4. GRT PROGRAM OUTCOMES

T wo types of GRT program outcomes were examined for this chapter: GRT trainee outcomes and GRT project/institutional outcomes. Trainee outcomes tracked by the Distance Monitoring System include trainee achievements, trainee Ph.D. completion, years required to complete Ph.D., employment status of trainees who completed Ph.D.s, trainee attrition and the reason for attrition, and employment status of trainees who left GRT program prior to Ph.D. completion. GRT project/institutional outcomes recorded in the System include course features developed by or resulting from the GRT project.

GRT Trainee Outcomes

Trainee Achievements. Projects reported in 1998 that about 55 percent of GRT trainees had at least one academic achievement during their years in the GRT program (Appendix Table A-13), essentially the same as the 56 percent for 1997 in the Baseline Report. The most common achievements were presentations and journal articles; very few trainees had patents, books, or book chapters. The percentage of trainees who had at least one achievement increased from 45 percent for the 1992 cohort to 71 percent for the 1995 cohort. This increase, however, may be partly attributable to the difficulty of obtaining citations on achievements from the earlier years of the projects for entry into the monitoring system during the 1997 reporting year. The average number of achievements per trainee in 1998 was 2.2. The average number of achievements per trainee varied considerably by broad focus area. Trainees in Education and Human Resources had the highest number of achievements per trainee (5.0), followed by Biological Sciences (2.5), and Engineering (2.1).

Trainee Ph.D. Completion. By 1998, the cumulative percentage of GRT trainees who had completed their Ph.D.s (Table 9) was about 12 percent, almost double the cumulative completion rate by 1997 reported in the Baseline Report. As expected, Ph.D. completion rates decreased for each cohort, from 23 percent of trainees in the 1992 award cohort to 5 percent of trainees in the 1995 award cohort (Appendix Table A-14). Overall, cumulative completion rates in 1998 were similar for male and female trainees (13 percent and 12 percent, respectively), while in 1997, the completion rate for females was about 5 percent compared to 7 percent for males. By 1998, the cumulative percentage of minority

trainees who had completed their degrees by 1998 was only 4 percent, compared to 13 percent of nonminorities, a difference of 9 percent. In 1997, the difference between the cumulative completion rates for these two groups was only 5 percent.

Completion rates also varied by broad focus area. They were highest among trainees in Mathematical and Physical Sciences (17 percent) and Biological Sciences (14 percent), and lowest for trainees enrolled in Engineering (8 percent) and Social, Behavioral, and Economic Sciences (7 percent) programs.

Table 9
GRT trainee Ph.D. completion: Reporting years 1997 and 1998

Trainee characteristic	All cohorts: 1997	All cohorts: 1998
Total trainees who completed Ph.D.	86	194
Percentage of trainees who completed Ph.D.	6.5%	12.2%
Gender		
Male..	7.4	12.6
Female	4.9	11.6
Minority status[1]		
Minority..	1.9	3.9
Nonminority	6.7	12.9
Disability status		
Disabled..	NA	12.5
Not disabled..	NA	12.2
Broad focus area		
Biological Sciences (BIO)	9.1	14.0
Computer and Information Sciences and Engineering (CISE)	8.9	11.7
Education and Human Resources (EHR)...	1.6	12.0
Engineering (ENG)..................................	1.8	7.6
Geosciences (GEO)	10.6	13.8
Mathematical and Physical Sciences (MPS)..	7.7	16.9
Social, Behavioral, and Economic Sciences (SBE).....................................	4.8	6.6

NA = not available.

[1]Race was coded as minority if race/ethnicity was reported as black, Hispanic, Pacific Islander or American Indian/Alaskan Native. Race was coded as nonminority when race/ethnicity was reported as white or Asian.

SOURCE: GRT Distance Monitoring Survey System. Surveys completed in 1997 and 1998.

Years Required to Complete Ph.D. The 1998 cumulative data show that the average time required to complete a Ph.D. (5.5 years) did not vary by gender or minority status (Appendix Table A-15). However, disabled trainees took longer to graduate than did nondisabled trainees, and trainees enrolled in Education and Human Resources and Social, Behavioral, and Economic Sciences programs took longer to graduate than trainees in other fields of study.

Overall, the number of years required for GRT trainees to complete their Ph.D.s[9] has decreased since the 1997 reporting year (Table 10). Appendix Tables A-16 through A-18 present the cumulative number of years required for GRT trainees to complete the GRT Ph.D. by cohort overall, by gender and minority status, and by broad focus area.

Table 10
Years required for GRT trainees to complete Ph.D.: Reporting years 1997 and 1998

Years to complete Ph.D.	All cohorts: 1997	All cohorts: 1998
Total trainees who completed Ph.D.	86	194
Years to complete Ph.D.		
3 years or less	1.9%	8.2%
4 years.....................................	9.6	12.9
5 years.....................................	44.6	25.3
6 years.....................................	34.4	28.9
7 or more years	3.2	19.1

NOTE: Percents may not add to 100 because of rounding and/or data not reported or missing.
SOURCE: GRT Distance Monitoring Survey System. Surveys completed in 1997 and 1998.

Employment Status of Trainees Who Completed Ph.D.s. Appendix Tables A-19 through A-21 show cumulative 1998 data on employment status of GRT trainees who completed their Ph.D.s, by award cohort overall, by gender and minority status, and by broad focus area. The data indicate that almost half of the 194 trainees who completed their GRT Ph.D.s by the 1998 reporting year were in postdoctoral positions. Most of the others were employed as educators (19 percent) or by private organizations (22

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[9] The average time that students receive GRT funding (15.7 months) is less than the number of years required to complete a Ph.D. (1997 GRT survey data).

percent). These data were not collected quantitatively in 1997, so comparisons between the reporting years are not possible.

Postgraduate employment status did not vary by gender. It did, however, vary by minority status. Minority graduates were more likely to be employed in education or government than were nonminority graduates, but they held no positions in private or other employment. Employment status of GRT graduates also varied by broad focus area. In reporting year 1998, 60 percent of Social, Behavioral, and Economic Sciences graduates were employed in education, compared to 12 percent each of Engineering and Geosciences graduates (Appendix Table A-21). Nearly 77 percent of Biological Sciences graduates were in postdoctoral positions, compared to 31 percent of Engineering graduates. The largest proportion of Engineering graduates were working in private employment (50 percent); in contrast, only 4 percent of Biological Sciences graduates were privately employed.

Trainee Attrition. By 1998, the cumulative percentage of all trainees who discontinued their participation in GRT before attaining a Ph.D. was 18 percent, compared to a cumulative 10 percent in 1997 (Table 11). Attrition rates increased in all broad focus areas, even doubling in Computer and Information Sciences and Engineering, Engineering, and Geosciences. Both the 1997 and 1998 cumulative data indicate that male and female trainees discontinued their GRT study at about the same rate, but minority trainees had a higher attrition rate than nonminority trainees—overall, 24 percent for minority trainees and 17 percent for nonminority trainees. Attrition rates were also higher for disabled trainees in the 1998 data (25 percent) than for nondisabled trainees (17 percent). The total number of disabled trainees, 16, was very low, however, so these percentages should be viewed from that perspective.

Table 11
GRT trainee attrition prior to Ph.D. completion: Reporting years 1997 and 1998

Trainee characteristic	All cohorts: 1997	All cohorts: 1998
Total trainees who terminated Ph.D.	126	280
Percentage of trainees who terminated Ph.D.	9.6%	17.5%
Gender		
Male...	9.7	17.1
Female	9.8	18.7
Minority status[1]		
Minority.....................................	14.7	23.5
Nonminority	9.2	16.8
Disability status		
Disabled....................................	NA	25.0
Not disabled..............................	NA	16.6
Broad focus area		
Biological Sciences (BIO)	5.4	10.5
Computer and Information Sciences and Engineering (CISE)	13.3	23.4
Education and Human Resources (EHR)...................	4.8	6.0
Engineering (ENG).....................	14.5	29.1
Geosciences (GEO)	4.2	10.6
Mathematical and Physical Sciences (MPS)......................	12.3	19.5
Social, Behavioral, and Economic Sciences (SBE)......	8.6	16.4

NA = not available.

[1]Race was coded as minority if race/ethnicity was reported as black, Hispanic, Pacific Islander or American Indian/Alaskan Native.   Race was coded as nonminority when race/ethnicity was reported as white or Asian.

SOURCE: GRT Distance Monitoring Survey System. Surveys completed in 1997 and 1998.

Reasons for Attrition. Appendix Table A-22 presents cumulative attrition data by award cohort, and Appendix Tables A-23 through A-25 show reasons for attrition by overall award cohort, gender and minority status, and broad focus area. These data help explain certain attrition trends. For example, 22 percent of the 1993 cohort stopped their pursuit of the GRT Ph.D. About 54 percent of the trainees in that cohort who left did so to pursue employment. In that cohort, there were seven projects in Human Computer Interface or Robotics, nine in Engineering, five in Hydrology, and

eight in Mathematical and Physical Sciences' integrative high-performance computing or environmental areas. In all of these fields, industry employment may be a more lucrative option than academic positions, perhaps explaining the high attrition rate.[10]

Analysis of attrition data by broad focus area also supports the theory that attrition rates may correspond with lucrative employment options in certain fields. In both the 1997 and 1998 cumulative data sets, attrition rates were higher than the overall GRT program average in the fields making up Engineering, Mathematical and Physical Sciences, and Computer and Information Science and Engineering graduate study. The 1998 data showed that the most common reason overall for trainees to leave the GRT program was to pursue employment (45 percent) (Appendix Table A-23). More than half of the Engineering and Computer and Information Science and Engineering trainees who left the GRT program did so to pursue employment (Appendix Table A-25).

Overall, men were more likely than women to leave the program to pursue employment (although that was not the case in every cohort). Similarly, nonminorities were more likely than minorities to leave to pursue employment overall, but not in every cohort (Appendix Table A-24).

The cumulative 1998 data indicate that the second most common reason for leaving the GRT program was to pursue other academic interests (27 percent). This reason was given by roughly equivalent percentages of men and women and of minorities and nonminorities. However, this reason varied greatly according to broad focus area; 80 percent of Education and Human Resources trainees who left the program did so for this reason, while only 12 percent of Social, Behavioral, and Economic Sciences trainees who left did so for that reason (Appendix Table A-25).

Very few (about 8 percent) trainees left the program due to family or economic problems. Women were twice as likely as men to leave for family or economic problems, and nonminorities were slightly more likely than minorities to leave for that reason. Overall, only 6 percent of trainees left because they failed to meet program requirements. However, minorities were more likely than nonminorities to fail to meet requirements (14 percent compared to 5 percent).

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[10] Staff of the Engineering Directorate's Engineering Workforce Commission state that in the engineering field, persons whose highest degree is a master's (sometimes in combination with another type of graduate degree) are very likely to obtain extremely interesting employment opportunities.

Employment Status of Trainees Who Left GRT Program Prior to Ph.D. Completion. Employment data for trainees who left the GRT program before Ph.D. completion were collected as text in 1997, so comparisons between the baseline and 1998 data are not feasible. The cumulative 1998 data showed that trainees who had left the GRT program prior to completing their degree were most likely to be employed in the private sector (39 percent) (Appendix Table A-26). Employment status was unknown for another 19 percent of former trainees. The other former trainees were in school either at the GRT institution or elsewhere, or employed in the public sector or an academic setting.

Appendix Tables A-27 and A-28 show employment status of former trainees by gender and minority status and by broad focus area. Males were more likely than females to be employed in the private sector, while females were more likely to be employed in the public sector. Females were also more likely than males to be enrolled in another graduate program at the GRT institution. The number of minority trainees who left the GRT program is very small (ranging from 7 to 16 over the various cohorts), so comparisons between minority and nonminority trainees in these tables should be made in light of this fact.

Former trainees enrolled in Computer and Information Science and Engineering, Engineering, and Social, Behavioral, and Economic Sciences were more likely than former trainees in the other broad focus areas to be employed in the private sector. Small numbers of former trainees in other employment or educational settings prohibit other comparisons between broad focus areas.

GRT Project/ Institutional Outcomes

GRT Course Features. Projects provided information about "institutional impact," defined in the Distance Monitoring System as "those course and/or curriculum accomplishments that will remain with a department after the GRT project has ended." Table 12 provides an overview of new course features attributable to GRT; Appendix Table A-29 presents those data by award cohort. As of the 1997 reporting year, 249 new courses had been developed by all projects from the start of their implementation. During the 1998 reporting year, those projects added another 79 new courses. The projects instituted 145 new requirements for trainees to complete in order to earn a doctorate as of the 1997 reporting year; they added another 42 during the 1998 reporting year. Projects reported 140 new interdepartmental offerings in the 1997 data, and an additional 35 in the 1998 data. Finally, they reported 527 seminars, workshops, and conferences in 1997, and another 130 in 1998.

Table 12
Number of GRT course features: Reporting years 1997 and 1998

Course feature[1]	Implemented 1992-97	Implemented 1998 reporting year
Total number of project awards ...	157	157
New courses[2] developed by GRT project	249	79
New requirements[3] resulting from GRT project..................................	145	42
New interdepartmental offerings[4] resulting from GRT project..........	140	35
Seminars, workshops, conferences resulting from GRT project	527	130
Other...	NA	30
Total new GRT course features	1,061	316

NA = not available.

[1]Projects may report multiple new course features. Numbers reflect counts of new course features, rather than counts of projects reporting new course features.

[2]The number of new course requirements developed by a department to serve the primary GRT subfocus area.

[3]The number of new requirements developed by a department for a trainee to complete a doctorate in the primary GRT subfocus area.

[4]The number of interdepartmental courses developed to serve the primary GRT subfocus area.

SOURCE: GRT Distance Monitoring Survey System. Surveys completed in 1997 and 1998.

Overall, 28 percent of projects reported developing one or more new courses during the 1998 reporting year (Appendix Table A-30). The percentages of projects that reported at least one new GRT course feature was lowest for the 1992 cohort projects, higher for each of the next two cohorts, then slightly lower for the 1995 cohort. In addition, during the 1998 reporting year, 9 percent of projects had added new course requirements, 17 percent added new interdepartmental offerings, and 39 percent added at least one seminar, workshop, and/or conference resulting from their GRT award.