



Emerging International Researchers: Findings from the Evaluation of the East Asia and Pacific Summer Institutes Program

Contract No. GS-10F-0086K
Order No. NSFDACS09T1516

June 5, 2012

Prepared for:

National Science Foundation

John Tsapogas

Office of International Science and
Engineering

Submitted by:

Alina Martinez

Kristen Neishi

Amanda Parsad

Karla Whittaker

Carter Epstein

Abt Associates

55 Wheeler Street

Cambridge, MA 02138

Acknowledgements

This evaluation was conducted with the assistance of Abt colleagues including David Cook, Mike McLaughlin, and Luba Katz who played key roles in the design and analyses of this study. The efforts of numerous other individuals including Beth Gamse, Nicole DellaRocco, Morgan Sharoff, Stephanie Althoff, Jan Nicholson, Melissa O'Connor and additional Abt team members allowed us to field the surveys and finalize this report. The data collection was made possible by the work of Paul Schroeder and Andy Weiss and their survey team at Abt SRBI. We thank them all.

Our work was greatly facilitated by the assistance of the staff at NSF. We thank the members of NSF's Office of International Science and Engineering (OISE) who dug into their archives to search for documentation we requested. We are grateful for the guidance and support provided by John Tsapogas, Jong-on Hahm, Carter Kimsey, Elena Hillenburg, and Rebecca Gaul throughout the study. We are also grateful to Nirmala Kannankutty and Adrian V. McQueen at the National Center for Science and Engineering Statistics (NCSES) at NSF, who shepherded us through the necessary licensing process for the SESTAT data.

An advisory panel was convened to help guide the study at each stage of the process. We are grateful to the panel members—Christopher Hill, Susan Cozzens, Irwin Feller, Terrence Russell, and Nicholas Vonortas—whose input enhanced the evaluation.

The evaluation team is indebted to the fellows, other applicants, hosts and advisors for completing the surveys. Their thoughtful and detailed responses allowed us to field the impact study, and collect a wealth of information on the experiences of participants in the program. We gratefully acknowledge the cooperation and assistance received from the agency officials and program managers in the foreign locations who took the time to speak with us and provide us with their perspectives on the program.

The data collection, analysis and reporting of this material was conducted in accordance with OMB Control No. 3145-0214 (expiration December 31, 2012).

The evaluation included data from the Survey of Doctoral Recipients (SDR) and the National Survey of Recent College Graduates (NSRCG). The use of NSF data does not imply NSF endorsement of the research, research methods, or conclusions in this report.

Introduction

*The scientific and engineering enterprise is itself increasingly global.... International boundaries have become considerably less important in structuring the conduct of research and development.*¹

Students in science and engineering (S&E) are preparing for careers in fields where international partnerships are increasingly important to advancing knowledge and discoveries. It has been over a decade since the National Science Board (NSB) highlighted the importance of international collaboration and called for increased government commitment to promoting international S&E research and education.² NSB called for the National Science Foundation (NSF) to take a leadership role in international S&E research and education activities promoting "...increased participation in international S&E activities by younger U.S. scientists and engineers from diverse backgrounds, especially those in the early stage of their careers, in order to develop an internationally competitive and globally-engaged S&E workforce."³

NSF's East Asia and Pacific Summer Institutes (EAPSI) program, which provides international fellowships to U.S. graduate students in S&E, is one program that helps to further NSF's commitment to support the active engagement of early career S&E researchers in international collaborations.

NSF contracted with Abt Associates to conduct an evaluation of the EAPSI program to investigate whether it was meeting its goal of providing U.S. graduate students with international experiences that will enable future collaboration with foreign peers. This report summarizes the findings from that evaluation, which was designed to investigate the characteristics of EAPSI applicants and their motivations for participation, the host researchers' motivations for participating in the program, participants' experiences in and perceptions of the program, and outcomes of the program. The full evaluation report is available online at <http://www.abtassociates.com/Reports/2012/Evaluation-of-the-East-Asia-and-Pacific-Summer-Ins.aspx>.⁴

¹ National Science Board. 2001. *Toward a More Effective Role for the U.S. Government in International Science and Engineering*. NSB-01-187. National Science Foundation, Arlington, VA., p. 12.

² National Science Board. 2001.

³ National Science Board. 2000. *Toward a More Effective NSF Role in International Science and Engineering, Interim Report*. NSB-00-217. National Science Foundation, Arlington, VA., p. 10

⁴ Martinez, A., Neishi, K. Parsad, A. , Whittaker, K., & Epstein, C. 2012. Evaluation of the East Asia and Pacific Summer Institutes Program: Final Report. Abt Associates Inc., Cambridge, MA.

Summary of Findings

The evaluation found evidence that the EAPSI program is meeting its goals to:

- Introduce U.S. graduate students to East Asia and Pacific science and engineering in the context of a research setting; and
- Help students initiate scientific relationships that will better enable future collaboration with foreign counterparts.

The evaluation also found evidence of broader benefits, finding that the program helps to orient fellows to the host's society, culture, and language, and provides benefits that extend beyond the EAPSI fellows.

Key Findings

To investigate the progress of the program toward its goals, the evaluation paid particular attention to the opportunities for international research collaborations, the experiences that develop research capacity and global perspectives, and the relationships between U.S. and foreign researchers.

1. What are the program experiences of program participants and managers?
2. Does the extent to which former fellows engage in international collaborations differ from that of unfunded applicants?
3. Do fellows' post-award career activities and job characteristics differ from those of unfunded applicants?
4. What are the perceived outcomes of program participation?
5. Do the outcomes of program participation extend beyond the direct participants?

Introduce Students to East Asia and Pacific Science and Engineering Research

Research experiences that included collaborations with foreign scientists at their host sites were central to the fellows' EAPSI program experiences.

- Overall, fellows were satisfied with their EAPSI research activities and interactions with their host. All EAPSI fellows would recommend the fellowship to another graduate student seeking an international experience, 92 percent of advisors would or have recommended the program to other graduate students, and 79 percent of hosts would or have recommended hosting an EAPSI fellow to others.

I believe the EAPSI experience was invaluable to my career. It gave me a unique opportunity I may not otherwise have had. It has shown me that international collaboration can be very fruitful, especially in combining research expertise from my home and host labs. (EAPSI fellow)

- EAPSI offers graduate students an opportunity to conduct research in foreign locations and to establish relationships that they may build on subsequently in their careers. A majority of fellows reported that they were very satisfied with their host's expertise (81 percent) and the match between their research interests and the host's (63 percent).
- A minority of fellows noted difficulties related to their research activities and host interactions. Among the difficulties cited were not enough guidance from the host (17 percent), and being assigned a role that was less than merited by their skills or knowledge (5 percent). Less than 10 percent of hosts reported specific challenges regarding collaborating on research with their fellow.

Initiate Relationships That Enable Future International Collaborations

A key goal of the EAPSI program is to help students initiate scientific relationships that will better enable future collaboration with foreign scientists. Although fellows and unfunded applicants similarly work with individuals in other countries, the evaluation provides evidence that the EAPSI experiences lead to more productive international research collaborations.

- Although EAPSI forges new relationships for the fellows, about half of the fellowships build on some existing relationship. Only 15 percent of hosts reported that they knew their prospective fellow prior to him/her applying. Almost half (45 percent) of the hosts, however, knew the graduate advisor of the prospective fellow.
- Fellows had the opportunity to work with a range of individuals at the host institution. Hosts most frequently reported that their fellow worked with the host (80 percent), graduate students in the host's research group (66 percent), and other scientists in the host's research group (45 percent).
- A majority of the fellows indicated that their relationship with the host has continued beyond the fellowship period, through subsequent research collaborations with the host (20 percent) and/or additional communications (60 percent). Hosts had similar responses to the fellows, as 29 percent stated that they had further collaborated with the fellow and 48 percent had communications with the fellow post-fellowship.
- Unfunded applicants continued to pursue other avenues for their international experiences. EAPSI fellows and unfunded applicants with PhDs held a similar number of international postdoctoral fellowships (0.32 versus 0.28 fellowships, respectively), yet fellows were less likely than unfunded applicants to have been employed outside the U.S. (13 versus 39 percent, respectively).
- Forty percent of fellows and 35 percent of unfunded applicants reported working with individuals located in other countries. Among those who work with a collaborator in a foreign

The EAPSI program allowed the establishment of an on-going collaboration between my lab and that of the U.S. graduate mentor. A peer-reviewed manuscript is under review at the moment from the work completed by the fellow (and the subsequent work by new members of my lab). I am organizing a visit to the U.S. lab by one of my current graduate students as part of this collaboration. (EAPSI host)

country, unfunded applicants were statistically more likely to report that their collaboration included joint publications or jointly developed products (82 versus 92 percent).

- Compared to unfunded applicants, fellows reported a higher number of publications co-authored with a foreign collaborator (2.2 versus 1.6 publications) and a larger proportion of publications that include a foreign co-author (22 versus 17 percent), suggesting that fellows have more productive collaborations with foreign counterparts than do unfunded applicants.
- Benchmarking analyses comparing career outcomes of EAPSI fellows to national estimates for similar S&E PhD graduates found that EAPSI fellows were more likely to be working with individuals in other countries (80 percent of fellows holding a PhD versus 30 percent of the national sample).

Extend Benefits Beyond EAPSI Fellows

The experiences extend beyond the specific participants and seed additional international S&E research activities. As such, EAPSI contributes to NSF's efforts to promote international science and engineering among early career scientists and engineers.

- As reported by host site representatives, host countries become involved in EAPSI to increase research collaborations with the U.S., to establish a research network and ongoing relationships between scientists, and to provide younger researchers from the U.S. with an opportunity to understand the R&D activities in their countries.
- About one-third of fellows reported that other researchers from their home institution became involved in the research project during the EAPSI fellowship.
- EAPSI fellows continue to promote international collaborations after they return to the U.S. More than half of the fellows engaged in activities where they extended the benefits of their EAPSI participation with others, particularly by sharing resources they collected or tools developed during their fellowship (59 percent) and teaching others about the research methods they learned during that time (56 percent).
- Fellows were significantly more likely than unfunded applicants to engage in a series of activities to foster international collaborations among others (40 percent versus 30 percent, respectively).
- Host site representatives identified several benefits of the program for those involved—fellows, other students in the host lab or institution, host researchers, and the host institutions and countries. Respondents commonly cited increased opportunities for collaboration and networking as benefits of participation.

The fellow introduced a new experimental system and a new idea into my group. The experience working on a new experimental system was quite stimulating for me. She worked efficiently, quickly setting up experimental conditions to obtain reliable results, and made successful accomplishments in the short period of her stay. (EAPSI host)

- Host researchers most commonly reported that they agreed to serve as a host in the program because of a shared interest in the prospective fellow's research project (64 percent), an interest in creating an international environment in their research group (59 percent), and to establish or maintain collaboration with a U.S. researcher (57 percent).
- As a result of the EAPSI experience, most hosts identified some benefit; only 11 percent perceived no personal benefits from their participation. The most common benefits selected by respondents included enhanced interest in collaborating with U.S. researchers (31 percent), established or renewed collaborations with other U.S. researchers (30 percent), and published papers based on the research conducted (25 percent).

Additional Findings

The evaluation was also designed to address the following questions:

1. What are the characteristics of people who apply for and participate in the EAPSI program?
2. What motivates individuals to apply for and participate in the program, and what are individuals' experiences during the application process?

The EAPSI applicants represent graduate students with varied backgrounds and motivations for participating in the program.

- Applicants most commonly applied to EAPSI to enhance their skills or knowledge as a researcher (82 percent).
- The majority of EAPSI applicants did not have extensive academic or travel experiences outside the U.S. at the time of application. Thus, through the research opportunities, EAPSI introduced fellows to international experiences. Only 36 percent of applicants participated in study abroad programs as undergraduates or graduate students, and 18 percent had attended elementary or secondary school outside the U.S. Around one-third had lived outside the U.S. for six months or longer (35 percent) or visited or lived in one of the seven EAPSI host locations for a month or longer (30 percent). Less than a quarter of applicants (22 percent) reported that they had attended a research conference outside the U.S.
- A majority of hosts agreed that their research interests were well-matched with those of their fellow (82 percent), and that they and the fellow shared similar goals and expectations for the EAPSI experience (60 percent).

Applicants are also drawn to EAPSI in part because it provides an opportunity to learn about the society, culture, and language of host sites. Nearly all fellows reported participating in cultural and leisure activities while abroad, and a larger majority reported becoming comfortable with the traditions and culture of their host site.

- Applicants commonly reported applying to EAPSI in part to learn about the culture, history, and geography of another country (77 percent), and to conduct research with a specific person or at a specific institution (70 percent).

- Nearly all fellows participated in cultural and leisure activities in their host site which included sightseeing (97 percent), exploring the landscape or geography (91 percent), and visiting museums (89 percent).
- Among fellows placed in primarily non-English speaking host sites—Japan, Korea, Taiwan, and China—67 percent reported some type of language training in preparation for their international fellowship experience. This included self-guided study (47 percent), a formal language training course (23 percent), and working with a conversational partner or tutor (9 percent).
- Communication or language issues were the most frequently cited difficulties that fellows encountered during their fellowship; however, this varied significantly by host site where a greater number of fellows in primarily non-English speaking host sites experienced these difficulties (28 to 44 percent within these sites) than fellows in primarily English-speaking host sites—New Zealand, Australia, and Singapore (0 to 10 percent within these sites).

Evaluation Approach

The evaluation was designed to assess how the EAPSI program contributes to the engagement of early career S&E researchers in international research collaborations. The study incorporated both extant and primary data sources. These included surveys administered to program applicants (both those who received EAPSI fellowships and those who did not), EAPSI foreign hosts, and EAPSI graduate advisors, as well as telephone interviews with EAPSI agency officials and managers at foreign counterpart agencies. The study included both descriptive and comparative analyses, including a rigorous quasi-experimental design to answer the questions about program impacts.

Propensity score analysis (PSA) was used to construct groups of awardees and non-awardees that were statistically similar across a number of pre-existing characteristics, in order to compare the outcomes of fellows to those of unfunded applicants, using pre-award characteristics of applicants to mitigate the potential threat of selection bias. To situate the EAPSI program participants' and applicants' outcomes within the national S&E context, a secondary set of comparative analyses was conducted using data from the Survey of Doctoral Recipients (SDR) and the National Survey of Recent College Graduates (NSRCG). The evaluation also used descriptive analyses to explore the pre-award international research experiences and other characteristics of EAPSI applicants and host scientists; to understand what motivated STEM graduate students to apply for an EAPSI fellowship and what led EAPSI host scientists to host a fellow to describe the perceptions and role of EAPSI advisors; and to describe the experiences of EAPSI participants (i.e., fellows and hosts), both during and after the period of the fellowship.

Summary

The evaluation of EAPSI examined the characteristics and motivations of EAPSI participants, the opportunities for professional and personal growth provided through EAPSI, and the professional outcomes related to the program. Findings from this study provide evidence that EAPSI is contributing to NSF's efforts to help develop an internationally competitive and globally engaged

S&E workforce. Specifically, the evaluation found evidence that EAPSI is meeting its goals: to introduce U.S. graduate students to East Asia and Pacific S&E in the context of a research setting and help students initiate scientific relationships that will better enable future collaboration with foreign counterparts. The evaluation also found evidence of ancillary benefits of the program, which include orienting fellows to the host's society, culture, and language, and providing opportunities whose benefits extend beyond the EAPSI fellows. Below, the program's progress toward its stated goals as well as its broader influences are summarized.

Introduce Students to East Asia and Pacific Science and Engineering Research

Research experiences that included collaborations with foreign scientists at their host sites were central to the fellows' EAPSI program experiences. The majority of EAPSI applicants did not have extensive academic or travel experiences outside the U.S. at the time of application. Thus, through the research opportunities, EAPSI introduced fellows to international experiences.

Reflecting the globalization of science, both home departments and host departments were generally supportive of international research. Both fellows and unfunded applicants reported being attracted to the program because it offered them an opportunity to enhance their skills and knowledge as a researcher. The fellowships provided opportunities for fellows to engage in research activities independently as well as collaboratively, and fellows reported being satisfied with the various aspects of their research and their interactions with their hosts. Overwhelmingly, EAPSI fellows would recommend the fellowship to other graduate students seeking an international experience.

Graduate students apply to EAPSI because they are interested in pursuing an international research experience. Several findings suggest that unfunded applicants continue to pursue other avenues for their international experiences. Among EAPSI applicants who held a PhD, EAPSI fellows and unfunded applicants held a similar number of international postdoctoral fellowships, and EAPSI fellows were less likely than unfunded EAPSI applicants to have been employed outside the U.S.

Initiate Relationships That Enable Future International Collaborations

A key goal of the EAPSI program is to help students initiate scientific relationships that will better enable future collaboration with foreign scientists. The evaluation provided evidence that the fellows initiate scientific collaborations during their fellowships and that fellows and advisors perceived the fellowships as expanding the opportunities available to fellows. Over half of the fellows indicated that their participation led to valuable connections to researchers outside the U.S., and the majority of host and fellows reported follow-up communications or collaborations after the fellowship had ended.

Fellows also continue productive working relationships with individuals outside the U.S. Although unfunded applicants who work with a collaborator in a foreign country were more likely than fellows to characterize their collaborations as ones that involved joint publications or jointly developed products, for actual products, fellows reported a higher number of publications and a

higher proportion of their publications that were co-authored with a foreign collaborator, providing evidence that the EAPSI experiences lead to more productive international research collaborations.

Orient Fellows to Host Society, Culture, and Language

Applicants are also drawn to EAPSI in part because it provides an opportunity to learn about the society, culture, and language of host sites. Nearly all fellows reported participating in cultural and leisure activities while abroad, and a larger majority reported becoming comfortable with the traditions and culture of their host site.

Many fellows who went to locations where English is not a major language reported engaging in language training. Nonetheless, some fellows still reported challenges related to communication and language, although most hosts did not report challenges related to the lack of familiarity.

Extend Benefits Beyond EAPSI Fellows

The EAPSI fellowship experience and benefits also extend to researchers in the U.S. For example, during the EAPSI fellowships, about one-third of fellows reported that other researchers from their home institution became involved in the research project. They continue to promote international collaborations after they return to the U.S.; specifically, the evaluation found that fellows were more likely than unfunded applicants to engage in a series of activities to foster international collaborations among others.

Among the reasons that foreign locations gave for becoming involved in EAPSI were to increase research collaborations with the U.S. and to establish a research network and ongoing relationships among scientists. Hosts, also, were drawn to EAPSI both by their interest in the research projects of the fellows and by the benefits they feel might accrue to their research groups in addition to themselves. Some pointed to specific benefits such as increased interest in collaborating with U.S. researchers and/or new or renewed collaborations with U.S. researchers.

Conclusion

The evaluation demonstrated that participants derive benefits from the program, on both an individual and a collective basis. EASPI fellows and hosts recommend the EAPSI program to their colleagues, and EAPSI U.S. advisors would also encourage additional students to participate. EAPSI offers graduate students an opportunity to conduct research in foreign locations and to establish relationships that they may build on subsequently in their careers. The experiences also extend beyond the specific participants and seed additional international S&E research activities. As such, EAPSI contributes to NSF's efforts to promote international S&E among early career scientists and engineers.