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EVALUATION OF THE NATIONAL SCIENCE
FOUNDATION'S INTERNATIONAL RESEARCH
EXPERIENCES FOR STUDENTS (IRES) PROGRAM:

Findings from a Survey of Former Participants

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A report from the Evaluation and Assessment
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Data

Data from this study is available to NSF licensees as a restricted-use file. For more information, please contact: eac@nsf.gov.

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EVALUATION OF THE NATIONAL SCIENCE FOUNDATION'S INTERNATIONAL RESEARCH EXPERIENCES FOR STUDENTS (IRES) PROGRAM: FINDINGS FROM A SURVEY OF FORMER PARTICIPANTS



Established in 2006, the National Science Foundation's (NSF) International Research Experiences for Students (IRES) program seeks to develop a globally engaged U.S. science and engineering workforce. Managed by the Office of International Science and Education, the program supports active participation of U.S. undergraduate and graduate students in high-quality collaborative research at an international site. Since its inception, the IRES program has supported 273 projects and approximately 5,000 undergraduate and graduate students. Together the funded projects have provided international research experiences spanning 77 countries across every continent except Antarctica, and across the full range of disciplines in NSF's larger research portfolio.¹

In this report, the final report of the formative evaluation of IRES conducted by Mathematica, we present the findings from a survey of former IRES participants supported by the 2013 cohort of IRES Site (Track I) awards.² The survey gathered detailed information on the characteristics of IRES participants, their experiences and satisfaction with the program, and their educational and employment outcomes. We collected information from 150 former IRES participants from the 15 IRES sites that were awarded in 2013; 90 had participated in IRES as undergraduates and 60 as graduate students.³ For most participants, the survey was administered 3 to 5.5 years after they have participated in IRES. Key findings include:

- The IRES program provided participants with active collaborative research opportunities involving mentorship from researchers at a foreign lab. International research sites spanned 27 different countries around the globe, and most research experiences lasted 8 to 12 weeks in the summer.
- Just over half of IRES participants were women and about a quarter belonged to an ethnic or racial group traditionally underrepresented in science, technology, engineering, and mathematics (STEM) fields. Most IRES participants were recruited from doctoral institutions with very high research activity. A large share of participants had research experience and had traveled internationally before they participated in IRES.
- Nearly all IRES participants currently hold a postsecondary degree, including half who obtained a graduate degree since participating in IRES. About one-quarter of students who participated in IRES as undergraduates subsequently earned a master's degree or doctorate; many of these students received support from NSF's Graduate Research Fellowship Program.
- The majority of IRES participants remained globally engaged after the program ended and are currently members of the STEM workforce.
- Most IRES participants reported the IRES program had shaped their professional goals. Participants often indicated IRES encouraged them to pursue further education (such as graduate school or postdoctoral studies) or that it helped them solidify their interest in science or engineering.

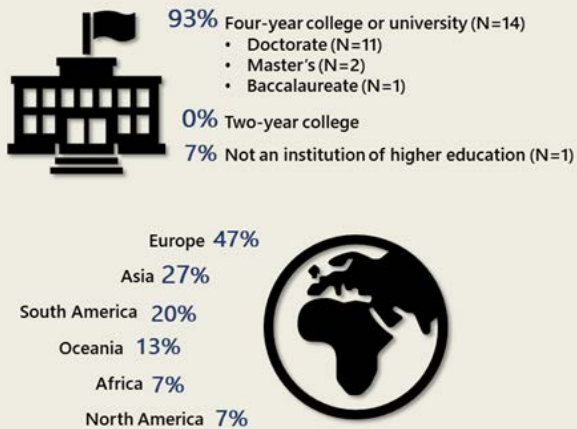
SURVEY SAMPLE AND APPROACH

- The survey was administered to participants in all 15 IRES Site (Track I) awards NSF funded in 2013. These awards provided research experiences for 244 IRES participants.
- 62 percent of IRES participants responded to the survey (N = 150), with no statistically significant differences in response rate between IRES graduate and undergraduate participants (59 and 63 percent, respectively). Respondents included participants from each of the 15 sites.
- The survey was administered online from March 3 to April 29, 2020, for a total of eight weeks.

IRES SITES AND PARTICIPANTS

Institutions receiving IRES awards were predominantly four-year colleges with extensive research activity and facilitated opportunities to conduct research around the world. Nearly all IRES awards NSF funded in 2013 were granted to four-year postsecondary institutions (14 out of 15, Exhibit 1), except for one awarded to a professional society. The vast majority of the institutions were doctorate-granting institutions, all of which are categorized with the highest and second-highest levels of research activity by the Carnegie Classification of Institutions of Higher Education. About 20 percent of the awards were granted to minority-serving institutions (not shown⁴).

Exhibit 1. Award institutions and locations of the international experiences



Source: Research.gov, 2013 IRES award reports, 2016 Integrated Postsecondary Education Data System, and 2015 Carnegie data.

Note: Totals do not sum to 100 percent because some experiences took place in multiple continents.

These IRES awards supported active collaborative research with mentorship from researchers at a foreign lab, which largely took place in summers 2014, 2015, and 2016. Respondents participated in research in 27 different countries around the globe, with some individual experiences taking place in multiple countries. About three-fourths of the research sites were located in Europe (47 percent) and Asia (27 percent), with fewer research sites located in South America (20 percent), Oceania (13 percent), Africa (7 percent), and North America (7 percent) (Exhibit 1). Most research experiences lasted 8 to 12 weeks in the summer, with a few lasting up to six months.

The majority of these sites supported both graduate and undergraduate participants (73 percent), providing opportunities for near-peer mentoring among participants. A few sites involved only graduate students (20 percent) or undergraduate students (7 percent).

Demographic characteristics and background experiences of participants reflected some success in broadening participation. Sites are encouraged to recruit underrepresented students, including women, ethnic or racial minorities, and first-generation students, among other groups. Just over half of the participants were women and about a quarter belonged to an ethnic or racial minority group, including those who identify as Hispanic (18 percent), Black (5 percent), and American Indian or Alaska Native (1 percent) (Exhibit 2).

Exhibit 2. Demographic characteristics of participants (percentages)

	All IRES participants	IRES undergraduate participants	IRES graduate participants
Women	55	56	54
Ethnicity			
Hispanic	18	19	15
Race			
American Indian or Alaska Native	1	1	2
Asian	5	4	5
Black or African American	5	6	3
Native Hawaiian or other Pacific Islander	0	0	0
White	68	63	76
Two or more races	10	13	5
Ethnic/racial underrepresented minority ^a	26	30	20
Any disability ^b	24	24	24
Highest level of parental education			
High school or less	11	13	7
Some college (including two-year degrees)	13	13	12
Bachelor's degree	23	26	19
Master's degree	32	27	39
Professional degree	9	8	10
Doctorate	11	10	12
Number of participants	138-148	82-89	57-59

Source: 2020 NSF survey of former international research participants (2013 cohort of awards).

Note: Sample sizes are presented as a range based on the data available for each row in the table.

"Do not wish to provide" were included in the analysis and ranged from 2% (for example, parental education) to 12% (for example, race among IRES undergraduate participants).

^a Ethnic/racial underrepresented minorities is defined as American Indian/Alaska Native, Black/African American, Native Hawaiian/Other Pacific Islander, or Hispanic.

^b Includes participants who indicated they had "slight," "moderate," or "severe" difficulty with or were "unable to do" at least one of the following functions: seeing; hearing; walking; lifting or carrying; or concentrating, remembering, or making decisions.

Participation among ethnic or racial minority groups was somewhat similar, or compared favorably, to other NSF programs that also support opportunities to conduct research abroad. Among undergraduate students, the percentage of minority participants in IRES (30 percent, Exhibit 2) was higher than that in the Partnerships in International Research and Education (PIRE) program (20 percent)⁵, though somewhat lower than in the international Research Experiences for Undergraduates (REU) program (36 percent).⁶ Among graduate students, the percentage of racial or ethnic minorities in IRES (20 percent, Exhibit 2) was slightly higher than in PIRE (17 percent).

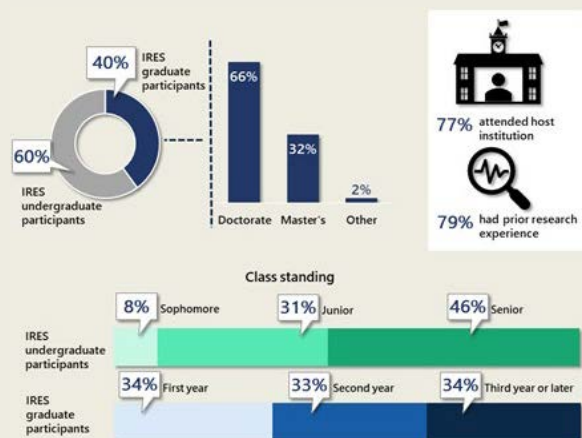
IRES students came disproportionately from highly educated families—half of IRES participants had at least one parent with a master’s degree or higher, with one-fifth holding a doctoral or professional degree. Compared to the population of college graduates, IRES participants were twice as likely to have at least one parent with a master’s degree or higher (52 percent of IRES compared to 26 percent in the 2017 National Survey of College Graduates [author’s calculations]). IRES undergraduate participants were generally more diverse than graduate students—a pattern consistent with the nation’s lower rates of diversity participation as students advance in their STEM pipeline, and likely exacerbated by program residency requirements (IRES participants must be citizens, nationals, or permanent residents of the United States).

At the time they participated in the international research experience, 60 percent of IRES students were undergraduates, close to half of whom were rising seniors in college (Exhibit 3). The remaining 40 percent of IRES students participated in the program when they were in graduate school, with some participating as early as their first year of graduate studies. Among participants who were graduate students, about two-thirds were pursuing a doctorate when they participated in IRES (66 percent).

NSF also encourages IRES sites to recruit students from institutions with limited research opportunities. However, unlike other NSF programs where there is an intentional requirement for sites to recruit students from institutions outside the award institutions, IRES sites can recruit participants locally. Most sites in the study did indeed recruit participants from their own institutions (Exhibit 3), resulting in participants coming predominantly from doctoral institutions with very high research activity.

IRES was not the first research or international travel experience for most participants. About 80 percent had research experiences prior to IRES (Exhibit 3), most involving multiple years or summers—a pattern that was similar across participants at both levels (graduate and undergraduate). One-fifth of IRES graduate students reported having participated in NSF’s REU program. In addition, most participants already had some international exposure before traveling with IRES (76 percent of undergraduate and 92 percent of graduate participants).

Exhibit 3. Participants’ academic enrollment, class standing, and prior research experience



Source: 2020 NSF survey of former international research participants (2013 cohort of awards).

Note: Ninety percent of IRES undergraduates were pursuing a bachelor’s degree with 10 percent selecting “no specific degree” or “other.” No IRES participant reported pursuing an associate’s degree. The exhibit shows the class standing as of the semester or quarter immediately after the international research experience.

Most frequently, participants had visited another country for leisure (65 percent), though some had participated in a study abroad program (23 percent) or lived outside the United States for six months or longer (16 percent). Before IRES, some graduate participants had previously collaborated on research with someone based in another country (25 percent) or traveled abroad for a research conference (13 percent).

COMPONENTS OF THE RESEARCH EXPERIENCE

Respondents reported participating in varied research activities, reflecting sites’ wide latitude in implementing their projects. The percentages of participants engaging in the various types of program activities captured in the survey ranged from 29 (mentoring other students) to 81 percent (conducting a literature review), indicating a large degree of latitude for sites to implement their projects (Exhibit 4). Overall, IRES participants were more likely to conduct literature reviews and analyze data than they were to collect data or prepare samples. About three-quarters of participants conducted literature reviews, interpreted or analyzed results, and presented their work to other students, faculty or researchers during the experience. In comparison, about half of participants prepared samples or specimens, collected data in a lab, or conducted fieldwork.

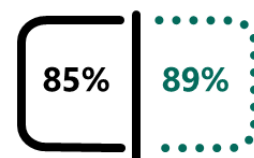
Few participants reported mentoring other students during the international experience (29 percent). Compared to undergraduate students, graduate students were more likely to report having mentoring others. Yet, less than half of graduate student participants reported mentoring other students conducting research or leading a student research

Exhibit 4. Characteristics of the international research experience



Participants were more likely to contribute to **reviews, analyses, and summaries** than data collection, sample preparation, and protocol development

Prepared sample or specimens (53%)	Reviewed literature (81%)
Collected data in a lab (49%)	Interpreted results (75%)
Developed protocols/instruments (49%)	Analyzed data (73%)
Conducted fieldwork (43%)	Presented research (73%)
Mentored other students (29%)	Summarized results (64%)



Pre & Post
experience activities or support

Source: 2020 NSF survey of former international research participants (2013 cohort of awards).

Note: Percentages on the left represent the share of participants who indicated each of the activities applied to their research experience. Percentages on the right indicate whether respondents identified at least one type of program activity or support before and after the international travel.

team (45 percent). This percentage was similar in the subset of sites that had both graduate and undergraduate students working together (55 percent).

In addition to providing research experiences for students, sites were expected to provide predeparture preparation and post-trip follow-up for students. More than 80 percent of the participants reported engaging with the project before traveling and upon their return to the United States (85 and 89 percent, respectively, Exhibit 4). Before the international research experience began, some participants reported receiving country orientations (62 percent) and training in research techniques (55 percent), and fewer reported receiving foreign language instruction (21 percent). When the research experience ended, participants most commonly received academic support in the form of research advice or academic planning (69 percent) and assistance disseminating findings based on research conducted while abroad (52 percent). Fewer participants reported receiving mentoring on how to integrate the research conducted at the host institution into future research (33 percent) or help for obtaining financial support to continue the research started abroad (19 percent).

PROGRAM SATISFACTION

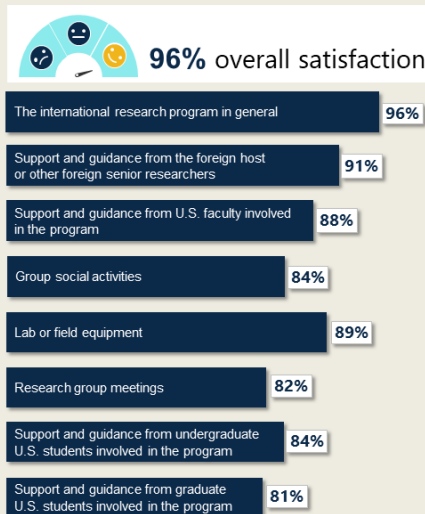
"I cannot speak highly enough about this program. It gave me an incredible opportunity to apply my technical knowledge in a foreign setting and collaborate with professors, students, and researchers from around the world."

"It was the most fulfilling academic and professional experience I had ever experienced. I learned to value my knowledge as an autonomous researcher actively applying what I had learned in previous research and the classroom to real-life issues."

Overwhelmingly, participants were satisfied with the IRES program and have recommended it to a friend.

Nearly all participants (96 percent, Exhibit 5) indicated they were somewhat (16 percent) or very satisfied (80 percent) with the IRES program overall. In addition, 91 percent reported they have recommended the program to a friend or colleague.

Exhibit 5. Satisfaction with various aspects of program



Source: 2020 NSF survey of former international research participants (2013 cohort of awards).

Note: Figure shows the percent of participants who indicated they were somewhat or very satisfied. Percentages exclude participants who indicated an item was "not applicable" to them.

Most students were satisfied with faculty support, group activities, and access to lab or field equipment. A large majority of respondents were somewhat or very

satisfied with support and guidance from foreign and U.S. faculty (91 and 88 percent, respectively). Open-ended responses provided insight about what students valued in working with faculty. For example, one graduate student appreciated working with a “multidisciplinary and open-minded PI [principal investigator] who cares about the progression of the careers of his graduate students and postdocs,” while an undergraduate student appreciated “being mentored by a scientist at the top of the field.”

Large proportions of students were satisfied with group social activities (84 percent), lab or field equipment (89 percent), and research group meetings (82 percent). Some students said in open-ended responses that they appreciated access to “state-of-the-art equipment” or equipment that was not available in their home lab. In contrast, a few students said they had to learn to work without resources that would have otherwise been available in the United States.

Most participants were satisfied with the mentoring from undergraduate and graduate students involved in the program. Among those who received peer support, about 80 percent were somewhat or very satisfied with those interactions (84 percent were satisfied with peer support provided by undergraduates and 81 percent with that provided by graduate students). In open-ended responses, some undergraduates said they valued working with graduate students in part because it helped them “figure out if research was right for me.” As one respondent noted, “Working closely with graduate students in the field was something I hadn’t done before, and seeing it in person, as well as being involved with so many parts of the process, made it that much clearer that I also wanted to pursue a graduate degree in the future.” However, not all participants believed they received peer support. About a third of participants did not believe they received mentoring from other students in the program (29 percent in each: support from undergraduates and support from graduates).

Participants offered some suggestions for how IRES could be improved. When asked what changes might have made the program more impactful, 79 percent of IRES participants identified areas for improvement in an open-ended response, while 9 percent provided no response, and 12 percent said they would not change anything. As one participant said, “I don’t think it could have been a better experience.” Participants who provided feedback offered recommendations for the international research experience (52 percent), pre-experience activities (19 percent), post-experience activities (12 percent), and residential, travel, or financial experience (7 percent).

Participants provided several suggestions for improving the research experience. Some participants indicated they would have preferred a longer research experience to have more time to work on their projects, write up a publication, and experience the foreign country (13 percent of

participants who provided feedback). As one said, “By the time that I had to leave, I was just started to make progress with my project, and I had just started to become comfortable in my host country.” Another participant pointed out the length of the program “was too short a time to gather significant results and publish a paper (though our team was really close!).”

Other participants indicated that additional support and guidance from their mentors (12 percent) as well as a clearer research plan (7 percent) would have made the experience better. One participant explained, “My project was largely independent, and I only had one staff scientist to answer to. She was not always around so I found myself struggling to make progress at times.” Another would have liked “a better plan for what aspects of data processing and analysis would be most feasible to involve students in” given the time constraints of the program.

Participants suggested ways to improve pre- and post-travel activities. For example, participants suggested they would have benefitted from more communication and involvement in the research project before the international experience, while they were still in the United States. One participant noted, “More involvement in the research area prior to traveling to the host university...would have saved time getting set up and oriented once arriving.” Respondents also noted additional language lessons before the program would have helped them take fuller advantage of the experience. After the program ended, respondents stated they would have liked assistance maintaining relationships they had made at the international sites. One noted, “There was no follow up with the team regarding the impact of our visit with community members or how to maintain [the] relationship. I felt responsible to the relationships I had made and was not sure how to continue them once we returned.” Some also noted they would have liked to have continued their research once back at their home institution. One participant explained, “I especially would have loved to further integrate the results gained abroad into my research at my home institution and to continue collaborating with the international research team.”

Some participants suggested changes related to logistics. A few participants made recommendations for other changes, such as increases in funding support, better housing accommodations, and more advance notice of the travel schedule.

PARTICIPANT OUTCOMES AND PERCEIVED IMPACTS

Reported areas of professional growth

A fundamental goal of IRES is to develop participants’ skills needed for successful immersion into the scientific enterprise. The survey included a series of questions to

gauge areas where students had gained knowledge or skills related to becoming an independent researcher.

Participants learned about working as a researcher and conducting lab work.

The vast majority of IRES participants indicated they had learned a good amount or great deal about the job of a researcher (91 percent) and working collaboratively with others (91 percent). Participants also learned about research methods and designs (84 percent), lab and research techniques (81 percent), and analyzing and interpreting results (81 percent). As one respondent noted, “The most valuable aspect in the international research program was the opportunity to get hands-on experience out in the field and learn techniques from other scientists at the site.” Another respondent commented students were able to “see how messy science can be and how to adjust when things do not go according to plan.”

A large majority (83 percent) also indicated they had more self-confidence in their research abilities. In open-ended responses, several students appreciated having received substantive responsibilities that helped them grow and become more independent in their research. As one noted, “As an undergraduate, it was extremely valuable to be trusted with the design and execution of experiments in an unfamiliar setting.”

Fewer participants reported gains in communicating research, writing technical text or proposals, and research ethics.

Around 60 percent of respondents reported learning about giving effective oral presentations (60 percent), writing technical and scientific text (58 percent), and ethics in scientific research (56 percent). Only about 40 percent of respondents learned about applying to or participating in conferences (42 percent) and writing a research proposal (40 percent).

Perceived impacts of the program

Most participants believed the program influenced their professional goals or plans.

Nearly all undergraduate participants (97 percent) and most graduate participants (85 percent) said the program influenced their professional goals (Exhibit 6). Most undergraduates reported IRES prompted them to consider other professional opportunities (84 percent) or to pursue further education (82 percent), and many reported it helped solidify their interest in science and engineering (69 percent). For example, one undergraduate said, “It was my first time working full time in a laboratory setting. This experience was the spark that got me interested in research as a career.” Compared to undergraduates, graduate students were somewhat less likely to report these impacts. Two-thirds of graduate students indicated the experience made them consider other professional opportunities (66 percent), and half agreed IRES helped solidify their interest in science and engineering (53 percent). When asked about the impact of IRES on their careers, most participants

thought IRES made them more competitive for jobs (89 percent of undergraduates and 83 percent of graduates).

Exhibit 6. Perceived effect of program participation

97% of IRES undergraduate participants and 85% of IRES graduate participants said that the program affected their professional goals



Source: 2020 NSF survey of former international research participants (2013 cohort of awards).

Note: Exhibit shows the percent of participants who indicated the statement applied to them (for program affecting professional goals) and the percent of participants who indicated they agreed or strongly agreed (for each of the statements).

Participants benefited from working with their foreign collaborators.

More than 80 percent of participants reported their research benefited from access to foreign partners in their field. This was particularly true for graduate students (95 percent). When participants identified in open-ended responses the most valuable aspects of the program, many participants indicated they appreciated the different perspectives that foreign partners brought to their research. For example, one respondent reported having “witnessed firsthand the value of diverse backgrounds in approaches to problem-solving.” Another noted, “The ideas and methods that I was exposed to during my research abroad directly influenced the topic and methods of my doctoral dissertation.” Most undergraduate (80 percent) and graduate (86 percent) participants also agreed the program helped them make valuable professional connections. One student said, “I was able to network with the people directly involved in my project as well as with other scientists I came in contact with outside of my project.” A few mentioned they made connections in their host countries that have opened the door for future collaborations.

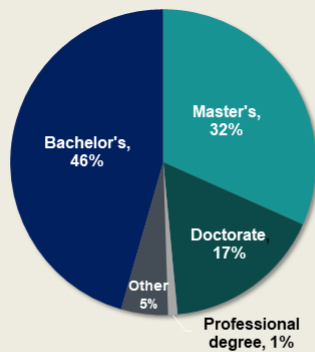
Degree attainment

Nearly all IRES participants currently hold a postsecondary degree, and some obtained degrees higher than what they were pursuing at the time of program participation.

After the 3 to 5.5 years since they had participated in IRES, half of the participants had earned a graduate degree (32 percent master’s degree, 17 percent doctorate, and 1 percent other professional degree, Exhibit 7). The remaining obtained a bachelor’s degree (46 percent), but not a graduate degree, or reported being

about to obtain a postsecondary degree (5 percent). Most IRES participants' highest degrees are in STEM fields, most commonly in engineering (29 percent), biological/life sciences (26 percent), and physical sciences (18 percent).

Exhibit 7. Highest degree earned



IRES undergraduate students		IRES master's students		IRES doctorate students	
Bachelor's	68%	Bachelor's	11%	Bachelor's	13%
Master's	21%	Master's	74%	Master's	31%
Doctorate	2%	Doctorate	16%	Doctorate	51%

Source: 2020 NSF survey of former international research participants (2013 cohort of awards).

Note: Pie chart is based on the 149 IRES participants who answered the survey item about highest degree they have obtained. Tables exclude two additional participants who could not be classified as master's or doctorate student at time of participation due to incomplete data in the survey item. Therefore, tables are based on 147 IRES participants (90 who participated as undergraduates, 19 as master's students, and 38 as doctorate students).

Importantly, about one-quarter of students who participated in IRES as undergraduates have subsequently earned a master's degree (21 percent) or doctorate (2 percent) (Exhibit 7). In doing so, many have sought support from the NSF's Graduate Research Fellowship (GRFP) support (12 percent of IRES undergraduate students participated in GRFP). Some IRES master's students have also continued their education after IRES and earned a doctorate (16 percent). Not everyone who participated in IRES as doctoral students finished their doctorate by the time the survey was administered. In fact, only about half of them did at the time of survey administration (51 percent), which seems well on track with national estimates of 10-year completion rates in doctoral programs of about 57 percent.⁷

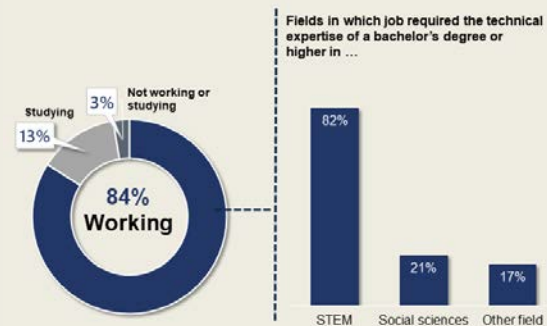
"I can honestly say that if it were not for this program, I would not have finished my Ph.D. Prior to attending IRES, I was struggling with my qualifying exams and research experiments. While I had not mentioned this to anyone, I was planning to quit my Ph.D. The IRES opportunity was so amazing and inspiring that I came back to my Ph.D. with new research ideas, a less stressed work mentality, and a new excitement to do experiments. I am so thankful for the opportunity to participate in IRES."

"Originally, all I knew is that I was interested in biology, but outside of getting a B.S., I had no clue what to do next. As a first-generation Mexican American, just getting an undergraduate degree was a pipe dream, let alone pursuing a career in scientific research. I always enjoyed reading about others' research, but I never had the confidence that I could do that myself. The way I saw it, these jobs are for people with backgrounds and life experiences that are different than mine. These international research experiences changed that. Dr. [name] and my international hosts were incredibly supportive and encouraged me to pursue a career in biological research. Because of them, I am now a clinical research biostatistician at a prominent research hospital, and I will be defending my Ph.D. dissertation (biology) at the end of next month."

Employment

The majority of IRES participants were employed and applying their STEM expertise in the professional workforce. More than 80 percent of IRES participants were employed for pay or profit in a job that required the technical expertise of a bachelor's degree or higher in STEM fields (Exhibit 8). If not working, most participants were still studying and on the path to a potential career in STEM.

Exhibit 8. Working for pay or profit and job characteristics



Source: 2020 NSF survey of former international research participants (2013 cohort of awards).

Note: The survey asked whether participants were working for pay or profit during the week of February 1, 2019. If not working, respondents were asked about the reasons for not working. If working, they were asked whether the job required the technical expertise of a bachelor's degree or higher. Other field includes health, business, and education. Percentages do not sum to 100 because participants could indicate multiple fields for their job.

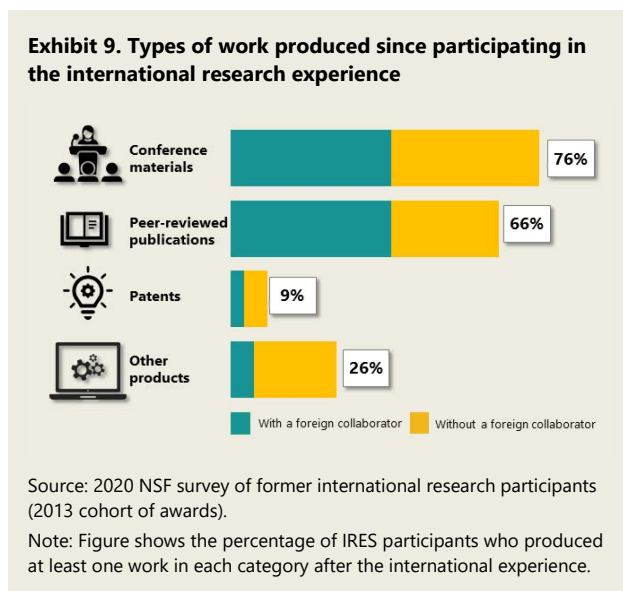
Research productivity and global engagement

Since their IRES participation, many participants have made scientific contributions. Most commonly, IRES participants have produced conference materials (76 percent) and peer-reviewed publications (66 percent) (Exhibit 9). About one-quarter of participants have contributed other products, including educational materials, software applications, datasets, and databases. Although only a few years have elapsed since participation (3 to 5.5 years), a few participants reported having applied for an NSF research grant as a principal or co-principal

investigator (8 percent) or produced a patent (9 percent, Exhibit 9).

Most participants remained globally engaged, maintaining professional connections with the international site and collaborating with foreign colleagues in peer-reviewed journals and other scientific products.

About 70 percent of IRES participants collaborated or communicated with the foreign host after participation, most often to brainstorm or exchange ideas; share data, tools, or research results; or to co-author a paper or grant proposal. Participants have also continued to work collaboratively with foreign scientists. At least half of the participants who were actively involved in an academic conference or had a scientific publication in a peer-reviewed journal after program participation did so in collaboration with the foreign researcher (Exhibit 9).



DISCUSSION

Our analysis of participant experiences and outcomes suggests that the IRES program is well aligned with Office of International Science and Education’s mission of leveraging international collaborations to advance science. IRES participants remained globally engaged after the program ended and are currently contributing to the STEM workforce and scientific community. These findings suggest that IRES is meeting the program’s objective of building the STEM pipeline through international research experiences.

The analysis also provided insights into potential ways NSF could refine or strengthen the program to better foster the development of the next generation of scientists, including the following:

Increase participation of some underrepresented groups. The IRES program emphasizes broadening participation among underrepresented groups. These include women, ethnic or racial minorities, people with disabilities, veterans, and students from low-income

backgrounds. Findings from this study suggest NSF could encourage sites to increase ethnic and racial diversity, particularly among undergraduate students, and aim to represent our nation’s diversity in each of the underrepresented groups, including African Americans, Alaska Natives, Hispanics, Native Americans, Native Hawaiians, and Native Pacific Islanders. To promote a diverse globally engaged STEM workforce, IRES could also emphasize participation from first-generation students or other economically disadvantaged students whose lack of prior international exposure might require increased outreach efforts in recruitment and possibly additional financial support.

Encourage participation from institutions with limited research opportunities. The program encourages participation of undergraduate students from academic institutions with limited research opportunities. Yet, the institutions receiving IRES awards have largely been doctoral universities, which typically recruit students locally from within their institutions. If NSF seeks to ensure that students beyond these universities have access to international research experiences, the program might consider (1) supporting other types of institutions in their efforts to submit competitive proposals, or (2) encouraging or requiring sites to recruit a share of their participants from outside their institutions.

Create a community of practice for international research. Participants identified several areas for program improvement, including providing longer research experiences, having well-defined research questions or plans before traveling, and receiving more guidance and oversight to make the most of the limited time abroad. Others also suggested additional support to continue the research and maintain the relationships when back in the United States. Survey findings also identified variation in the extent that students gained specific scientific skills. Participants reported learning the least about dissemination activities such as presenting findings, applying for conferences, and writing scientific text or proposals. Furthermore, findings from this study indicate that not all participants received support from peers generally, and from graduate students specifically, suggesting room to promote peer guidance and support. NSF could play a role in leading or facilitating site collaboration to address these and other common implementation challenges and to promote best practices.

Sponsor an impact evaluation of the program and research studies to assess the efficacy of programmatic features. Although participants’ self-reflections on program impacts provide formative feedback of the program efforts, a different study design could establish a causal link between students’ education and career trajectories and their experiences in the program. In addition, funders need to assess whether the activities or core program components are working in ways that could plausibly improve student outcomes in the future, making it

necessary to identify and measure activities and intermediate outcomes. The data system NSF is developing to support its human capital investments—the Education and Training Application—will enable the IRES program to conduct additional research that could contribute to the literature on international research experiences for students.

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ENDNOTES

¹ Martinez, A., A. Mraz Esposito, and C. Cosentino. "Evaluation of the International Research Experiences for Students (IRES) Program—Portfolio Analysis." Report submitted to the National Science Foundation. Washington, DC: Mathematica, December 2019.

² An earlier report examined extant sources maintained by NSF (including proposals submitted to the Track I mechanism and IRES project reports) to describe the IRES portfolio (Martinez, Esposito and Cosentino, 2019). Full citation in first endnote.

³ Data from this study are available to NSF restricted-use data licensees.

⁴ This report contains several statistics that are not all presented in an exhibit. Data that are presented in exhibits are preceded in text by a callout for the corresponding exhibit.

⁵ Martinez, A., C. Epstein, and A. Parsad. "Evaluation of the National Science Foundation's Partnership for International Research and Education (PIRE) Program: Final Report." Cambridge, MA: Abt Associates, 2015.

⁶ Author's calculation of a survey of former international REU participants funded with the 2013 cohort of award. Data from this sample are also available in the restricted-use file for this study.

⁷ Sowell, R., T. Zhang, K. Redd, and M. King. "Ph.D. Completion and Attrition: Analysis of Baseline Program Data from the Ph.D. Completion Project." Washington, DC: Council of Graduate Schools, 2008.