CHAPTER 4

Trainees — Broadening Participation

The current science and engineering workforce is aging. To meet the continuing, strong demand it will be important that every American has the opportunity to achieve in mathematics and science. Women, minorities and persons with disabilities remain underrepresented in STEM professions while they are an increasing percentage of the U.S. overall workforce.

— NSF Strategic Plan

IGERT trainees represent a cross-section of America. As a program, IGERT takes very seriously the solicitation mandate to facilitate diversity in student participation and preparation, and to contribute to a world-class, broadly inclusive, and globally engaged science and engineering workforce. Mandated by Congress that trainees must be citizens or permanent residents, a critical part of review criteria for all IGERT proposals is the recruiting and retention plan, not only for the best students, but explicitly for women and underrepresented minorities.

One-thousand five-hundred nineteen (1,519) trainees were funded in 2006-2007 by the IGERT program overall across 136 active IGERTs. One-hundred fifty-four (154) trainees received their doctoral degrees through the 136

active IGERTs reporting in 2006-2007 (84 male; 65 female; 5 gender not reported; 9 underrepresented minorities). Eighteen (18) trainees chose to complete a master's degree (10 male; 6 female; 2 gender not reported; 7 underrepresented minorities).[3] Table 10 shows the alignment of IGERT trainees with research themes of importance to the nation, as outlined in Chapter 1.[4]

When asked to compare the quality of their IGERT trainees to their other graduate students, 94.85% of IGERT PIs rated IGERT trainees as far superior or somewhat better than their usual graduate students.

1. Far superior to our usual graduate students: 27.94%

2. Somewhat better than our usual graduate students: 66.91%

3. About the same as our usual graduate students: 4.41%

4. Somewhat less promising or less successful than our usual graduate students: 0%

5. Much less promising or less successful than our usual students: 0%

The remainder of this chapter will detail trainee demographic data with comparison to national data, in so far as is possible. This will include comparisons by discipline which is the most meaningful comparison to illustrate the way in which IGERT is raising the bar for broadening participation by diverse groups in STEM.

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[3] Reporting of gender and minority status is completely voluntary by trainees. Compliance rates vary for gender, race, and ethnicity.

[4] NOTE: Themes are overlapping and one IGERT may cover multiple theme areas. Hence trainees may be multicounted.

Table 10: Alignment of Trainees With Research Themes

TOPICS	# Trainees
Sustainability: ecology and the environment	488
Computational science and engineering	476
Human and social dimensions of new knowledge and technology	488
Nanoscience: engineering and technology	287
Energy: alternate and renewable resources and conservation	44
Materials science and engineering	305
Bioinformatics	96
Civil infrastructure monitoring and improvement	12
Entrepreneurialism	224
Neuroscience: biology and psychology	71
Climate change: impacts and factors	76
Biological evolution and development	92
Diverse device development	292
Sensing, signals, imaging and signal processing	176

IGERT Trainees: Comparisons to National Data Sets

Accurate comparison of IGERT trainee data to national data requires defining a national data set that most closely resembles IGERT trainee demographics. Specifically, IGERT trainees are all declared doctoral students, as no master's students are currently supported, and must be U.S. citizens or permanent residents. Data for comparison selected to be as close as possible to these demographic requirements for IGERT are from the NSF compilation of 2005 doctorates awarded by sex, citizenship status, and major field of study of the recipients.[5] While not identical to the IGERT trainee data for 2006-2007 in that IGERT trainees are still in a graduate program, this is the only data set which allows for control of the variables of doctoral program, citizenship status, gender, and race/ethnicity — major variables for meaningful comparisons to IGERT trainees.

To enable more detailed comparison of IGERT data with national data, both overall statistics by gender, race, and ethnicity as well as a detailed breakdown analysis of IGERT trainees by major field of study using the fields described in the national data set have been compiled. To determine field of study for individual trainees, the department in which the trainee is currently enrolled was used as a proxy for the analysis.

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[5] NSF SRS data Table 3: Doctorates awarded, by sex, citizenship status, and major field of study of recipients: 1996-2005.

Table 11 illustrates that for race/ethnicity IGERTs are ahead of national data in meeting the goal of the Solicitation in facilitating diversity in student participation and preparation, and to contribute to a world-class, broadly inclusive, and globally engaged science and engineering workforce. As the table shows, for gender, IGERTs are similar to national data overall.

Table 11: IGERT Trainees Compared with National NSF Data for Gender, Race and Ethnicity

	# IGERT Trainees	IGERT %	Science Resources Statistics (SRS) National Data %
Gender			
Female	635	41.8	44.5
Male	876	57.7	55.4
Not reported	8	.5	——
Race/Ethnicity [6]			
American Indian/Alaskan Native	18	1.2	0.4
Black or African American	82	5.4	4.4
Hispanic or Latino	91	5.9	5.0
Asian, Native Hawaiian & other Pacific Islanders	129	8.5	No comparable SRS data
White	1,101	72.5	76.6
Not reported	151	9.9	——

When analyzed by race and ethnicity, *IGERT trainee data exceeds or is equal to national data for 70% of all fields* (Table 12).[7] For females, when broken down by field, IGERT is *engaging more females into nontraditional fields for the gender. IGERTs exceeded national data for females in 80% of fields and were slightly lower in 20% of fields* (Table 13). Table 14 summarizes the alignment of male IGERT trainees by field with national data. Tables 13 and 14 also convey information about the concentration of fields for the 2006-2007 IGERT grants.

For IGERT trainees there was a 9.9% non-report rate for race/ethnicity and a 1.3% non-report rate for field of study. Among females there was a 1.1% non-report rate for field of study. Among males, the field non-report rate was 1.4%.

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[6] Count will exceed the total of 1,519 trainees due to trainee double race/ethnicity.

[7] IGERT trainee data exceeds national data 50% of the time for all fields.

Table 12: IGERT Trainees' Race and Ethnicity by Field of Study Compared to National Data[8]

Field of Study	% American Indian, Alaskan Native IGERT*	% American Indian, Alaskan Native SRS	% Black or African American IGERT*	% Black or African American SRS	% Hispanic or Latino IGERT*	% Hispanic or Latino SRS	% White IGERT*	% White SRS	% Asian, Native Hawaiian & other Pacific Islanders IGERT***
Aeronautic & Astronautics Engineering	0.00	0.07	0.00	0.01	0.00	0.04	**7.00**	0.46	0.00
Astronomy	**0.00**	0.00	0.00	0.01	0.00	0.02	0.00	0.62	0.00
Biological Sciences	**0.46**	0.07	0.86	0.99	**1.51**	1.42	16.13	20.83	1.80
Chemical Engineering	**0.07**	0.00	**0.26**	0.09	**0.79**	0.13	**5.00**	1.48	0.60
Chemistry	**0.20**	0.01	**1.12**	0.26	**0.46**	0.34	**7.50**	5.97	0.70
Civil Engineering	**0.00**	0.00	0.00	0.06	**0.13**	0.07	**2.37**	1.19	0.13
Computer Sciences	0.00	0.006	0.00	0.09	**0.13**	0.07	**3.69**	2.04	0.80
Earth, Atmospheric and Ocean Science	**0.07**	0.02	**0.26**	0.04	**0.39**	0.11	**3.75**	2.396	0.20
Electrical Engineering	0.00	0.02	**0.20**	0.193	**0.13**	0.09	**2.76**	2.196	0.30
Industrial Engineering	**0.00**	0.00	**0.07**	0.05	0.00	0.01	**0.66**	0.31	0.13
Mathematics	**0.00**	0.00	0.07	0.14	**0.13**	0.10	2.30	2.58	0.06
Mechanical Engineering	**0.07**	0.02	**0.39**	0.07	**0.20**	0.08	**1.71**	1.48	0.40
Other Engineering**	**0.07**	0.006	**0.86**	0.12	**0.66**	0.069	**7.97**	1.97	1.60
Physics	0.00	0.01	**0.46**	0.07	**0.26**	0.099	**4.67**	2.78	0.50
Psychology	0.07	0.09	0.07	1.02	0.53	1.17	1.84	14.27	0.13
Social Sciences	**0.13**	0.12	0.79	1.05	0.66	0.93	11.45	12.08	1.10

* NOTE: In Tables 12, 13 and 14, bolded numbers indicate that IGERT trainee data exceeds or is equal to national data. The data for all IGERT columns are calculated using the following formula: (# IGERT Trainees with that field as their home department for their doctoral degree and associating themselves with the specific demographic group / Total # of IGERT trainees in 2006-2007 reporting period) X100. There are 1519 IGERT Trainees in this reporting period. The data for all SRS columns are calculated using the following formula: (# doctorates earned in that field by the demographic group indicated as reported for 2005 / Total # of doctorates earned in S&E) X100. (Footnote 8 below). This data set was selected for its closest alignment with IGERT trainees – all of whom must be US citizens or permanent residents and are pursuing doctoral degrees. The data show 16024 earned doctorates across all fields for 2005. We acknowledge the lack of perfect alignment of this data set and that of IGERT trainees.

** NOTE: The "other engineering" category is comprised primarily of biomedical engineering.

*** NOTE: There are no comparable SRS data for this category.

Table 13: Comparison by Field of Female Trainees With National Data

Field of Study	% of Females – IGERT*	% Females – National Data
Astronomy	**0.2**	0.2
Biological Sciences	11.7	13.5
Engineering:		
Chemical Engineering	**2.2**	0.5
Electrical Engineering	**0.8**	0.5
Civil Engineering	**1.4**	0.5
Industrial Engineering	**0.3**	0.1
Mechanical Engineering	**0.7**	0.3
Other Engineering	**4.7**	0.7
Chemistry	**5.2**	2.8
Computer Sciences	**1.0**	0.7
Earth, Atmospheric, Ocean	**2.9**	1.0
Mathematics	**1.0**	0.9
Physics	**1.3**	0.5
Psychology	1.1	12.4
Social Sciences	7.0	8.1

Table 14: Comparison by Field of Male Trainees With National Data

Field of Study	% of Males – IGERT*	% Males – National Data
Astronomy	0.0	0.5
Biological Sciences	9.7	13.9
Engineering:		
Aeronautic & Astronautics Engineering	0.3	0.5
Chemical Engineering	**4.2**	1.5
Electrical Engineering	**3.1**	3.0
Civil Engineering	**1.2**	1.1
Industrial Engineering	**0.6**	0.37
Mechanical Engineering	**2.5**	1.7
Other Engineering	**7.3**	2.1
Chemistry	**5.8**	4.8
Computer Sciences	**10.7**	2.3
Earth, Atmospheric, Ocean	**2.4**	1.7
Mathematics	1.7	2.4
Physics	**4.8**	3.0
Psychology	1.4	5.6
Social Sciences	**8.2**	7.8

* NOTE: In Tables 12, 13 and 14, bolded numbers indicate that IGERT trainee data exceeds or is equal to national data.