IRIS Summative Evaluation of Intern and Mentor Data 2010 – 2017

For

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I. Introduction

This NSF funded research experience for undergraduates (REU) provides interns with the opportunity to:

- conduct exciting research with state of the art geophysical data and leading researchers at IRIS institutions
- develop an understanding of scientific inquiry, including designing and conducting scientific investigations, defending scientific arguments, and preparing publications
- gather, manage, and convey information, using various skills, strategies, resources
- learn, use, and evaluate technologies for the collection and study of geophysical data

This paid experience features a week-long orientation program, the use of a variety of virtual communication technologies to help students stay connected with other interns during the 8 to 10 week research placement, and an opportunity to present their research at a scientific meeting.

This evaluation summarizes the data collected from both interns and mentors from 2010 through 2017 on the interns' experience with the orientation prior to their internship, the interns' experiences during their internship, and the mentors' impressions after the internship. In some cases, the same data are not available for each year due to modification of the tools used from year to year to better capture the feedback from the participants and explore emerging areas of understanding. The table below summarizes the data available for both interns and mentors for each year and each survey.

Year	Interns			Mentors
	Orientation Survey	Post Internship Survey	Post AGU Survey	Post Summer Survey
2010	14	13	7	NA
2011	15	15	NA	13
2012	15	14	NA	13
2013	15	13	NA	15
2014	11	11	NA	7
2015	8	9	NA	9
2016	9	8	NA	NA
2017	12	14	NA	12

The findings from both interns and mentors are presented first in summarized form in four categories: 1) Process, 2) Strengths, 3) Outcomes, and 4) Improvements. The summarized data are then presented in a raw/table only by intern responses and then for mentors.

II. Summary of Findings

1) Process Summary

It is important that potential interns are able to learn about the program and get the information they need to make an informed decision to apply. Interns reported first learning about the IRIS Undergraduate Internship Program from a faculty member at their home institution by way of a general announcement in class or broad email (34% across all years) or from a faculty member in-person (18%). Interns also learned about the program online through the NSF website (18%), IRIS website (16%), and through Google (20%). After the heard about the program, they learned more primarily from the IRIS website (93%), discussing the program with a faculty member personally (57%), and from reading previous interns' blogs (51%). During the orientation of accepted interns, interns reported that the details and logistics were clearly explained and their questions answered (96%). Interns reported the orientation was well organized (100% agree or strongly agree).

2) Strengths Summary

When deciding to participate, a number of areas for the interns stand out. They wanted to know if geophysics was for them (47%) or they already loved geophysics (42%), they felt the internship sounded interesting (54%) and they wanted to do something different (59%), a faculty member recommended it to them (43%), and because of the stipend and support package (45%). The geographical location of the project (45%) was also important but they were not very influenced by another student (10%) or the advertising (16%).

For the mentors, the most important aspects when deciding to host an intern were the quality and preparedness of the interns accepted into the program (97% fairly or extremely important), the overall reputation of the program (95%), and the support for the intern to present their summer research at AGU or other conferences (82%). Other areas important to the mentors were the support for the intern to attend a one-week orientation prior to traveling to their host site (68%), and the opportunity to work with students from outside their own institution (65%).

Selecting well qualified candidates is an important first step in insuring a successful internship for both the intern and the mentors. Mentors felt that the internship selection committee provided them with well-qualified undergraduates to work with for the summer (91% fairly or extremely important).

Setting and working towards goals is an important part of any internship and helps the intern maximize their experience while helping to provide direction in their work and clarify what they hope to gain. Goals also serve as a way of setting expectations both for themselves and for their experience. During orientation, interns created their own written goals pertaining to what they wanted to get out of the internship (93%) and monitored their goals throughout their internship (88%) adjusting them as necessary. They also had clear goals from their mentors (76%) and they used these to monitor their progress and adjust as necessary (77%). Throughout their internship they received technical/scientific assistance and guidance from their mentor/graduate students/staff (90%). Interns in 2015-2017 were in strong agreement that the orientation was an important aspect in helping them feel part of a community (96%). Mentor comments mirrored

the interns when it came to setting goals. The mentors felt that the most important aspect of the internship was creating clearly stated, written goals for the internship with their intern (98% fairly or extremely important). Throughout the internship, the mentors also monitored the progress of their intern using the goals and adjusted them with the intern as necessary.

The mentoring rubric was established in 2014 for mentors to use as a tool to help them help their interns. The mentors agreed or strongly agreed that the rubric helped them illuminate areas that needed improvement and areas where growth occurred (81%), that the rubric provided a concrete way to assess their intern's progress (75%), that the rubric was a beneficial resource for the mentoring process (67%), that the rubric provided a mechanism for focusing on developing the intern's career capabilities (63%), and that the rubric provided them with a structure for discussing their intern's progress (73%).

The cohort model is an often used and well understood method for helping participants feel engaged, supported, and part of a group. From 2010 through 2017, the IRIS interns reported that being part of a cohort was valuable because they enjoyed spending time with the members of their group (95% agree or strongly agree), that other group members helped them feel part of the group (92%), and that the group members spent time getting to know one another (90%).

From 2010 through 2014, interns reported the best parts of their orientation were the field trip to Magdalena (49% agree or strongly agree), interacting with orientation staff (43%), interacting with other interns (45%), and being part of a group of interns (45%). While few interns reported many "worst parts" of their internship, those that did indicated over the same time period cited classroom/lab work (18%), the geographic location (13%), and the PASSCAL tour (11%).

3) Outcomes Summary

From 2010 through 2014, 97% of interns reported that as a result of their orientation, their awareness of the scope of seismologic research increased (a little or a lot), 91% increased their understanding about how to get the most out of their internship, 90% increased their understanding of the culture of science, and 88% increased their understanding of the acquisition of active source data.

After participating in the summer program, the interns completed a survey about their experiences. These data show that interns decided to participate in the program because they wanted to learn more about being a researcher (84%), wanted to see if grad school in science was for them (73%), wanted a hands-on experience (87%), thought it would help them get into graduate school or get a job (80%), or because they thought it would be fun (85%). Interns' ratings from year to year were fairly consistent with the areas of highest ratings from year to year staying the same. In years 2010 – 2014, the interns reported significant improvements in their feeling of being prepared ($p<0.01$).

Interns reported feeling that their work during their internship contributed in meaningful ways to the overall success of their mentor's research (80% agree or strongly agree), that they could easily apply the information and skills they learned during their internship to their future career goals (92%), and overall, the internship was one of the best learning experiences they had ever

had (92%). Mentors felt that overall, hosting an intern was beneficial to them and a worthwhile use of their time (89% fairly or extremely important), that their intern's work contributed in a meaningful way to the overall success of their research (83%), and that as a result of this internship, they would like to host another IRIS intern (91%). Mentors themselves also felt effective (98% effective or very effective) increasing the likelihood that they would continue to participate in the IRIS Intern program in the future. Advice for future program mentors included having weekly reports/evaluations from the intern (24%), organizing the work prior to the intern's arrival (24%), offering a realistic project time frame that the intern can complete during their internship (24%), and establishing goals and reviewing them (24%).

After their internship, interns were asked about their own attitudes and beliefs. From 2010 through 2017 interns found it to be moderately or exactly true that they can usually handle whatever comes their way (96%), that if they want, they can become a geoscientist (996%), that they can solve most problems if they invest the necessary effort (96%), that if they are in trouble, they can usually think of a solution (96%), that they are confident that they could deal efficiently with unexpected events (95%), and that it is easy for them to stick to their aims and accomplish their goals (95%).

Participating in the IRIS internship program impacted interns in a number of ways. From 2010 through 2017, interns reported that as a result of their internship, their knowledge of and ability to use the technologies to collect and study geophysical data "increased a little" or "increased a lot" (93%), that their ability to design and conduct scientific investigations "increased" (85%), that their ability to gather, manage, and convey scientific information "increased" (93%), and that understanding of the process of scientific inquiry "increased" (90%).

4) Intern and Intern/Alumni Mentor Relationships

Developing relationships between both the interns and the alumni mentors will help the interns have a better experience during their internship and make them more likely to reach-out for help and guidance when needed. Having the opportunity to become connected to the other IRIS interns was mostly rated as important (42%) or moderately important (39%) by the interns prior to their internship experience. When asked what "connected" meant to them, the interns described becoming friends, socializing, and doing things together (25%), staying in touch after the summer (19%), helping answer questions, offering advice, and developing a support network (19%) and staying in touch through social media (15%). The interns also highly valued the opportunities available during orientation to connect to their fellow interns including spending time with the group (95% agreed or strongly agreed), being made to feel like part of the group (92%), spending time together and getting to know one another (90%), and having a comfortable group atmosphere (90%). Overall, the interns were very satisfied (95%) with the relationships they developed with other IRIS interns. During the summer, most interns (78%) agreed or strongly agreed that they felt like they were connected to the other IRIS interns in a beneficial way.

Peer/Alumni Involvement

It is believed that helping interns establish a relationship with a program alumni will help them in their own experience as interns. When asked whether it was helpful to have an alumni mentor

available to answer questions and post comments on the blogs and Facebook group, most (88%) interns agreed or strongly agreed it was helpful. Overall, nearly all of the interns (91%) agreed or strongly agreed that the alumni mentor served a positive role in their summer experience. When asked to describe the role the alumni mentor played in their summer experience, the interns wrote about how they were helpful with problems and questions (41%) and offering career and graduate school advice (21%).

5) Potential Improvements Summary

Peer Relationships
Finding*:* Interns were not very influenced by another student (10%)
Improvement: Peer mentors can be a powerful tool in helping students make decisions about participating in an internship and be better prepared to succeed. Involving past students as mentors for new interns and those interested in the program may help to involve more students and help answer any questions prior to and during their internship.

Faculty as Recruiters
Finding*:* Faculty members at potential interns' home institution were the primary source for first finding out about the IRIS Undergraduate Internship Program (34%) as well as where potential interns could go to learn more about the program (57%).
Improvement: As the primary contact, insure that faculty are well informed about the program by offering webinars to present the program highlights, strengths, and process and answer questions they might have.

IRIS Website
Finding*:* The IRIS website was also a primary source for additional information about the internship program (93%).
Improvement: Continue to update the IRIS website to contain the most up to date information about the program and important information about registration dates and requirements.

Stipend
Finding*:* The amount of the stipend and support package has become less important over the years (71% in 2010 to 29% in 2017).
Improvement: Determine an appropriate level for the stipend and support to best reflect the current internship environment and intern needs.

IRIS Reputation
Finding*:* The importance of the reputation of the IRIS Undergraduate Internship Program cannot be understated. Mentors reported that it was a critical aspect of their decision to host an intern (95% fairly or extremely important).
Improvement: Use past mentors as "spokespersons" for the program by asking them to share their experiences with others through testimonials on the website, stories put out to IRIS members, and asking current and past mentors to encourage others to host an intern.

Goal-Setting

***Finding**:* Goal-setting is a critical aspect of success from both the interns' (93%) and mentors' (88%) perspective and experience.
Improvement: Help interns and mentors establish goals by providing a template for writing well-conceived goals, suggestions for when and how to adapt them throughout the internship, and examples of plan.

Mentor Success Factors
***Finding**:* Mentors offered valuable advice for future mentors:

- *Make sure you have regular communication with the student, and that you spend the time to discuss the project and details with them on a regular basis.*
- *Have a realizable and interesting project that can be accomplished in the short time period.*
- *Think about what you want to achieve with, and for, the intern, codify that via the agreement goals, and check back with those regularly, particularly if progress is not smooth.*

Improvement – Provide the advice from mentors in a summarized form to new program mentors as a checklist for success.

Mentor Rubric
***Finding**:* While the mentors found the Mentoring Rubric helpful, they did not find it motivating (26% found it motivating) or did not look forward to completing it with the intern (30% looked forward to it) and about half plan to use it in the future (53%).
Improvement: Help mentors see the value of using the Mentoring Rubric. Provide a protocol for how to use it positively and productively with their intern. Collect feedback from the mentors about the use of the rubric and possible refinements.

III. Detailed Findings

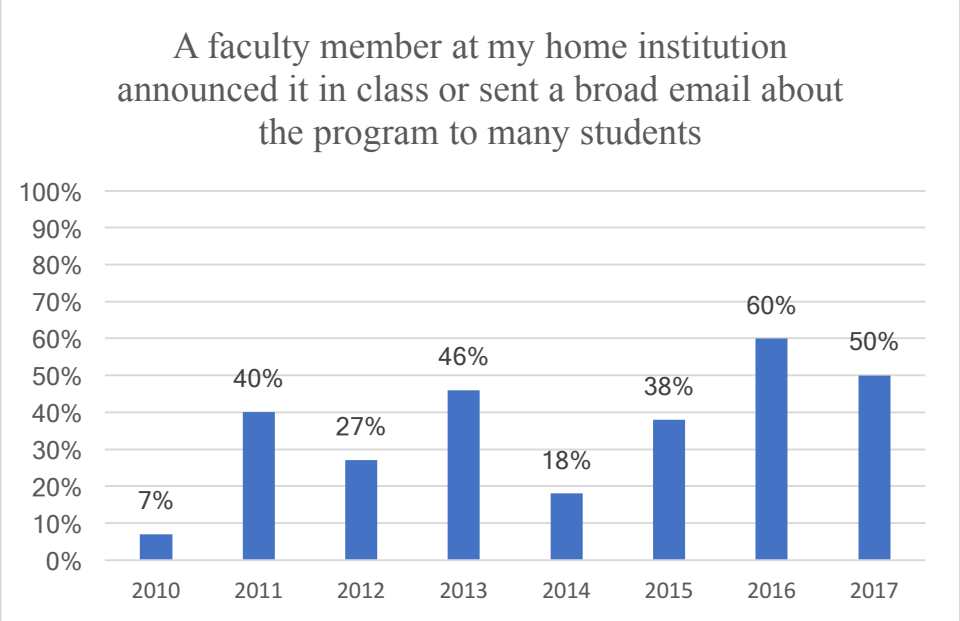
III.A. Intern Data Summary Tables by Year

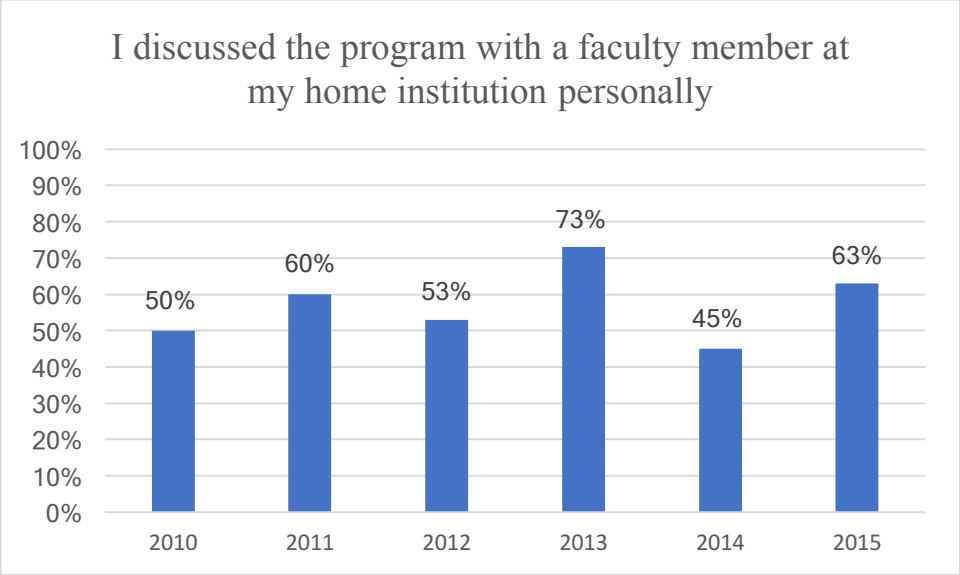
Interns were asked to complete a survey on their experience after the internship. The results in this section are presented by question or item and year. Some data were not collected in some years.

Orientation Survey Data Summary
From which of the following sources did you FIRST find out about the IRIS Undergraduate Internship Program?

	2010	2011	2012	2013	2014	2015	2016	2017	**Avg**
A faculty member at my home institution announced it in class or sent a broad email about the program to many students	7%	40%	27%	46%	18%	38%	60%	50%	34%
A faculty member at my home institution discussed it with me personally	36%	33%	7%	7%	27%	0	20%	14%	18%

A friend who had participated in the program previously	14%	20%	7%	13%	18%	13%	10%	7%	13%
Personal contact with the program coordinator	0	0	0	0	0	0	0	0	0
E-mail/notice from a professional society or other organization	7%	0	0	0	0	0	0	7%	2%
Email from my department's/school's listserve	NA				36%	0	20%	14%	22%
My college's Website	0	0	7%	0	0	0	0	0	1%
NSF's Website	14%	27%	27%	13%	18%	0	40%	7%	18%
IRIS's Website	7%	13%	20%	20%	27%	13%	20%	14%	16%
"Google" or other search tool	29%	13%	27%	33%	18%	13%	0	14%	20%
Social Networking site (e.g. Facebook, Twitter, Youtube, etc.)	0	0	0	0	9%	0	0	0	1%
A poster/flier	0	7%	NA						4%





Which of the following sources did you then use to learn MORE about the IRIS Internship Program?

	2010	2011	2012	2013	2014	2015	Avg
None	0	0	0	0	9%	0	1%
I discussed the program with a faculty member at my home institution personally	50%	60%	53%	73%	45%	63%	57%
I discussed the program with a friend who had participated in the program previously	14%	13%	13%	20%	18%	13%	15%
I discussed the program with the RESESS program coordinator	0	0	7%	0	0	0	1%
My college's Website	0	0	0	NA			0
NSF's Website	14%	13%	NA				14%
IRIS's Website/I read more about the program on IRIS's Internship website	100%	87%	100%	100%	82%	88%	93%
I read previous intern's blogs about their summer experiences	NA		53%	80%	45%	25%	51%
"Google" or other search tool	0	27%	0	20%	18%	50%	19%
Social Networking site (e.g. Facebook, Twitter, Youtube, etc.)	0	7%	0	13%	0	0	3%
A printed poster/flier	0	0	NA				0

Did you watch the IRIS Internship advertisement video or slide show?

	2010	2011
Yes	43%	56%
No	57%	44%

If yes, where did you see it (or download it)?

	2010	2011
A faculty member at my home institution showed it during class	0	0
On the IRIS website	43%	53%
YouTube	0	0

Interest in a Research Internship

How important was each of the following in your decision to participate in research this summer? (% important or extremely important)

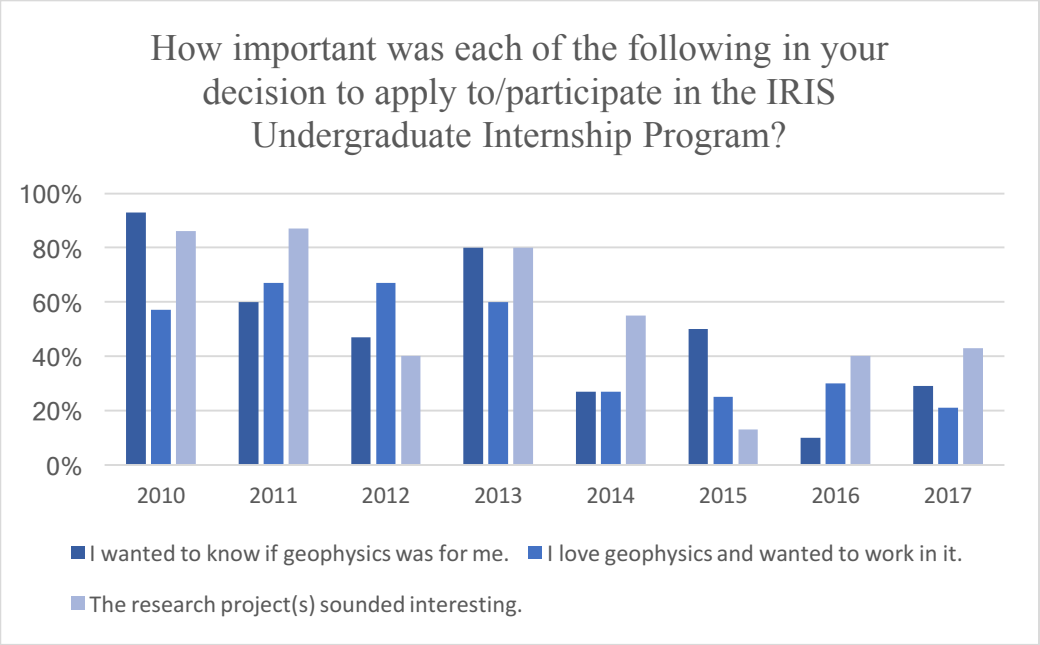
	2010	2011	2012	2013	2014	2015	2016	2017	Avg
I wanted to know if science or engineering was for me.	64%	33%	NA						49%
I wanted to know if science was for me	NA	NA	33%	33%	45%	38%	50%	29%	38%
I wanted to learn more about what is like to be a researcher.	86%	93%	60%	93%	82%	75%	100%	79%	84%
I wanted to know if going to grad school in science or engineering was for me.	72%	87%	NA						80%
I wanted to know if going to grad school in science was for me.	NA		53%	60%	82%	100%	80%	64%	73%
I wanted hands-on experiences to reinforce what I learned in class.	86%	93%	73%	73%	82%	100%	90%	100%	87%
I needed to fulfill my school's/scholarship's requirements for research.	0	7%	20%	6%	0	13%	0	0	6%
I thought it would help me get in to graduate school or get a job.	93%	87%	80%	87%	82%	75%	50%	86%	80%
I needed/wanted the academic credit I could get from doing research.	0	0	NA						0
I thought it would be fun.	93%	100%	53%	100%	91%	100%	80%	86%	85%

Interest in the IRIS Undergraduate Internship Program

How important was each of the following in your decision to apply to/participate in the IRIS Undergraduate Internship Program? (% important or extremely important)

	2010	2011	2012	2013	2014	2015	2016	2017	Avg
I wanted to know if geophysics was for me.	93%	60%	47%	80%	27%	50%	10%	29%	47%

I love geophysics and wanted to work in it.	57%	67%	67%	60%	27%	25%	30%	21%	42%
The research project(s) sounded interesting.	86%	87%	40%	80%	55%	13%	40%	43%	54%
I wanted to do something different than what I had done before.	79%	100%	53%	93%	18%	38%	50%	50%	59%
A fellow student I know recommended it.	7%	13%	20%	20%	0	13%	10%	0	10%
A faculty member/researcher I know recommended it.	43%	60%	33%	60%	36%	50%	40%	36%	43%
The advertising (website, video, etc).	7%	27%	47%	13%	9%	13%	0	14%	16%
The reputation of the IRIS Consortium	43%	60%	47%	53%	36%	50%	10%	29%	40%
The amount of stipend and support package (orientation, AGU Conference, etc).	71%	73%	60%	73%	18%	25%	30%	29%	45%
The geographic location of the project was appealing.	71%	53%	47%	67%	36%	25%	40%	43%	45%
This was the first program/project that accepted me for the summer.	36%	27%	NA						32%
This was the only program/project that accepted me for the summer.	0	20%	NA						10%



Orientation (% agree or strongly agree)

	2010	2011	2012	2013	2014	Avg
The orientation was well organized and facilitated.	100%	100%	100%	100%	100%	100%
I anticipate that I will be able to easily apply the information/skills learned at the orientation to my summer research.	79%	93%	87%	80%	91%	86%
I found the relative amount of time devoted to geophysics talks to be appropriate.	100%	93%	NA			97%
I found the relative amount of time devoted to geophysics labs (fieldwork and computer work) to be appropriate.	93%	87%	87%	87%	91%	89%
I found the amount of time devoted to the careers and the culture of science to be appropriate.	NA		80%	80%	100%	87%
I found the relative amount of time devoted to the culture of science to be appropriate.	86%	87%	NA			87%
I found the relative amount of time devoted to maximizing my summer research experience to be appropriate.	100%	80%	73%	93%	91%	87%

Orientation (% Fairly well or Extremely well prepared)

	2010	2011	2012	2013	2014	Avg
When you arrived at the orientation, how well prepared did you feel you were for the upcoming work of the summer?	14%	33%	33%	20%	9%	22%
Now that you have participated in the orientation, how well prepared do you feel for the upcoming work of the summer?	64%	73%	73%	80%	82%	74%

Please read each of the following statements carefully and select the choice that best describes your level of agreement with the statement. (% agree or strongly agree)

	2010	2011	2012	2013	2014	2015	2016	2017	Avg
Details and logistics about the internship program were clearly explained or someone was available to answer my questions.	100%	87%	100%	100%	100%	100%	100%	100%	96%
I created "my own" written goals for what I wanted to get out of the internship.	92%	87%	100%	92%	91%	89%	100%	100%	93%

Throughout the internship I monitored my progress towards "my own" goals and adjusted them when necessary.	69%	93%	86%	85%	100%	100%	88%	92%	88%
My host/mentor provided (in-person or via the internship facilitator) clearly stated written goals for my internship.	92%	73%	71%	69%	73%	89%	63%	92%	76%
Throughout the internships I monitored my progress using the mentor's goals and adjusted them with the host PI when necessary.	92%	80%	64%	69%	100%	78%	50%	92%	77%
My work this summer contributed in a meaningful way to the overall success of the mentor's research.	77%	87%	86%	54%	91%	100%	63%	92%	80%
Technical/scientific assistance and guidance from the mentor, their graduate students or other staff was readily accessible throughout the internship.	100%	87%	86%	77%	100%	100%	88%	92%	90%
I can easily apply the information/skills I learned during the internship to my future career goals.	NA	87%	86%	92%	100%	100%	100%	92%	92%
Overall this internship was one of the best learning experiences I have ever had.	100%	80%	86%	92%	100%	100%	100%	92%	92%

In retrospect,

	2015	2016	2017	Avg
I felt the orientation helped to prepare me for the research I did this summer.	89%	50%	100%	80%
I felt the orientation prepared me to get the most (e.g. learning) out of my summer internship.	89%	87%	91%	89%

I felt the orientation was an important aspect to helping me feel part of a community of interns.	100%	100%	91%	96%

Which of the following were among the BEST parts of the orientation? (% agree or strongly agree)

	2010	2011	2012	2013	2014	Avg
Being part of a group of interns	64%	53%	67%	13%	36%	45%
Welcome/Social evening on first night	14%	33%	20%	20%	0	16%
Fieldwork (broadband install)	NA	NA	27%	40%	36%	33%
Fieldwork (refraction experiment/vibe)	43%	53%	33%	20%	9%	30%
PASSCAL Tour	7%	47%	0	7%	9%	13%
Fieldtrip - Socorro Fault & Quebradas hike	50%	13%	33%	7%	36%	26%
Fieldtrip - Magdalena hike & observatory tour	50%	40%	47%	80%	45%	49%
Classroom/Lab work	36%	47%	33%	0	18%	25%
Interactions with other interns	57%	20%	47%	47%	64%	45%
Interactions with orientation staff	79%	53%	40%	40%	45%	43%
Interactions with program alumni	29%	60%	NA			45%
Learning about career choices/Career panel	57%	20%	53%	27%	64%	42%
Learning how to get the most out of my internship	21%	13%	7%	13%	36%	17%
Learning what grad school is like	29%	53%	33%	33%	27%	33%
The geographic location	14%	13%	13%	13%	0	10%

Which of the following were among the WORST parts of the orientation?

	2010	2011	2012	2013	2014	Avg
Being part of a group of interns	0	0	0	7%	0	1%
Welcome/Social evening on first night	0	0	0	0	9%	2%
Fieldwork (broadband install)	NA	0	0	7%	0	2%
Fieldwork (refraction experiment/vibe)	0	0	0	0	9%	2%
PASSCAL Tour	7%	7%	13%	20%	9%	11%
Fieldtrip - Socorro Fault & Quebradas hike	0	0	0	0	9%	2%
Fieldtrip - Magdalena hike & observatory tour	7%	13%	13%	13%	9%	11%
Classroom/Lab work	7%	33%	20%	13%	18%	18%
Interactions with other interns	0	0	7%	7%	0	3%
Interactions with orientation staff	0	0	0	0	0	0
Interactions with program alumni	0	0	NA			0
Learning about career choices/Career panel	0	7%	7%	0	0	3%
Learning how to get the most out of my internship	0	7%	7%	0	0	3%

Learning what grad school is like	7%	0	7%	0	9%	5%
The geographic location	0	20%	20%	7%	18%	13%

Orientation Continued (% Increased a little and Increased a lot)

	2010	2011	2012	2013	2014	Avg
As a result of the orientation, I feel my ability to install a seismic station has …	93%	93%	NA			93%
As a result of the orientation, I feel my awareness of the scope of seismological research has…	100%	93%	100%	93%	100%	97%
As a result of the orientation, I feel my understanding of the relationships between seismic data and our understanding of Earth structure has…	100%	80%	87%	100%	100%	93%
As a result of the orientation, I feel my understanding of Earthquakes (location, magnitude, elastic rebound, relation to plate tectonics, focal mechanisms) has…	93%	67%	67%	67%	73%	73%
As a result of the orientation, I feel my understanding of earthquake prediction has…	93%	60%	NA			77%
As a result of the orientation, I feel my understanding of UNIX has…	64%	80%	87%	73%	NA	76%
As a result of the orientation, I feel my understanding of Reflection and Refraction Theory (Reflection coefficient, Attenuation, Resolution, etc) has…	93%	93%	87%	87%	100%	92%
As a result of the orientation, I feel my understanding of signal processing (spectral analysis and filtering) has…	93%	80%	87%	80%	82%	84%
As a result of the orientation, my awareness of seismological techniques (Waveform cross correlation, Tomography, Shear-wave splitting, Tomography, etc) has…	NA				91%	91%
As a result of the orientation, I feel my understanding of geophysical inverse theory has…	71%	73%	87%	80%	NA	78%
As a result of the orientation, I feel my ability to use GMT has…	71%	93%	80%	87%	NA	83%
As a result of the orientation, I feel my understanding of the acquisition of active source data has…	86%	60%	93%	100%	82%	84%

As a result of the orientation, I feel my ability to analyze reflection and refraction data has…	86%	47%	87%	87%	100%	81%
As a result of the orientation, I feel my ability to use Seismic Unix has…	NA				91%	91%
As a result of the orientation, I feel my ability to use ProMax has…	93%	100%	80%	53%	NA	82%
As a result of the orientation, I feel my understanding of analyzing broadband seismic data has…	86%	73%	67%	100%	NA	82%
As a result of the orientation, I feel my ability to use Matlab has…	79%	93%	87%	73%	73%	81%
As a result of the orientation, I feel my understanding of the composition of a seismogram has…	NA				100%	100%
As a result of the orientation, I feel my understanding about how to get the most out of my internship this summer has…	100%	93%	93%	80%	100%	93%
As a result of the orientation, I feel my understanding of the culture of science has …	86%	93%	93%	87%	91%	90%

Cohort

Please read each of the following statements carefully and select one of the five alternatives that most closely matches your feelings. (% agree or strongly agree)

	2010	2011	2012	2013	2014	2015	2016	2017	Avg
Group members spend time getting to know one another	86%	87%	100%	93%	73%	100%	100%	82%	90%
There are feelings of unity and togetherness among the group	93%	87%	93%	67%	73%	100%	88%	100%	87%
Group members make me feel like part of the group	93%	100%	100%	87%	73%	100%	100%	100%	92%
We can say anything in the group without having to worry	86%	87%	80%	67%	18%	100%	88%	82%	75%
I enjoy spending time with the members of the group	93%	100%	100%	100%	91%	100%	100%	91%	95%
The group atmosphere is comfortable	93%	93%	87%	93%	73%	100%	100%	100%	90%
Some of the group members could become my friends.	93%	100%	100%	100%	72%	100%	38%	91%	85%

How important is it to have an opportunity to become connected to the other IRIS interns this summer?

	2015	2016	2017
Very important	25%	0	21%
Important	25%	50%	50%
Moderately important	38%	50%	29%
Of little importance	13%	0	0
Not important	0	0	0

To help us better understand what "connected" in the question above means to you, please describe several actions that you or the other interns would engage in that would demonstrate this connectedness. (total of 48 responses)

	N	%
Staying in touch during the summer	5	10%
Stating in touch after the summer	9	19%
Becoming friends/doing things together/socializing	12	25%
Social media	7	15%
Sharing resources/ideas	6	13%
Helping with questions/offering advice/support network	9	19%

During the summer, I felt like I was connected to the other IRIS interns in a beneficial way. (% agree or strongly agree)

	2010	2011	2012	2013	2014	2015	2016	2017	**Avg**
	75%	80%	86%	54%	73%	100%	75%	82%	78%

How satisfied were you with your relationship with the other IRIS interns? (post internship)

	2010	2011	2012	2013	2014	2015	2016	2017	**Avg**
	NA	NA	NA	85%	91%	100%	100%	100%	95%

During the summer, I felt like I was connected to other undergraduate students at my mentor's institution in a beneficial way.

	2010	2011	2012	2013	2014	2015	2016	2017	**Avg**
	NA	NA	NA	NA	NA	22%	38%	46%	

In the space below, describe any benefits you experienced from being connected to the other undergraduate students at your mentor's institution. (15 total responses)

	N	%
Preparing for AGU	1	7%
Professional contacts	2	13%
Learn about other internship programs	2	13%
Learning about graduate school and careers	2	13%
Built friendships	4	27%
We were a community of interns	1	7%

Alumni Mentor

It was helpful to have the alumni mentor available to answer questions and post comments on the blogs and the Facebook group.

	2010	2011	2012	2013	2014	2015	2016	2017	**Avg**
	91%	73%	79%	77%	100%	100%	86%	100%	88%

Overall, I felt the alumni mentor served a positive role in my summer experience. (% agree or strongly agree)

	2010	2011	2012	2013	2014	2015	2016	2017	**Avg**
	91%	87%	86%	77%	100%	100%	100%	100%	91%

In the space below, briefly describe the role, if any, the alumni mentor played in your summer experience, and/or how the alumni mentor could have been more helpful to you during the summer.

	N	%
Helped with problems/questions	38	41%
Offered career/grad school advice	19	21%
Commented on blog/Facebook posts	16	17%
Encouraging/supportive/motivating	12	13%
Provided resources	6	7%
Keep me informed/what to expect	4	4%
Responded quickly	3	3%
Mediator/go-between	2	2%
Key to my success	1	1%

More helpful

	N	%
More influential during the orientation	9	10%
Mentor every intern rather than a select few	2	2%
Would have liked more one-on-one time	2	2%
Could not related to him	1	1%
Preferred in-person help and feedback	1	1%
Hiked too fast for beginners	1	1%

Describe any benefits you experienced (N=19 written responses)

	N	% (of 19)
Having friends	4	21%
Had a place to stay	1	5%
Enjoyable field work experience	1	5%
Work together and help each other	4	21%
Not alone	1	5%
Comparing progress	1	5%
Reading blogs	4	21%
Sharing common experience/support	5	26%

Developed a network	1	5%

Attitudes and Beliefs

How true is each of the following statements? (% moderately true or exactly true)

	2010	2011	2012	2013	2014	2015	2016	2017	Avg
I can always manage to solve difficult problems if I try hard enough.	100%	100%	93%	40%	91%	100%	100%	93%	89%
If someone opposes me, I can find the means and ways to get what I want.	86%	87%	60%	73%	73%	88%	60%	64%	72%
It is easy for me to stick to my aims and accomplish my goals.	100%	100%	100%	93%	91%	100%	90%	100%	95%
I am confident that I could deal efficiently with unexpected events.	100%	93%	93%	100%	100%	100%	100%	93%	95%
Thanks to my resourcefulness, I know how to handle unforeseen situations.	71%	93%	93%	100%	82%	100%	100%	93%	90%
I can solve most problems if I invest the necessary effort.	100%	100%	93%	100%	91%	100%	100%	100%	96%
I can remain calm when facing difficulties because I can rely on my coping abilities.	93%	93%	73%	87%	91%	100%	100%	86%	89%
When I am confronted with a problem, I can usually find several solutions.	71%	100%	73%	100%	73%	100%	90%	79%	84%
If I am in trouble, I can usually think of a solution.	93%	100%	100%	100%	91%	100%	100%	93%	96%
I can usually handle whatever comes my way.	100%	93%	100%	100%	100%	100%	100%	93%	96%
If I want to, I can become a geoscientist.	93%	93%	100%	100%	100%	100%	100%	100%	96%

As a result of this internship... (% increased a little and increased a lot)

	2010	2011	2012	2013	2014	2015	2016	2017	Avg
As a result of this internship, my desire to	92%	73%	86%	62%	100%	89%	100%	83%	85%

pursue a career in geoscience or seismology has…									
My ability to gather, manage and convey scientific information has…	100%	87%	86%	100%	100%	100%	100%	83%	93%
My understanding of the process of scientific inquiry has…	92%	87%	86%	92%	91%	100%	100%	83%	90%
My ability to design and conduct scientific investigations has…	92%	87%	86%	85%	100%	89%	75%	83%	85%
My ability to defend a scientific argument has…	85%	87%	86%	85%	81%	100%	88%	92%	87%
My knowledge of, and ability to use, the technologies to collect and study geophysical data has…	92%	93%	93%	100%	91%	100%	100%	92%	93%
My ability to use scientific literature and media to broaden my knowledge has	84%	73%	86%	100%	91%	89%	100%	92%	87%

III.B. Mentor Data Summary Tables by Year

Mentors were asked to complete a survey after the internship period on the experience. The results in this section are presented by question or item and year. Some data were not collected in some years.

How important was each of the following in your decision to host an intern this summer? (If an item does not apply to you, please select the "not important" category)

	% Fairly or Extremely Important							
	2011	2012	2013	2014	2015	2016	2017	Avg
Program advertising (website, video, etc).	15%	0	7%	0	11%	NA	17%	8%
Overall reputation of the program	100%	92%	87%	100%	100%		100%	95%
Quality and preparedness of the interns accepted into the program	92%	100%	100%	100%	100%		100%	97%

The opportunity to work with students from outside my own institution	77%	69%	80%	57%	67%		58%	65%
Potential of the intern becoming one of my graduate students	54%	31%	40%	29%	44%		17%	33%
Diversity of the interns	31%	31%	47%	0	56%		42%	32%
$1000/$600 available to cover costs associated with the intern	8%	38%	27%	29%	0		17%	19%
The opportunity to conduct preliminary work on an unfunded projects	31%	38%	53%	57%	67%		83%	53%
The opportunity to accelerate work on funded projects	54%	62%	27%	86%	56%		67%	56%
Support for the intern to attend a one-week orientation prior to traveling to their host site	62%	69%	60%	100%	67%		67%	68%
Support for the intern to present their summer research at AGU or other conference	77%	77%	73%	100%	89%		92%	82%

Processes and Logistics

	% Fairly or Extremely Important							
	2011	2012	2013	2014	2015	2016	2017	Avg
The internship selection committee provided me with a well-qualified undergraduate to work with for the summer.	92%	92%	100%	86%	89%		92%	91%
Making arrangements with my institution to host an intern (e.g. library access, keys, campus parking, use of equipment etc) was relatively easy.	92%	NA	NA	NA	NA		NA	92%
I created clearly stated, written goals for the internship with my intern.	100%	100%	93%	100%	100%		100%	98%
Throughout the internship I monitored the progress of my intern using these goals and adjusted them with the intern when necessary.	100%	92%	100%	86%	100%		100%	95%
I was aware that my intern kept a blog as part of the internship program and I occasionally looked at it.	69%	77%	80%	100%	89%		42%	75%

Benefits to Mentor

	% Fairly or Extremely Important							
	2011	2012	2013	2014	2015	2016	2017	Avg
My intern's work this summer contributed in a meaningful way to the overall success of my research project.	85%	85%	93%	71%	100%		75%	83%
Overall, hosting an intern this summer was beneficial to me and a worthwhile use of my time.	92%	100%	87%	86%	100%		83%	89%
As a result of this internship, I would like to host another IRIS intern in the future.	85%	85%	100%	86%	100%		100%	91%

How effective did you feel as a mentor this summer?

	% Fairly or Extremely Important							
	2011	2012	2013	2014	2015	2016	2017	Avg
% Effective or Very Effective	92%	100%	100%	100%	100%	NA	100%	98%

Please read each of the following statements carefully. Then select the statement which best matches your level of agreement.

	% Agree or Strongly Agree							
	2011	2012	2013	2014	2015	2016	2017	Avg
The mentoring rubric helped illuminate areas that needed improvement and areas where growth occurred.	NA	NA	NA	71%	89%	NA	83%	81%
The mentoring rubric provided a concrete way to assess my intern's progress during the summer.				43%	89%		92%	75%
The mentoring rubric was a beneficial resource for the mentoring process.				43%	67%		92%	67%
The mentoring rubric provided mechanisms for me to focus on developing the intern's career capabilities.				43%	78%		67%	63%
The mentoring rubric provided me with a structure for discussing my intern's progress with them.				57%	78%		83%	73%
The mentoring rubric and meetings motivated my mentoring during the summer.				0%	11%		67%	26%
I looked forward to completing the mentoring rubric and discussing it with my intern.				14%	33%		42%	30%

I plan to use the mentoring rubric (or a modified version) with other students in the future.				NA	56%		50%	53%

What concrete advice/tips would you give to faculty that will mentor the next cohort of students?

Summary for 2016-2017 N=21	N	%
Weekly reports/evaluations	5	24%
Organize prior to interns' arrival	5	24%
Offer a realistic/complete project	5	24%
Establish goals and review them	5	24%
Regular communication	4	19%
Be a hands-on mentors/invest your time	4	19%
Detailed instructions	3	14%
Have your intern work with others	2	10%
Design a project intern can take ownership of	1	5%
Assess your intern's skills	1	5%

IV. Conclusions and Recommendations

Orientation

The orientation was highly impactful on the interns. Developing goals was an important component of the orientation and contributed to intern success.

- Interns created their own written goals pertaining to what they wanted to get out of the internship (89%-100%).

Orientation helped interns feel part of a larger community.

- Interns in 2015-2017 were in strong agreement that the orientation was an important aspect in helping them feel part of a community (91%-100%).

Being part of a cohort was valuable

- Interns enjoyed spending time with the members of their group (91%-100% agree or strongly agree), that other group members helped them feel part of the group (73%-100%), and that the group members spent time getting to know one another (73%-100%).

Orientation does a good job at helping the interns feel prepared for their internship.

- Interns reported significant improvements in their feeling of being prepared ($p<0.01$) and reported the orientation was well organized (100% agree or strongly agree).

Internship

It was important to continue to monitor intern's goals during the internship and modify them as necessary.

- Monitoring their goals throughout their internship (69%-100%) adjusting them as necessary.

Receiving assistance and guidance is important for interns.

- Throughout their internship they received technical/scientific assistance and guidance from their mentor/graduate students/staff (77%-100%).

Having a meaningful project to work on is an important aspect of the internship.

- Interns reported feeling that their work during their internship contributed in meaningful ways to the overall success of their mentor's research (54%-100% agree or strongly agree).

Other meaningful aspects of the internship are learning applicable skills.

- Interns could easily apply the information and skills they learned during their internship to their future career goals (86%-100%), and overall, the internship was one of the best learning experiences they had ever had (80%-100%).

Participating in the internship program impacted interns attitudes and beliefs.

- Interns rated themselves highly in their ability to handle difficult tasks (93%-100%), that they could become geoscientists (93%-100%), that they could solve problems (91-100%), that they are able to think of solutions (91%-100%), that they can deal with unexpected events (93%-100%), and they were able to accomplish their goals (90%-100%).
- Interns reported that as a result of their internship, their knowledge of and ability to use the technologies to collect and study geophysical data "increased a little" or "increased a lot" (73%-100%), that their ability to design and conduct scientific investigations "increased" (75%-100%), that their ability to gather, manage, and convey scientific information "increased" (83%-100%%), and that understanding of the process of scientific inquiry "increased" (83%-100%).

Mentoring

Mentors played an important role in the program beyond providing a learning opportunity for the interns. Mentors help interns review and refine their goals throughout the internship.

- Interns also received clear goals from their mentors (69%-92%) and they used these as well to monitor their progress and adjust as necessary (50%-100%).

Mentors felt using the rubric was beneficial.

- The mentors agreed or strongly agreed that the rubric helped them illuminate areas that needed improvement and areas where growth occurred (71%-89%), that the rubric provided a concrete way to assess their intern's progress (43%-92%), that the rubric was a beneficial resource for the mentoring process (43%-92%), that the rubric provided a mechanism for focusing on developing the intern's career capabilities (43%-78%), and that the rubric provided them with a structure for discussing their intern's progress (57%-83%).

For the mentors, hosting an intern is beneficial.

- Mentors felt that overall, hosting an intern was beneficial to them and a worthwhile use of their time (83%-100% fairly or extremely important), that their intern's work contributed in a meaningful way to the overall success of their research (71%-100%), and that as a result of this internship, they would like to host another IRIS intern (85%-100%).
- Mentors themselves also felt effective (92%-100% felt effective of very effective) increasing the likelihood that they would continue to participate in the IRIS Intern program in the future.

Future Metrics

In addition to the metrics currently collected, a follow-up survey is recommended.

- Conduct a follow-up survey with all past interns to learn
    - Current and intended educational level

- Current job and position
- How they rate the impact of the IRIS Undergraduate program on their work/career
- Have they stayed in geological/geophysical sciences or moved to another area
- In retrospect, was there anything specific about the program that was most beneficial, that they would recommend be changed, and that they feel should be altered
- Have they gone on to mentor other interns
- What aspects of the program did they continue to incorporate into their own work and studies (goal setting, working with a mentor, being part of a cohort, etc.)
- Would they be interested in mentoring future IRIS interns
- Would they be willing to talk to and answer questions of perspective IRIS interns
- Broad impacts of the IRIS Undergraduate program on them

Overall

Eight years of data provide strong evidence that the program structure is effective for students and mentors, that it meets the objectives of increasing students' understanding of seismology and the nature of science, building their confidence to enter a STEM field, and building their research skills and experience. Interns offer consistently positive feedback on the orientation and their internship experiences. Mentors have found working with the interns very positive and of value to their work.

We offer a few recommendations on the overall program while there are some specific detail orientated suggestions based on the feedback from the interns and mentors. Primarily, finding ways for past interns to interact with potential interns, insuring faculty are well informed about the program and offering them an informational webinar to best support and inform their students, leveraging the powerfully positive reputation of the program as a means to attract new interns and mentors, working to make the goal setting process a standard practice in the program, and summarizing the advice from past mentors to be shared with future mentors.