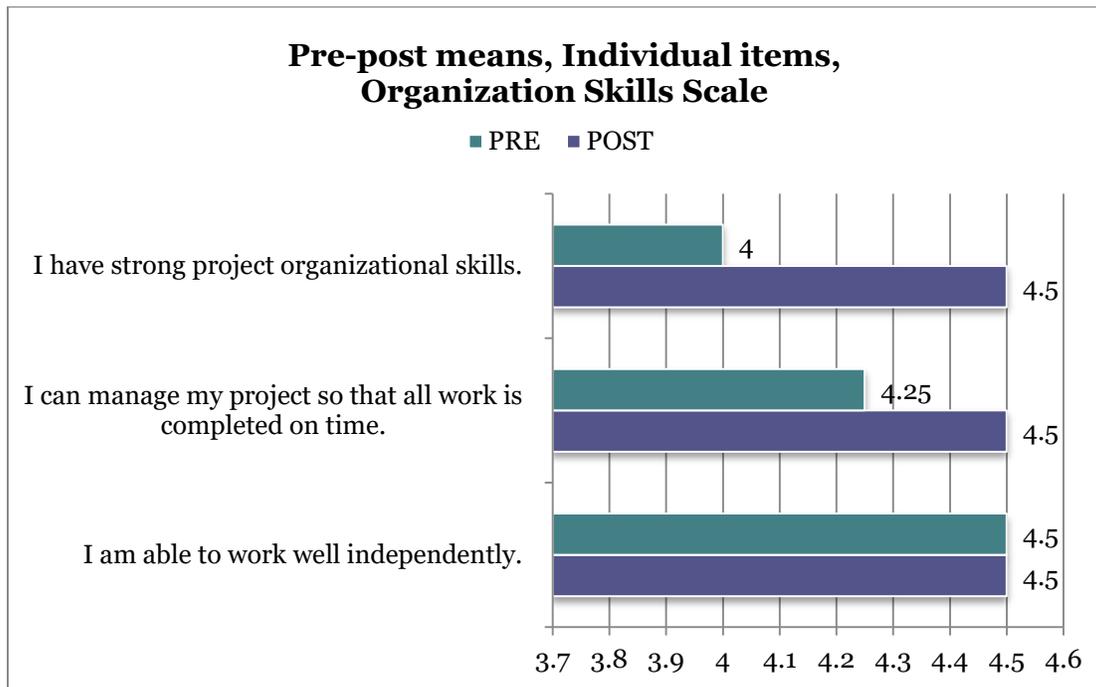
I feel like we got a very, very good look at a lot of different aspects of being professional, from communication to how to make our posters, to how to present things, and it was definitely something that will help each and every one of us, no matter what level of exposure we've had to that before.

Organizational and Project Management Skills

Students entered the GLP internship with strong beliefs in their organizational skills, however, their skills still increased slightly over the summer. Students reported the most gains in general project organizational skills and time management skills. Students felt that their ability to work independently remained consistent over the summer, although they entered the

internship with strong beliefs in their abilities in this area (see figure 5). In the focus group interview, one of the teams noted that they struggled with project management as they fell behind in data collection due to weather delays, thus, losing time to work on their poster.

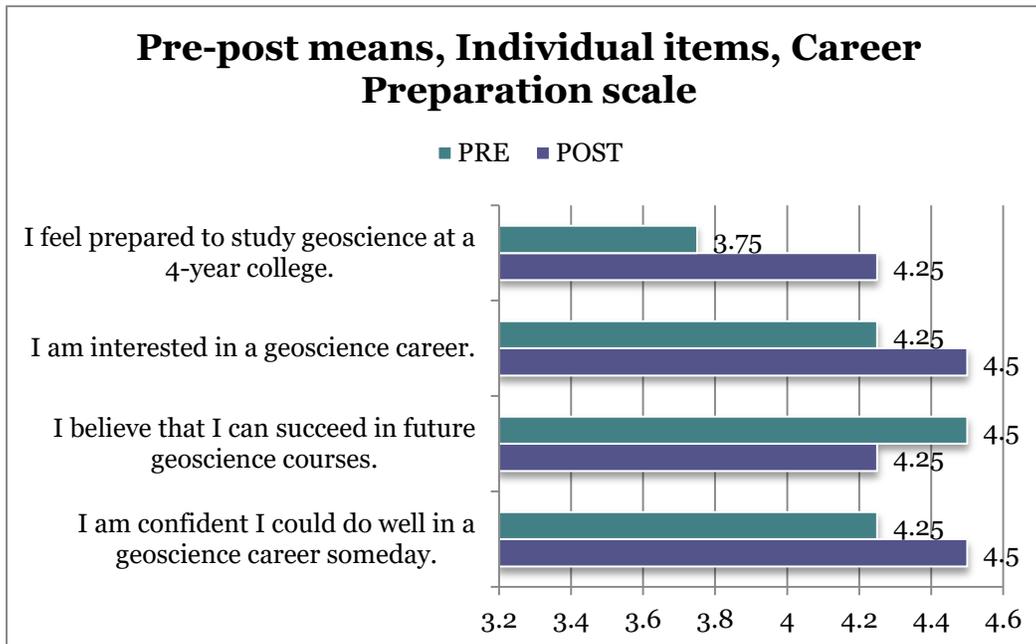
Figure 5. Pre-post item means, Organizational skills scale



Career Preparation

Students reported moderate gains in feeling prepared for future education and careers in geoscience. Students felt quite well prepared already for their future in geoscience when they started the GLP internship. However, they still reported some gains on the survey in their beliefs and confidence that they could succeed in the field of geoscience. Similar to last year, students showed the most growth in feeling ready to study geoscience at a 4-year institution (see figure 6). Surprisingly, students’ belief that they could succeed in future geoscience courses decreased. Nevertheless, students’ increased their confidence that they could have a successful geoscience career and they became more interested in geoscience careers.

Figure 6. Pre-post item means, Career preparation scale.



Faculty mentors noticed that their students had solidified their educational plans as a result of the GLP internship, and had begun to think about career plans.

I think this summer seems to have helped her focus in on, that her major is the right choice for her. I think she's not second-guessing herself on that as much anymore.

Some faculty mentors commented that the internship had boosted students' confidence that they can have a career in the geosciences. One of the faculty mentors noted the career benefits from the internship for community college students, in particular.

I think overall it's a great program. I'm really happy that it got up and running, and has helped to show some of our community college students that they are good enough, they are smart enough to work in science or work professionally or continue on to all those tracks. Sometimes students at our level don't have that. That's not a part of their vision.

Faculty mentors observed that students would be more competitive for future internships or transfer to 4-year institutions because of their experience with the GLP program.

I think it's a great experience for him. It's a good start in itself, and then hopefully he's gained some skills that will directly apply to his goals. Right now, it's kind of a resume builder, and a pathway to getting into a 4-year program.

Students reported that the GLP internship provided them with the tools and knowledge to be competitive in geoscience education and careers, and also provided them with valuable career skills and resources. Students were particularly appreciative of the skill-building seminars, such as the resume workshop, as a student commented in the focus group interview.

I think one of the most helpful parts of [the seminars] was the resume writing, and specifically we were able to have members of the staff look at our resumes and give us feedback, which I actually used all of their feedback.

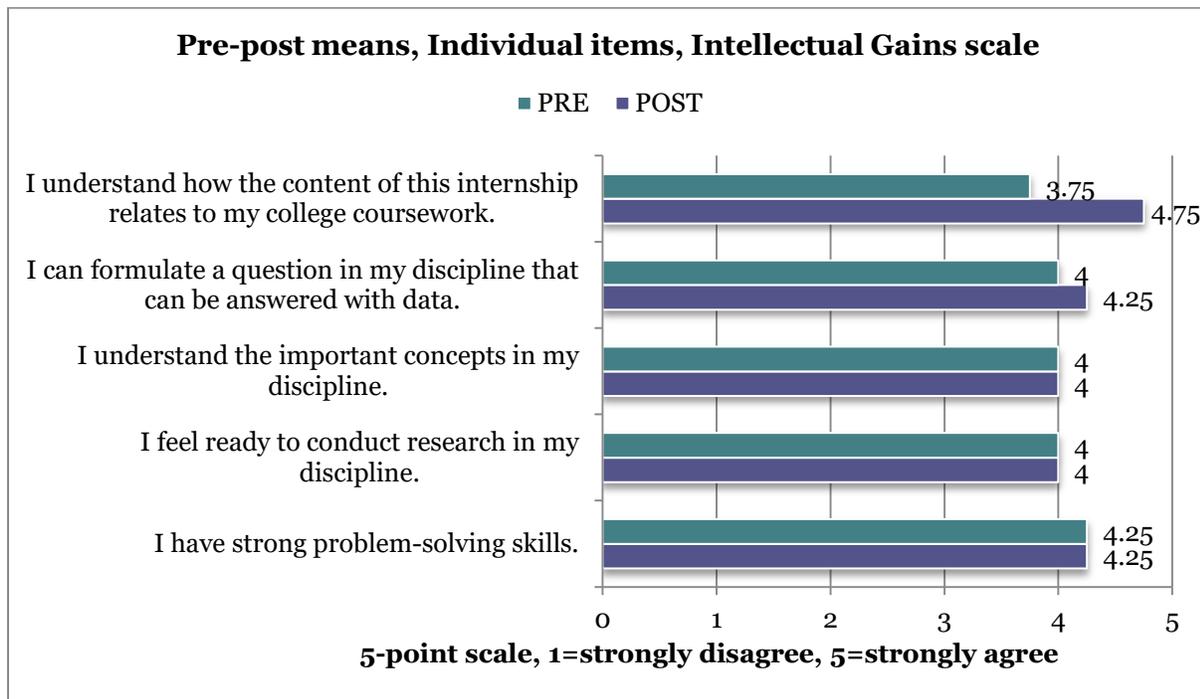
Perhaps more importantly, students gained confidence that they belonged in geoscience and could succeed in geoscience from the GLP program. One of the interns described her lack of confidence and her uncertainty at the beginning of the internship and how she gained confidence that she could persevere in the face of challenges in her education or career.

*I gained confidence. Coming in, I was so afraid of not being able to cut it, and being able to come though and say, 'I did that and I did it well.' And also just really **feeling a lot more comfortable about my place in science** and being able to discuss all of these questions and all of the uncertainties that I had, with actual people in the field doing what I like, and **really getting a better sense of where I want to go**. And just getting through the tough parts, and the hard classes and things like that, in order to get to the classes I'm interested in, because all of them talked about how they struggled, and talked about similar things that have happened to me, and **it was just like, 'Okay, I can do this.'** – GLP intern*

Intellectual Gains

Students reported fewer intellectual gains than they did in other skills domains, as their cognitive understanding of the discipline remained relatively steady over the summer. However, interns demonstrated the most growth in understanding how the GLP internship related to their college geoscience coursework and in their ability to formulate a question that could be answered with data. Students remained steady in their problem-solving skills, readiness for research, and understanding of important concepts in geoscience. As with some of the other domains measured by the survey, students entered the internship with strong beliefs in their intellectual abilities in geoscience.

Figure 7. Pre-post means, Individual items, Intellectual Gains scale



Faculty and students alike observed how the activities and projects within the GLP internship built upon and expanded foundational concepts and skills that students had learned in their coursework, as noted in the following faculty mentor comment.

She was so excited to do the internship. She would go on and on about how much she loved the program and how much she was learning. They were quantifying the accuracy of the scanner, so she did need to know about coordinate systems and all that stuff. She was like "I'm not making maps, but I'm using the things that I learned in class for this other thing that's not exactly what the class was about." For her, I think it was really great because she took a class and learned some concepts that are being applied in something real and slightly different.

Mentors observed that their students had gained knowledge about the discipline and the technical terms associated with geoscience fields.

He's probably learned some more geology and learned about all the nomenclature related to it, and those kinds of things that he probably didn't have before, so he's a step ahead of the other students.

Students also perceived that they had made progress in their understanding of the discipline and their understanding of the research process, especially the iterative nature of the process of scientific research.

The TLS, we learned pretty intensely, but still probably only scratched the surface, but we worked with it in a functional capacity. We didn't just do a little part of it, and then hand it off to somebody else who was more familiar with everything. We learned how to employ it, and then we learned how scientists approach a problem, and develop a solution, just through the scientific method, so that was probably the biggest takeaway, was how scientists in the field answer questions so that their hypothesis and testing method. Is this test going to give us the data that we need to answer the question, developing a way to test, physically testing, gathering the data, interpreting the data, and then explaining the data, so it was like a full science project and it's what they do on a daily basis.

Students also developed problem-solving and trouble-shooting abilities, and gained confidence in their ability to handle challenges.

Definitely [gained] confidence in myself in being able to approach a problem, and just knowing like, there's a way around this, or a way through it, and I'm going to find it.

Preparation for research

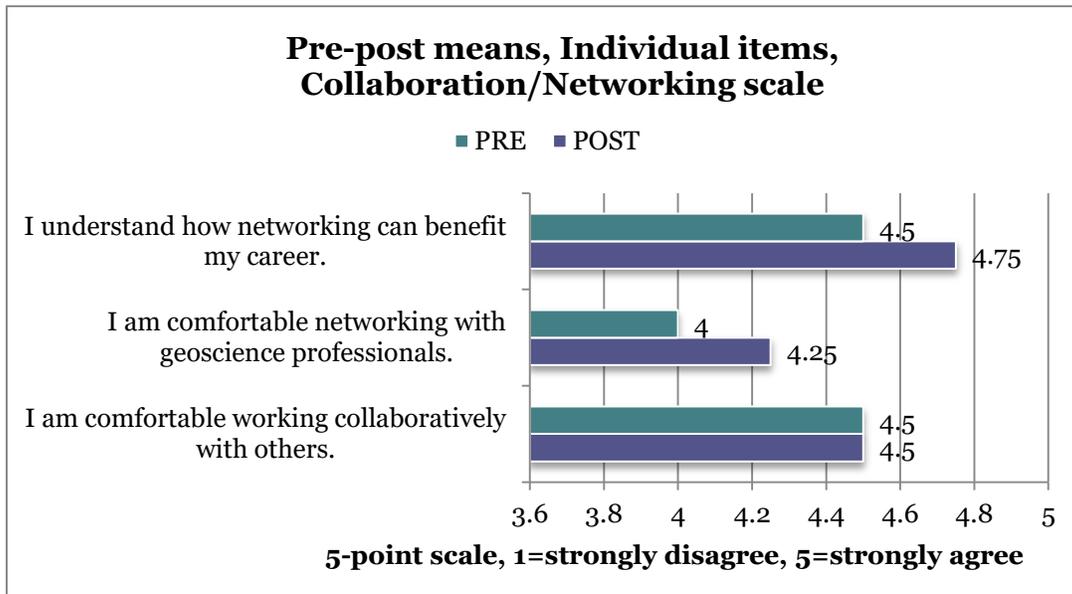
Mentors and students reported that the GLP internship had helped to prepare students for future research experiences in the geosciences. Although students' response to this item on the survey remained flat, faculty mentors noticed that their students were more prepared for future research endeavors. Mentors have more knowledge of the skills, knowledge, and aptitudes that are needed to successfully engage in research or other extended inquiry in geoscience. For example, the following quote highlights' mentors observations of the way in which the GLP internship prepared students for research experiences.

All the skills of working as a team, using GPS and technology that way, fiddling around and working with all that kind of stuff would potentially prove effective, and he will be a viable assistant to some professor doing research in the field. He actually got some experience testing something and going through the methodology.

Collaboration, Networking and Mentoring

Students made the least gains in collaboration and networking skills, primarily because they entered the internship with very strong confidence in their ability to network with scientific professionals. Thus, students' beliefs about the importance of networking and their comfort in networking with geoscientists remained steady throughout the GLP internship. However, students did gain a better understanding of why networking is important and how it might benefit them professionally in the future (see figure).

Figure 8. Pre-post means, Individual items, Collaboration/Networking scale



Students' survey responses showed that they became more comfortable with networking and gained a better understand of how networking can benefit them professionally. Students did not discuss networking and collaboration very much during the focus group interview, but they mentioned that they had worked very well with one another over the summer, as demonstrated in the following comment.

No, we really did have, at least in my opinion, we had an amazing GLP team this summer. I mean I honestly could not have asked for better teammates. It was such a wonderful experience.

Mentoring

A core element of the GLP internship is the provision of an external faculty mentor to guide and advise the student during the summer, and especially, in the coming year. Most students and mentors reported that they communicated relatively frequently over the summer. Two pairs communicated every few weeks, one pair communicated several times over the summer, and another pair communicated did not communicate during the summer. Mentors and students primarily communicated through email. Students provided updates about what they were doing in the program and sent pictures.

Students received mentoring not only from the faculty mentors who were part of the formal mentoring aspect of the GLP internship, but also from UNAVCO staff who provided informal day-to-day mentoring by supporting the interns in their scientific work.

And it wasn't just strictly our mentors, we had some wonderful experiences with many of the staff here like [male UNAVCO staff person – name removed for confidentiality] where he came in and he would explain to us the why behind things. And it was just such a friendly environment and [female UNAVCO staff] was absolutely phenomenal with us. It was such an eye opening experience to work with so many people that truly enjoyed what they do, not like anything I've ever experienced before.

Another student commented on the benefits of working side-by-side with UNAVCO staff. Students felt that they were treated like equals during the internship and that they were able to provide input into their work.

Working with the field engineers was far and above my favorite part about it, working hand-in-hand with them and like, they didn't tell us what to do. They worked with us. If we had a problem on TLS, I mean some of this stuff on the whiteboard is from me and [my teammate] and our mentor, each equally putting in contribution to solving the problem, not just her telling us, this is how we're going to do it. Our mentor was a phenomenal teacher. The field engineers aren't just engineers, they're amazing teachers and I think they get some practice at it through here because she goes and teaches TLS, but she was a wonderful teacher.

Overall, interns felt that the environment at UNAVCO and the internship were very supportive, as highlighted in the following quote.

The way they've built this internship, it's so supportive, and so the staff and then our mentors, and, it's just, it's really been a very supportive and wonderful environment.

Influence on Career Intentions

Students reported that the GLP internship had not necessarily changed their career path, but confirmed that they were on the right track. Students noted that they had strengthened their commitment to geoscience and that they had chosen the right field. Mentors also noticed that the GLP internship had influenced students' career paths by providing information about future careers and education in geoscience and solidifying their educational decisions.

He is very much in sort of an information collecting stage right now. In that regards, I think that this is just a piece of his information that he's getting to decide what it is he wants to do when he's ready to graduate. When we talked last semester he was not 100% confident in that line that was going to. In talking with him now he's pretty confident that that's the path he wants to go in, so I've seen him recognize that he is really interested in pursuing a degree in his chosen major.

Students also affirmed that the internship had cemented their commitment to their field of study. As one student noted:

I learned I'm in the right field. That's the sentence I would use to sum it up.

Students also felt that the internship had broadened their career options by introducing them to new careers and fields of study. As one student commented, she was confident that she would be able to find a field of study and career within geoscience that was the right fit for her.

I think it was very enlightening to see how much I had an interest in what so many of them did, that I hadn't really thought of before, and being able to learn more about each one. Because we were fortunate enough to have somebody from geography, geology, atmospheric science, EPA, teaching. It was such a wide variety that definitely made me feel a little bit more comfortable about my chances of finding something that I'm going to be just absolutely passionate about.

Students also reported that the internship had spurred them to think more strategically about their future and their overall career trajectory, as noted in the comment below. The speakers during the Career Circles served as role models for thinking about and planning for careers in geoscience fields.

It definitely influenced my thinking, but to more like, I am thinking like one step ahead now, more than like where I'm at now and just finish my bachelor's degree. I'm kind of like, well, I need to start thinking about what I'm going to do about after my bachelor's degree. I actually have a plan ahead of time because that seemed to be like what they all, they were all focused on what they were doing, but had an idea of what they wanted to do after, consistently, throughout their career.

Three students also reported that they are more likely to pursue graduate school because of the GLP internship. Students not only learned more about graduate school as an educational option, but became more interested in pursuing that path, as indicated in the following comment.

It has helped inform me on graduate school options. Before the internship I was not really considering graduate school. Now I believe it is something I will likely pursue.

Faculty Outcomes

The GLP internship also had a positive impact on the faculty mentors themselves, expanding their awareness of the different types of projects undertaken by the geoscience workforce and keeping them apprised of current work in the field. Several faculty members noted that this knowledge will influence their teaching and work with students. As one faculty member commented:

One of the things I love about teaching is that I also learn from them and that goes on in class and this summer, too. Learning about what she's been doing and the types of things that are really happening in research and the types of tools and instruments they're using and projects that they're working on. I learned a lot yesterday [at the RECESS presentation]. I will use that and plug it into my classes like "Hey this is what people are really doing. This is how you can apply the knowledge from class. You can do projects like this." I'm always soaking all that in and incorporate it into my classes.

Faculty mentors also reported that they had become better mentors from the experience because the formal mentoring arrangement within the GLP program prompted them to be more intentional in their mentoring. Faculty also felt that they had received helpful mentoring resources.

I think professionally it's been great to learn a lot more about mentoring and be able to be more intentional with these relationships that crop up with students. Now, having more resources on the mentoring side, I think will benefit me greatly in my career as a teacher, to be more intentional with how I give advice or how I talk with students or build a rapport. Giving more than just, "Oh, take this class, take this class," but more to, "What's your ultimate goal?" Then figuring out the best way to reach that goal.

Program implementation: Recommendations from students and faculty

Students and faculty were very positive about the format of the GLP internship and its benefits for students. Students and faculty expressed a lot of positive feedback about the implementation of the GLP internship. Some of the highlights from interviews and survey written responses were:

- The internship overall was well designed and well organized.
- UNAVO mentors (including educational and technical personnel) were very supportive, helpful, and available when needed.
- Students felt that working side-by-side with field engineers was one of the highlights of the program and they were able to learn more about the nature of work in geoscience careers.
- The Career Circles and communications seminars provided many benefits for students and gave them a better understanding of career options in geoscience along with valuable professional advice.
- The poster session provided a glimpse into the scientific communication process and students learned a lot about communicating scientific results.
- Students appreciated the team-building activities at the beginning of the program. They also appreciated the field trips and interactions with RECESS students.

Advice for future implementation

Students and faculty did not have much for advice, but they offered a few recommendations to consider in future years. Their advice included:

Recruiting faculty to be mentors

- There was some concern among faculty that it might be difficult to recruit faculty mentors due to the time commitment and the fact that some faculty might be off-contract during the end-of-summer poster session. Faculty agreed that personal outreach and recruitment of fellow faculty members is most likely the best method to recruit new faculty to serve as mentors. Faculty also agreed that the benefits and intrinsic rewards justify the commitment to be a faculty mentor.
- One faculty member noted that she was nervous at the beginning of the program about being a good mentor for her students. She thought that more direction and resources regarding the mentoring component would be helpful if they were provided at the beginning of the program.

Skills and communication seminars

- Students perceived that some of the skill-building seminars seemed misaligned with other aspects of the internship. For instance, students learned about Adobe Illustrator about a month before they actually needed to use it and would have preferred to learn about it closer to the time that they needed to use it for their posters.
- Students requested more specific advice about the poster making process. They would like to receive more advice about the big-picture view of creating a poster and how to summarize their most important findings. Several interns felt that they spent too much time on granular details that were not needed for a poster.
- Students also requested some advice about project management, meeting deadlines, and managing stress. They felt that this would be helpful at the end of the summer when they were working very hard to meet the poster deadline.

Recruiting students

- Students felt community college students may be deterred from applying for the GLP internship because of a lack of confidence or because of abundant outside commitments. One student suggested that the GLP program could have students make recruitment videos where they could discuss their experience and the benefits they received from the program, while also addressing these misconceptions that might keep students from applying to the program.

Conclusion

In conclusion, students gained expertise in geoscience instrumentation and deepened their understanding of the discipline. The most important outcome for students was greater awareness of the breadth of career options in geoscience and the ways in which their interests and skills may fit within the field. None of the students discovered new areas of study, but all of them felt that their current educational and career choices had been validated by the GLP internship. Students solidified their commitment to the field of geoscience and pursuing a 4-year degree in their major of interest. Students also began to consider graduate school more seriously and became convinced that they could be successful within the field of geoscience. The GLP internship accomplished its goal of providing immersive, technical experiences and mentorship in geoscience to traditionally underrepresented students from Colorado community colleges. Students received mentoring from faculty and field engineers, gained a better understanding of the real-life work of geoscientists, and strengthened their commitment to a geoscience career.