(April 2009)

Research in Disabilities Education Program Evaluation: Study 1 Methods and Results

GSA MOBIS Contract No. GS-10F-0554N 04 Mod. 002
NSB 0353574
SRI P17606.012

Prepared for:
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Section I: Introduction

The National Science Foundation (NSF) is interested in determining the effectiveness of its Research in Disabilities Education (RDE) program in meeting its goals and objectives. In 2007 NSF commissioned SRI International to develop a menu of evaluation options for the RDE program to answer five broad research questions. (See Appendix A, Evaluation Options for the Research in Disabilities Education Program, 2007, p. 5.). Subsequently, NSF commissioned SRI to conduct a preliminary evaluation with the primary purpose of providing data to be used to create a full RDE program evaluation. Another purpose of the evaluation was to provide preliminary information to NSF for reporting to federal entities such as the Academic Competitiveness Council and the Office of Management and Budget. In June 2008, SRI presented its findings at NSF's Joint Annual Meeting at the OMNI Shoreham Hotel in Washington, D.C. This report presents and builds on those findings.

Statement of the Problem

Sustaining the country's global leadership in science, technology, engineering, and mathematics (STEM) remains a top priority for policymakers in the United States. Since its inception in 1950, NSF has played a significant role in maintaining U.S. preeminence in STEM research and innovation. In December 2005, in its bold new 2020 Vision for the National Science Foundation, the National Science Board (2005) articulated three strategic priorities for NSF:

1. Ensure the nation maintains a position of eminence at the global frontier of fundamental and transformative research, emphasizing areas of greatest scientific opportunity and potential benefit.
2. Sustain a world-class science and engineering workforce and foster scientific literacy for all our citizens.
3. Build the nation's basic research capacity through critical investments in infrastructure, including advanced instrumentation, facilities, cyber-infrastructure, and cutting-edge experimental capabilities.

Integral to the success of these priorities is the imperative to improve the STEM education and training of all Americans and to access previously untapped sources of STEM talent. According to the Committee on Equal Opportunities in Science and Engineering (CEOSE, 2006, p.1), "Women, underrepresented minorities, and persons with disabilities constitute the largest untapped pool of potential American scientists, engineers, technologists, mathematicians, and technicians."

The Division of Human Resource Development (HRD) is one of four divisions[1] within the NSF Directorate for Education and Human Resources (EHR). HRD serves as a focal point for enhancing the quality and excellence of STEM education and research through broadening and enhancing the participation of underrepresented groups in institutions from high school to associate- and baccalaureate-level study and from undergraduate STEM programs to graduate degrees. The Research in Disabilities Education (RDE) program[2] within HRD has been performing this role for individuals with disabilities since 1994.

Barriers often associated with including individuals with disabilities in STEM majors and careers still exist, however. Specific barriers include the following:

- Low expectations and insufficient access to challenging academic curricula in science and math (Wolanin & Steele, 2004)
- Low enrolment of individuals with disabilities in postsecondary institutions after leaving high school (Wagner, Newman, Cameto, Levine, & Garza, 2006)
- Low enrolment of individuals with disabilities in STEM undergraduate fields (NCES, 2003)
- High rates of students with disabilities leaving college without earning a degree (Belch, 2004; Nutter & Ringgenberg, 1993; U.S Department of Education, 1999; Wolanin & Steele, 2004)
- Lack of quality data related to the number of individuals with disabilities enrolled in postsecondary institutions in STEM majors and in the workforce (Hall & Belch, 2000; Kroeger & Schuck, 1993; Wolanin & Steele, 2004).

The goals and structure of the RDE program were designed to rectify the long-standing underrepresentation of individuals with disabilities in STEM careers by emphasizing two related goals: (1) increasing the number and quality of students with disabilities successfully completing associate, undergraduate, and graduate degrees in STEM and (2) increasing the number of students with disabilities entering the professional STEM workforce.

Brief Description and Overview of the NSF RDE Program in 2008

The RDE program supports three tracks to achieve its goals:

- The Demonstration, Enrichment, and Information Dissemination (RDE-DEI) program track provides support to institutionalize accessible products and educational materials, enhance STEM learning experiences for students with

[1] Graduate Education, Undergraduate Education, Learning in Formal and Informal Settings, and Human Resource Development

[2] Previously called the Program for Persons with Disabilities Program

disabilities, and disseminate information about effective products, pedagogical approaches, teaching practices, and research for broadening the participation of people with disabilities in STEM.

- The Focused Research Initiatives (RDE-FRI) program track supports promising research on assistive technology development, technology use in educational environments, and investigations of effective instructional methods and practices in STEM for people with disabilities.
- The Regional Alliances for Persons with Disabilities in STEM Education (RDE-RAD) program track provides support for comprehensive multidisciplinary networks that increase the quality and quantity of students with disabilities completing associate, baccalaureate, and graduate degrees in STEM who then will be well prepared for science and engineering research, education, and professional workforce.

RDE has funded a range of proposals across these three award tracks, with individual projects active in the K-12 education system, the postsecondary arena, and STEM employment environments. Based on a review of recent awards made by the RDE program, from 2002-2007 RDE has made 56 awards across the three tracks with an additional 14 awards co-funded within NSF. Twenty-nine awards were made under the FRI track, 23 under the DEI track, and 4 under the RAD track.

Projects funded under the RDE program cover a wide array of activities and serve students with a range of disabilities. Projects may be directed toward students with a broad spectrum of disabilities—for example, an RDE-FRI project to enhance the capacities of STEM teachers in high schools and a resource directory of scientists and engineers with disabilities. Other projects target a specific disability category. For example RDE-DEI is funding projects to open chemical engineering design to students with visual impairments and to promote educational access to STEM for deaf students. Some projects provide resources, such as the RDE-DEI project to compile resources for teaching students who are blind or visually impaired in STEM and to build a web portal for general education teachers, teachers of blind and visually impaired students, parents, and students. Others increase access to STEM, such as the automated microscope workstation for students with mobility and visual impairments, funded through the RDE-FRI track. The RAD projects are funded on a larger scale than those funded under the other two tracks. RADs create partnerships with 2 year and 4 year colleges, pre-college educational entities, government research laboratories, state and government agencies, STEM businesses and industries, and professional organizations.

Although RDE supports a range of initiatives, in FY 2008 the program expended the majority of its funds, about 60% on the awards made in the RAD track. To date, the RDE program has funded four RADs in different geographic regions: New Mexico State University (RASEM2, Southwest), University of Washington (AccessSTEM, Northwest), the University of Southern Maine (EAST, Eastern), and the University of Wisconsin-Madison (MIDWEST, Midwest).

To help RDE determine how effective its programs are, NSF commissioned SRI International to develop a menu of evaluation options. SRI suggested that the RDE program evaluation answer five broad research questions (Appendix A, Menu of Evaluation Options for the Research in Disabilities Education Program, 2007, p. 5.). NSF indicated that it was commissioning SRI to pursue a preliminary evaluation in two phases. Phase 1, the subject of this report, was to focus on two specific evaluation questions identified in the *Menu of Evaluation Options*. These questions are:

- What are the participation trends for persons with disabilities who were recipients of the RDE program for entering the STEM workforce compared with recipients not receiving RDE support? What are the trends for recipients and nonrecipients to stay in a STEM career?
- What components of the RDE program are likely to contribute to achieving its desired results? What are the barriers and opportunities for using promising program features?

Further clarification from NSF (Dr. Wyn Jennings, personal communication, March 4, 2008) indicated that the first phase should use the extant data on undergraduate students served by two of the RADs and interviews with past participants to answer the following questions:

- What were the 3 contiguous years (within the last 6 years) in which the project had the highest number of participants?
- For these 3 years, how many people with disabilities participated in the two RAD projects?
- What were their demographic characteristics (gender, disability type, and race/ethnicity)?
- For a sample of these past participants, what were their perceptions of the importance of RAD services and supports relative to retention and progression to degree?

Section II of this report presents the methodology followed to carry out Phase 1 of the evaluation. NSF identified two of the four RADS, AccessSTEM and RASEM2, for this phase of the study, as they had been funded for the longest period of time and thus had outcome data for analysis.

Section II: Study Methodology

SRI used a case study approach with qualitative and quantitative data analysis. Methods included a thorough review of target RDE-RAD project documents, telephone interviews with project staff members and with former RASEM2 and AccessSTEM students or professionals currently employed in a STEM career (or planning to be), and a descriptive analysis of extant data collected by the RADs.

Project Document Review

To become familiar with project structures and the strategies used by the RADs, we conducted a review of the project websites, proposal abstracts, annual reports, and products resulting from the projects. It was clear that both AccessSTEM and RASEM2 had numerous types of activities, only a subset of which were direct services for undergraduate students.

Telephone Interviews with RAD Principal Investigators (PIs)

In December 2007, NSF Program Director Dr. Mark Leddy sent an introductory letter electronically to each RAD principal investigator[3] to introduce the SRI researchers and provide background information on the project activities. Immediately afterward, SRI sent a letter to each PI and made initial telephone contact.

In January 2008, SRI conducted a short telephone interview with each PI to request support in the following activities: (1) obtaining information on the types of extant data collected by the RADs on former RASEM2 and AccessSTEM participants and obtaining these data in electronic form for secondary analysis by SRI and (2) assistance in recruiting persons with disabilities to interview who were former RASEM2 and AccessSTEM participants, were graduates, and are currently employed in a STEM career.

AccessSTEM provided data in electronic form, but the data from RASEM2 were only maintained in paper files. Accordingly, SRI researchers conducted a site visit to RASEM2, April 6–8, 2008, to collect these data and create an electronic database. Dr. Sheryl Burgstahler from AccessSTEM and Dr. Ed Misquez from RASEM2 provided additional information on their projects and during our analysis of these extant data we clarified, verified, and confirmed our findings with both PIs.

[3] Mr. Ed Misquez from RASEM2 at New Mexico State Las Cruces; Dr. Sheryl Burghstaler from AccessSTEM at the University of Washington; Dr. Langley-Turnbaugh from East Alliance at the University of Southern Maine, and Dr. Jay Martin from Midwest at the University of Wisconsin-Madison

Telephone Interviews with Past Participants

In spring 2008, SRI researchers conducted telephone interviews with six former RASEM2 and AccessSTEM participants of the two RADs. The purpose of these interviews was to gather information about their experiences with project activities and the impact the activities had on their career choice in STEM. A secondary purpose was to inform the development of the full assessment of the RAD program.

The PIs of both RADs agreed to help SRI recruit former RASEM2 and AccessSTEM participants for interviews. Because of confidentiality concerns, the PIs made the initial contact with former participants and requested their permission to release contact information to SRI.

Six individuals consented to participate in a short interview. Three had received services from RASEM2 and three from AccessSTEM. To ensure that the interviews would collect uniform data and would not be unduly burdensome to participants, SRI developed a systematic interview format (Yin, 1989). Participant responses were elicited in four areas: (1) academic history and interest in STEM while in school, (2) RAD contact and services received, (3) employment history, and (4) importance of RAD services to progression in the degree program and decision to enter a STEM career. We also collected demographic data from each participant.

Each telephone interview lasted between 30 and 45 minutes and was scheduled at a time convenient to the participant. Three interviews were conducted by Dr. Camille Marder and three by Dr. Katherine Nagle. Each interview began with an introduction to the interviewer and the purpose of the interview. A confidentiality statement was read to each participant and an opportunity to withdraw was provided. All participants agreed to continue with the interview. Each researcher followed the same interview guide and typed interviewee responses in a Microsoft Word file during the interview itself to create individual transcripts of each interview.

Following the interview, each researcher incorporated any additional field notes into the interview narrative to ensure a complete and accurate dataset. During analysis, transcripts were read independently by each researcher and a third researcher to ensure that the ideas and findings accurately represented the evidence gathered. Original transcripts were used as evidence to support or refute these ideas. After an initial draft of the findings was developed, the research team organized these findings into critical themes or big ideas (Miles & Huberman, 1994).

Section III: Evaluation of RDE Program: Results from AccessSTEM and RASEM2

In this section SRI reports the findings from study 1, conducted in two stages: analysis of extant data provided by the PIs from AccessSTEM and RASEM2 and telephone interviews with former participants. This section presents findings on the demographic characteristics and the status of RAD participants and former participants' perceptions of the importance of the services and supports provided by the RADs as they progressed toward degree completion and entry into a STEM career. When interpreting the results in this report, it is important to understand that some participants counted more than once across years as they received RAD services and supports for multiple years.

Analysis of Extant Data from AccessSTEM

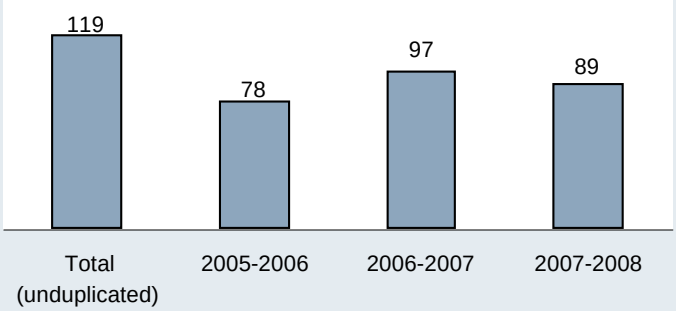
Definition of "Participant"

AccessSTEM collects and maintains data on only those students who complete an application to participate in the program. Each year large numbers of students, particularly secondary school students, have brief contact with AccessSTEM through its events or exploration/career fairs but do not complete applications. A subset of these students "choose to be part of AccessSTEM multiple activities often after participation in a presentation, transition fair, etc. …They generally have some interest in STEM and want to participate in AccessSTEM activities beyond a workshop, transition fair, field trip, and apply to become part of the AccessSTEM team." (Sheryl Burgstahler, personal communication, April 1, 2008). For purposes of the analyses presented here, those students are considered "participants." AccessSTEM considers people to be participants in the program indefinitely once they have begun participation. For this analyses, individuals' participation ended when they graduated or left the institution.

Demographic Characteristics and Disability Classifications

During the 3 years it served the most participants, AccessSTEM served a total of 119 postsecondary students some over multiple years: 78 in 2005–2006, 97 in 2006–2007, and 89 in 2007–2008 (Exhibit 1). The majority of AccessSTEM's postsecondary participants over the 3-year period were undergraduate students, but small numbers of graduate and vocational/technical students also participated (Exhibit 2).

Exhibit 1. Number of Postsecondary Participants in AccessSTEM: 3 Years with the Largest Numbers of Participants



SOURCE: Unpublished tabulations compiled by SRI International from raw data provided by AccessSTEM in January 2008.

Exhibit 2. Educational Status of AccessSTEM Postsecondary Participants, by Year: 2005–2006 through 2007–2008

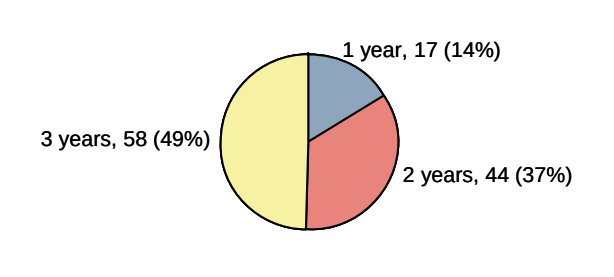
	2005–2006 (N=78)		2006–2007 (N=97)		2007–2008 (N=89)	
	Number	Percent	Number	Percent	Number	Percent
Total	78	100	97	100	89	100
Undergraduate	71	91	89	92	81	91
Graduate	3	4	4	4	6	7
Votech[1]	4	5	4	4	2	2

[1] Two-year technical or community colleges granting associate degrees.

SOURCE: Unpublished tabulations compiled by SRI International from raw data provided by AccessSTEM in January 2008.

AccessSTEM served a total of 119 postsecondary participants from 2005–2006 through 2007–2008. Of these, only 17 individuals were participants for only 1 year (Exhibit 3). Forty-four individuals participated for 2 years, and 58 participated for 3 years.

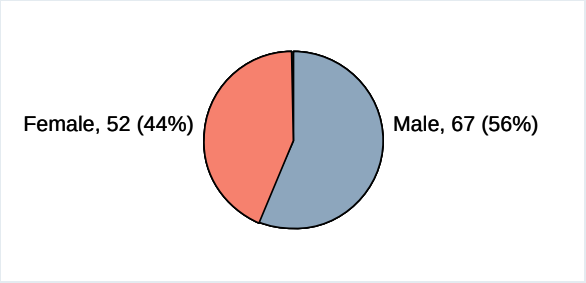
Exhibit 3. Number and Percent of Participants in AccessSTEM for 1, 2, and 3 years: 2005-2006 through 2007-2008 (N=119)



SOURCE: Unpublished tabulations compiled by SRI International from raw data provided by AccessSTEM in January 2008.

Fifty-six percent of the AccessSTEM postsecondary participants during the 3-year period were males, and 44 percent were females (Exhibit 4). Sixty-nine percent were White; 7 percent were Black; 2 percent were Hispanic; 19 percent were Asian, Native Hawaiian, or Other Pacific Islander; and 3 percent were American Indian or Alaska Native (Exhibit 5). These data generally reflect the race/ethnicity of students in the K-12 population in the state of Washington.

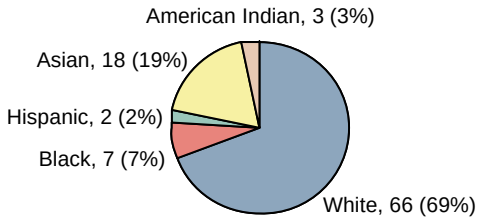
Exhibit 4. Number and Percent of AccessSTEM Participants, by Gender: 2005-2006 through 2007-2008



SOURCE: Unpublished tabulations compiled by SRI International from raw data provided by AccessSTEM in January 2008.

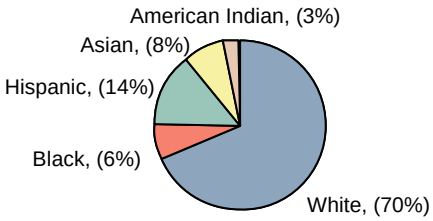
Exhibit 5. Number and Percent of AccessSTEM Participants and State of Washington K-12 Public School Students by Race/Ethnicity

AccessSTEM Postsecondary Participants: 2005-2006 through 2007-2008 (N=119)



Data not available, 19

State of Washington K-12 Public School Students: 2005-2006



NOTES: Percentages may not sum to 100 because of rounding.

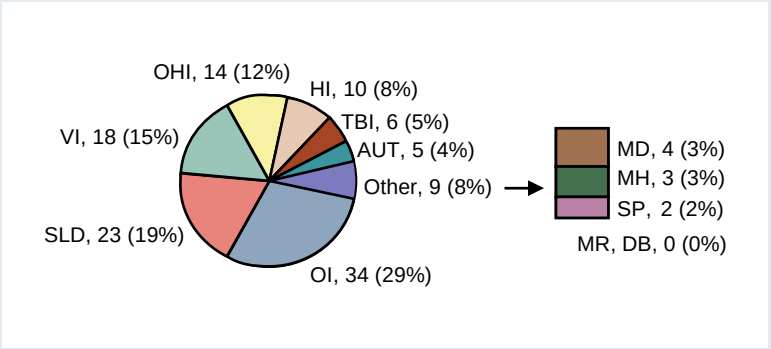
AccessSTEM percentages do not include individuals for whom race/ethnicity data were not available.

Black includes African American, Hispanic includes Latino, Asian includes Native Hawaiian and Other Pacific Islander, and American Indian includes Alaska Native.

SOURCES: Unpublished tabulations compiled by SRI International from raw data provided by AccessSTEM in January 2008. National Center for Education Statistics. "Nation's report card." U.S. Department of Education. Retrieved August 12, 2008 from http://nces.ed.gov/nationsreportcard/states/profile.asp .

By far the most common type of self-reported disability among postsecondary participants was orthopedic (mobility) impairments, with 29 percent so reporting (Exhibit 6). Students reporting specific learning disabilities, visual impairments (including blindness) made up 19 percent and 15 percent, respectively, of participants. Students reporting other health impairments and hearing impairments made up another 12 percent and 8 percent, respectively, of participants. Five percent reported having traumatic brain injury, 4 percent reported autism, 4 percent reported multiple disabilities, 3 percent reported mental health impairments, and 2 percent reported speech or language impairments.

Exhibit 6. Number and Percent of AccessSTEM Postsecondary Participants, by Disability Classification: 2005-2006 through 2007-2008 (N=119)



NOTES: Disability classification abbreviations are as follows: AUT=autism including Asperger's disorder, DB=deaf-blindness, HI=hearing impairments, MR=mental retardation, MD=multiple disabilities, MH=mental health conditions, OHI=other health impairments (including ADHD), OI=orthopedic impairments, SLD=specific learning disabilities, SP=speech or anguage impairments, TBI=traumatic brain injury, VI=visual impairments (including blindness).

SOURCE: Unpublished tabulations compiled by SRI International from raw data provided by AccessSTEM in January 2008.

Institutional Reach

During the focal 3-year period, AccessSTEM served participants in 45 postsecondary institutions in nine states (Exhibit 7). Although most participants were in the states of Washington (*N* = 54), Alaska (*N* = 30), Oregon (*N* = 14), and Idaho (*N* = 10), a few participants (*N* = 8) were in California, Colorado, Indiana, Minnesota, and Oklahoma.

Exhibit 7. Number and Percent of Postsecondary Participants in AccessSTEM, by Institution: 2005–2006 through 2007–2008 (N=119)

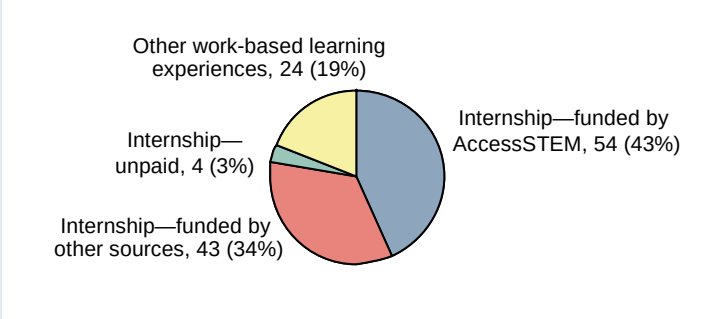
	Participants			Participants	
Institution	Num.	Pct.	Institution	Num.	Pct.
University of Washington	22	18.5	Eastern Idaho Technical College	1	0.8
University of Alaska Fairbanks	16	13.4	Eastern Washington University	1	0.8
University of Alaska Anchorage	12	10.1	Evergreen State College	1	0.8
University of Oregon	5	4.2	Goshen College	1	0.8
Bellevue Comm. College	3	2.5	Matanuska-Susitna Comm. College	1	0.8
College of Southern Idaho	3	2.5	Minneapolis Technical & Comm. College	1	0.8
Oregon State University	3	2.5	Mount Hood Comm. College	1	0.8
Portland State University	3	2.5	Nine Star Technical	1	0.8
Seattle University	3	2.5	Olympic College	1	0.8
Boise State University	2	1.7	Pacific Lutheran University	1	0.8
Central Washington University	2	1.7	Shoreline Comm. College	1	0.8
Gonzaga University	2	1.7	Skagit Valley Comm. College	1	0.8
Idaho State University	2	1.7	Spokane Comm. College	1	0.8
North Seattle Comm. College	2	1.7	Spokane Falls Comm. College	1	0.8
Seattle Pacific University	2	1.7	University of California LA	1	0.8
University of Arizona	2	1.7	University of Northern Colorado	1	0.8
University of Idaho	2	1.7	University of Oklahoma	1	0.8
University of Puget Sound	2	1.7	University of Portland	1	0.8
Western Washington University	2	1.7	University of Washington Tacoma	1	0.8
Arizona State University	1	0.8	Walla Walla Comm. College	1	0.8
Big Bend Comm. College	1	0.8	Whatcom Comm. College	1	0.8
Chemeketa Comm. College	1	0.8	Yakima Valley Comm. College	1	0.8
Dental Assistant College	1	0.8	Data not available	3	2.5

SOURCE: Unpublished tabulations compiled by SRI International from raw data provided by AccessSTEM in January 2008.

STEM Internships and Work-Based Learning Experience

From academic year 2005–2006 to the present, AccessSTEM arranged for 101 internships in STEM businesses and industry and 24 work-based learning experiences for its participants (Exhibit 8). The vast majority of the STEM internships were financially supported, with 54 funded by AccessSTEM and 43 from other sources including the business or industry that provided the internship. In addition, AccessSTEM funded 24 STEM work-based learning experiences for postsecondary participants. AccessSTEM staff reported that participants were involved in a range of work-based activities, including development and delivery of presentations on STEM education, self-advocacy, and academic accommodations; administrative assistant positions on short-term projects; presenting at conferences about AccessSTEM; and delivering keynote speeches at professional conferences.

Exhibit 8. Number of Internships and Work-Based Opportunities Arranged by AccessSTEM: 2005-2006 hrough 2007-2008 (N=125)



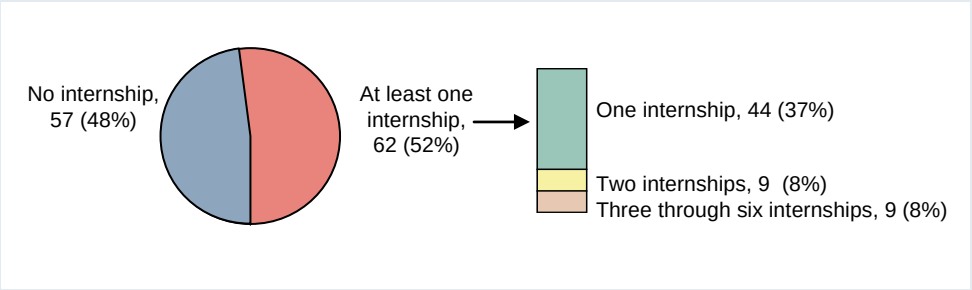
NOTE: Percentages may not sum to 100 because of rounding.

Examples of work-based learning experiences include development and delivery of presentations about STEM education; development and delivery of presentations about self advocacy and academic accommodations; administrative assistant positions on short-term projects; representing AccessSTEM at exhibitions; keynote speaker.

SOURCE: Unpublished tabulations compiled by SRI International from raw data provided by AccessSTEM in January 2008.

Fifty-two percent of participants (*N* = 62) engaged in one or more internships arranged by AccessSTEM (Exhibit 9). Thirty-seven percent of participants engaged in one internship, 8 percent engaged in two internships, and 8 percent engaged in three to six internships. No participant engaged in more than six internships.

Exhibit 9. Number and Percent of AccessSTEM Participants Engaging in Internships: 2005-2006 through 2007-2008 (N=119)



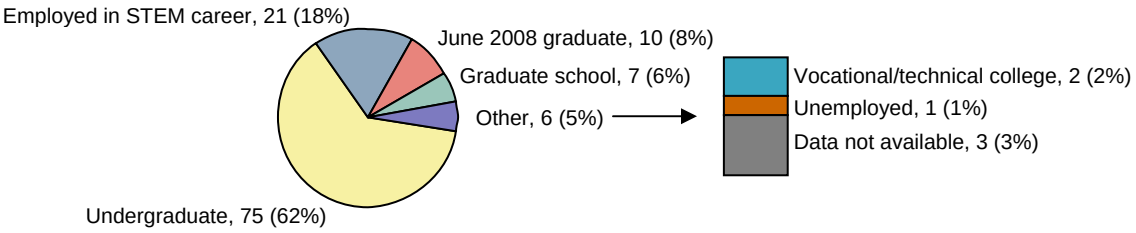
NOTE: Details may not sum to total because of rounding.

SOURCE: Unpublished tabulations compiled by SRI International from raw data provided by AccessSTEM in January 2008.

Status of AccessSTEM Academic Year 2005–2006 through 2007–2008 Postsecondary Participants as of June 2008

Exhibit 10 indicates the status, as of June 2008, of individuals who were participants in AccessSTEM in 2005–2006, 2006–2007, or 2007–2008. Sixty-two percent were still enrolled as undergraduates, 18 percent were employed in STEM occupations, 8 percent had just graduated and their employment status was not known, and 6 percent were in enrolled in graduate school. Two percent were enrolled in vocational/technical colleges, and 1 percent was unemployed. No information was available for 3 percent of AccessSTEM participants.[4]

Exhibit 10. Number (and Percent) of 2005-2006, 2006-2006, and 2007-2008 AccessSTEM Postsecondary Participants with Selected Statuses: June 2008 (N=119)



NOTES: Percentages may not sum to 100 because of rounding.

SOURCE: Unpublished tabulations compiled by SRI International from raw data provided by AccessSTEM in January 2008, updated in May 2008.

[4] As noted earlier, to be counted as a "postsecondary participant" in a given year, an individual must have been enrolled in a postsecondary institution in that year.

Exhibit 11 shows that of the 119 individuals who participated in AccessSTEM during academic year 2005–2006 through 2007–2008, 35 graduated with a degree from a 4-year college and 8 graduated with a degree from a 2-year college. In addition, two individuals graduated with multiple degrees, one with both a 2-year and a 4-year college degree and the other with a 4-year college degree and a technical degree. Another individual also graduated with a technical degree. Access STEM participants obtained a total of 48 postsecondary degrees.

Exhibit 11. Number and Percent of Access/STEM Postsecondary Participants Who Obtained Postsecondary Degrees, by Type of Degree: 2005–2006 through 2007–2008 (N=119)

	Number	Percent
No postsecondary degree (including participants still enrolled in 2007–2008)	73	61
Any postsecondary degree	46	39
4-year degree only	35	29
4-year and 2-year degree	1	1
4-year degree and technical degree	1	1
2-year degree only	8	7
Technical degree	1	1

SOURCE: Unpublished tabulations compiled by SRI International from raw data provided by AccessSTEM in January and June 2008.

Analysis of Extant Data from RASEM2

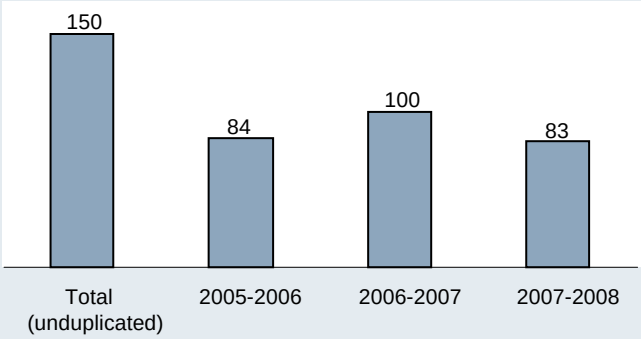
Definition of "Participant"

RASEM2 defines "participants" as postsecondary STEM students who mentor K-12 students. These mentors receive stipends from RASEM2—currently $600 if they have a GPA of 3.0 or higher each semester and $300 if their GPA falls below 3.0. In previous years, when RASEM2 served fewer participants, stipends were somewhat higher ($750 and $375), and some participants are still grandfathered in at those levels. With the increased funding for the higher-GPA students comes increased responsibility. Such students take on heavier mentoring activities, whereas the lower-GPA students are expected to spend their time on improving their academic work rather than on mentoring activities.

Demographic Characteristics and Disability Classifications

During the 3 years in which it served the most participants, RASEM2 served a total of 150 students: 84 in 2005–2006, 100 in 2006–2007, and 83 in 2007–2008 (Exhibit 12).

Exhibit 12. Number of Postsecondary Participants in RASEM2: 3 Years with the Largest Numbers of Participants



SOURCE: Unpublished tabulations compiled by SRI from hard-copy files made available by RASEM2 in April 2008.

Over this period, more than 90 percent of students (N = 140) were undergraduates, 6 percent (N = 9) were graduate students, and 1 percent (N = 1) began as an undergraduate student and continued to graduate school (Exhibit 13).

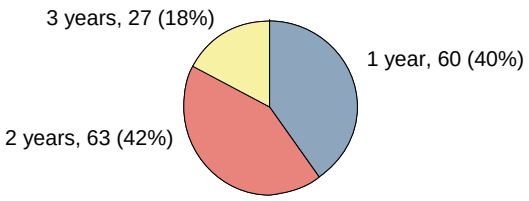
Exhibit 13. Number and Percent of 2005–2006 through 2007–2008 RASEM2 Participants, by Educational Standing (N=150)

Standing	Number
Undergraduate student	140
Graduate student	9
Undergraduate student, then graduate student	1

SOURCE: Unpublished tabulations compiled by SRI International from hard-copy files made available by RASEM2 in April 2008.

As with AccessSTEM, the RASEM2 numbers presented here represent duplicate counts across the years. Sixty participants were in RASEM2 for 1 of the 3 focal years, 63 were in the program for 2 years, and 27 were in the program for all 3 years (Exhibit 14).

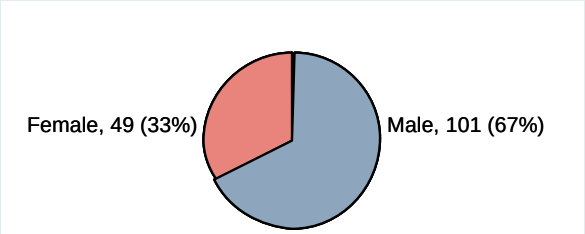
Exhibit 14. Number and Percent of Participants in RASEM2 for 1, 2, and 3 Years: 2005–2006 through 2007–2008 (N=150)



SOURCE: Unpublished tabulations compiled by SRI International from hard-copy files made available by RASEM2 in April 2008.

Sixty-seven percent of RASEM2 participants during the 3-year period were males, and 33 percent were females. (Exhibit 15). In terms of race/ethnicity, Hispanics made up a plurality of participants (45 percent) (Exhibit 16). Twenty-seven percent of participants were White, 19 percent were American Indian or Alaska Native, and 7 percent were Black (including African Americans). One percent (one student) was Asian, Native Hawaiian, or Other Pacific Islander; and 1 percent (one student) was of "other" race/ethnicity. These data generally reflect the race/ethnicity of students in the K-12 population in New Mexico.

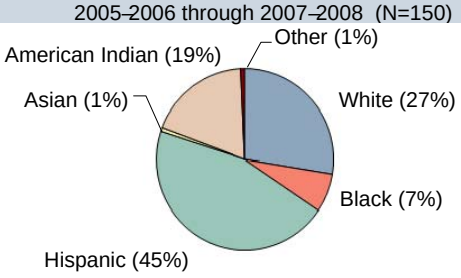
Exhibit 15. Number and Percent of RASEM2 Participants, by Gender: 2005-2006 through 2007-2008



SOURCE: Unpublished tabulations compiled by SRI International from hard-copy files made available by RASEM2 in April 2008.

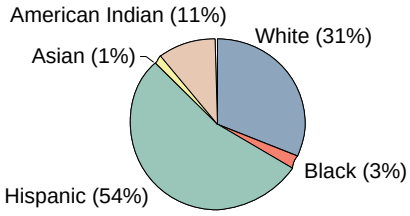
Exhibit 16. Number and Percent of RASEM2 Participants and State of New Mexico K-12 Public School Students, by Race/Ethnicity

RASEM2Postsecondary Participants: 2005–2006 through 2007–2008 (N=150)



Data not available, 7

State of New Mexico K-12 Public School Students: 2005–2006



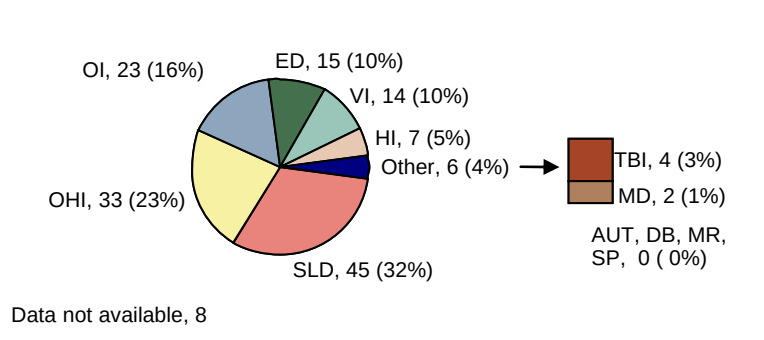
NOTES: RASEM2 percentages do not include individuals for whom race/ethnicity data were not available.

Black includes African American, Hispanic includes Latino, Asian includes Native Hawaiian and Other Pacific Islander, and American Indian includes Alaska Native.

SOURCES: Unpublished tabulations compiled by SRI International from hard-copy files made available by RASEM2 in April 2008. National Center for Education Statistics & National Assessment of Educational Progress. "Nation's report card." U.S. Department of Education. Retrieved August 11, 2007, from http://www.ideadata.org/arc_toc8.asp

Specific learning disability was the most common type of self-reported disability among postsecondary participants, with 32 percent of participants reporting this disability (Exhibit 17). Twenty-three percent reported having other health impairments, 16 percent reported orthopedic impairments, 10 percent reported mental health condition, and another 10 percent reported visual impairments. Five percent reported hearing impairments, 3 percent reported traumatic brain injury, and 1 percent reported multiple disabilities. Data on disability classification were unavailable for 8 participants.

Exhibit 17. Number and Percent of RASEM2 Postsecondary Participants by Disability Classification (N=150)



Data not available, 8

NOTE: Percentages do not include individuals for whom disability data were not available. Disability classification abbreviations are as follows: AUT=autism including Asperger's disorder, DB=deaf-blindness, HI=hearing impairments, MR=mental retardation, MD=multiple disabilities, MH=mental health conditions, OHI=other health impairments (including ADHD), OI=orthopedic impairments, SLD=specific learning disabilities, SP=speech or language impairments, TBI=traumatic brain injury, VI=visual impairments (including blindness).

SOURCE: Unpublished tabulations compiled by SRI International from hard-copy files made available by RASEM2 in April 2005.

Institutional Reach

A plurality of RASEM2 participants (26 percent over the 3-year period) were students at New Mexico State University (NMSU), RASEM2's home institution (Exhibit 18). Another 16 percent were at the University of New Mexico. Participants were by no means limited to these two institutions, however. Small numbers of participants were students at numerous other institutions located in the southwest. In 2007–2008, the percentage of participants from New Mexico State University decreased, as RASEM2 began to serve participants from Luna Community College (LCC) in Las Vegas, New Mexico.

Exhibit 18. Number and Percent of RASEM2 Participants, by Institution: 2005–2006 through 2007–2008 (N=150)

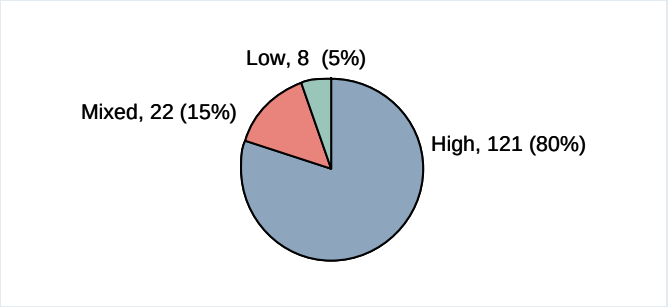
	Participants			Participants	
Institution	Num.	Pct.	Institution	Num.	Pct.
New Mexico State Univ.	39	25.7	Northern NM CC	3	2.0
University of NM	24	15.8	Univ. of Texas—El Paso	3	2.0
Southwestern Indiana Polytechnic Institute	12	7.9	El Paso CC (TX)	2	1.3
Doña Ana CC (NM)	10	6.6	Western NM University	2	1.3
Luna CC (NM)	10	6.6	Diné College (NM)	1	0.7
New Mexico Jr. College	7	4.6	Eastern New Mexico Univ.	1	0.7
New Mexico Highlands U.	6	3.9	New Mexico Tech	1	0.7
NM State Univ. at Alamogordo	6	3.9	New Mexico State University—Grants, NM	1	0.7
Central New Mexico CC	5	3.3	Univ. of NM—Los Alamos	1	0.7
San Juan CC (NM)	5	3.3	Not available	13	8.6

SOURCE: Unpublished tabulations compiled by SRI International from hard-copy files made available by RASEM2 in April 2005

Stipends Received by 2005–2006 through 2007–2008 RASEM2 Participants

RASEM2 paid participants high ($750 or $600) or low ($375 or $300) stipend amounts depending on whether the students' GPAs were at least 3.0.[5] Over the 3 focal years, a large majority of participants (80 percent) received high stipends during all their semesters of participation, and most of the remaining participants (15 percent) received mixed levels of stipends (Exhibit 19). Only 5 percent of participants received low stipends during all their semesters of participation.

Exhibit 19. Number and Percent of RASEM2 Participants Receiving High and Low Stipends: 2005-2006 through 2007-2008 (N=150)



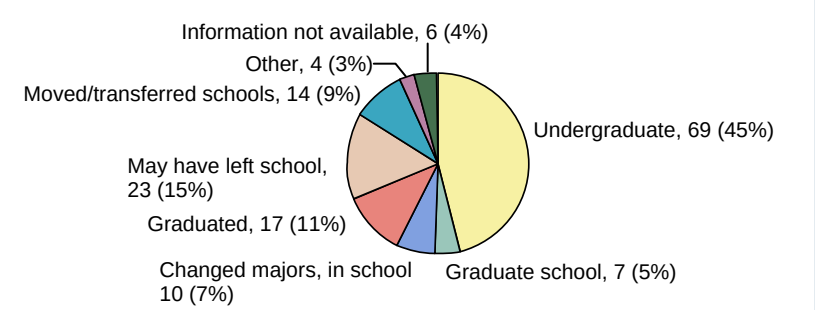
SOURCE: Unpublished tabulations compiled by SRI International from hard-copy files made available by RASEM2 in April 2005.

[5] Stipend amounts for students changed in RASEM2. Currently, RASEM2 offers stipend of $300 or $600 dependent upon their GPA whereas in previous years students were offered higher stipends (i.e., $375 or $750). These latter students were grandfathered in at those higher levels.

Status of 2005–2006, 2006–2007, and 2007–2008 RASEM2 Participants as of April 2008

In April 2008, half of the individuals who participated in RASEM from fall 2005 through spring 2008 were active participants: 45 percent were undergraduate students, and 5 percent were in graduate school (Exhibit 20). At that time, 15 percent were thought to have left school, 11 percent had graduated, 9 percent had moved or transferred to another institution, and 7 percent were no longer part of RASEM2 because they had changed to non-STEM majors. Information was not available for 4 percent of participants.

Exhibit 20. Number (and Percent) of 2005-2006, 2006-2006, and 2007-2008 RASEM2 Participants with Selected Statuses: April 2008 (N=150)



NOTES: Percentages may not sum to 100 because of rounding.

SOURCE: Unpublished tabulations compiled by SRI International from hard-copy files made available by RASEM2 in April 2008.

Analysis of Telephone Interviews with Former Participants

SRI conducted six telephone interviews with former participants from AccessSTEM and RASEM2 . We interviewed three males and three females. Four participants were 25 years old or younger and two were students in their mid-forties. Four participants were White and two were Hispanic. Three participants had an acquired disability—a spinal cord injury—two were learning disabled, and one had muscular dystrophy. Four of the six participants interviewed were wheelchair users.

Exhibit 21: Demographic Characteristics of Participants

Participant	RAD Membership	Age	Gender	Race/ethnicity	Disability
1	AccessSTEM	22	Male	White	Muscular dystrophy
2	AccessSTEM	24	Female	White	Learning disability
3	AccessSTEM	25	Male	White	Spinal cord injury
4	RASEM2	45	Female	Hispanic	Spinal cord injury
5	RASEM2	48	Male	White	Spinal cord injury
6	RASEM2	25	Female	Hispanic	Learning disability

Source: Interviews conducted by SRI February-March 2008

The interviews with former participants revealed a number of similarities and some differences in perceptions about the influence of RAD services on degree attainment and career decisions. The next section of this report presents our findings in the following framework: (1) academic history and early interest in STEM, (2) initial contact and services received from RAD, (3) employment history, and (4) importance of RAD services to progression in the interviewee's degree program and decision to enter a STEM career.

Participant's Academic History and Early Interest in STEM

Five participants reported that they graduated from high school with a high school diploma, and two of these individuals stated that they had received academic distinctions while at secondary school. One participant earned a GED. Three participants, all female, reported that they had struggled academically at middle and high school, and two of these interviewees reported that mathematics and science were particularly difficult. For example, one stated, "I was so afraid of school and math especially. In my teens I would go and then quit. I dropped out[of school] in ninth grade." Another commented, "I didn't think I was very good at math at school. I couldn't speak English and was very shy." Four participants stated that they were already interested in STEM subjects while at secondary school.

Two indicated that one or both of their parents were involved in a STEM career and that it seemed natural for them to pursue a STEM discipline. Five participants went into postsecondary education straight after high school, and two of the six participants went to a community college before entering a 4-year college.

Initial Contact with and Services Received from the RADs

Participants reported that they heard about the RAD in a variety of ways. For example, one participant explained she had attended a talk by the RAD PIs and decided there and then to go into engineering, "I was afraid, but the RAD staff told me I could do it." Another participant explained that she had been involved in another NSF funded program while at high school and continued the association while at university. Two participants reported that they had heard about the RAD through a friend, and another reported that she had seen a flyer about the program at the university Disabled Services Center.

Participants varied considerably in the amount of contact they had with the RADs, their degree of involvement, and the type and duration of the services received or accessed. Three participants were only peripherally involved—for example, attending a workshop or social event or joining the RAD's Listserve—while the others received financial help, participated in business internships, participated in work-based experiences, attended RAD retreats, and became mentors of other postsecondary students with disabilities.

Networking Opportunities. All interviewees reported that the RAD provided a valuable and often informal way to network with other individuals with disabilities and provided opportunities to meet potential employers. Networking opportunities included social events, RAD retreats, and career fairs. One participant described his involvement as very peripheral to the RAD, consisting of occasionally reading e-mails on the Listserve. This individual explained that he was already motivated and committed to a career in STEM and did not really need access to any of the services the RAD offered.

> I already knew what I wanted to do and how to get there—I was self-motivated and ambitious. I had networks in place and just called them to ask about jobs. The RAD did call me though to tell me that a firm was hiring and I got my first job through that.

Mentoring. Mentoring was defined differently depending on the RAD involved. RASEM2 had a mentor/mentee program in which college students with disabilities mentored sixth to twelfth grade students as a requirement for receiving a stipend. This activity is similar to service learning and also serves the purpose of linking the STEM curriculum with related STEM activities outside of the university. Three participants reported that they had participated in mentorship opportunities in K-12 public schools.

At AccessSTEM, mentoring was much more loosely structured and not tied to funding. It involved the development of informal relationships with RAD staff, STEM faculty, other students with disabilities, and persons with disabilities in STEM careers. Mentoring functioned as a source of information and support for RAD participants, and how much each individual accessed this support was based on his or her needs at the time. Mentoring frequently occurred via e-mail. One participant reported receiving mentoring as an undergraduate and commented, "I knew that anyone who worked at the RAD or anyone on the discussion list was always available as a mentor. There was no formal pairing, but this could form organically." This individual indicated that she later acted as a mentor for other college students with disabilities and participated in career panels once she had graduated.

Internships in STEM Business/Industry. Both RADs provided information, support, and funding for participants to participate in internships in STEM business and industry. Most were paid internships, covered either by the RAD or by the employing business/industry. The RADs frequently coordinated the internships by establishing contacts, disseminating information, and assisting students in applying through other organizations such as the American Association for the Advancement of Science's Entry Point! program or with individual organizations such as Texas Instruments, Microsoft, the World Bank, and NSF. Internships varied in duration, from the summer and to a year long. Three participants said that they were offered permanent positions in the companies where they were interns.

Resources, Services, and Technology. Both RADs provided a central location for resources related to a myriad of disability issues; provided information on careers, how to prepare for interviews, how to write resumes, and how to develop advocacy skills and self-confidence; and provided tutoring support in academics. Several participants reported that they relied a great deal on these services and supports.

Graduation and Employment Experiences

Exhibit 22 provides information on the graduation and employment status of the interviewees. Five graduated with a bachelor's degree in a STEM-related discipline, and one is due to graduate in summer 2008. Four participants are currently employed in a STEM career. Two are in the private sector, one is in the financial sector, and the fourth is employed in higher education. The individual who will graduate this year with Bachelor of Science plans to enter private industry, and another will complete a master's degree and plans to join a doctoral program in industrial engineering.

Exhibit 22: Degree and Employment Status

Participant	Degree/Year	Current Employer
1	B.S., 2008 Computer science	Undergraduate student, University of Washington
2	B.S., 2004 Science and information	Washington Mutual
3	B.S., 2005 Business/computer science	Battelle-Pacific Northwest National Laboratory
4	B.S., 2005 Industrial engineering	Master's student, New Mexico State University- Las Cruces-
5	B.S., 2001 Engineering technology	Instructor, New Mexico State University- Las Cruces-
6	B.S., 2005 Computer science	Texas Instruments

Source: Interviews conducted by SRI February-March 2008

Participant's Perception of the Importance of RAD Services to Degree Progression and Decision to Enter a STEM Career

Although participants' perceptions varied on the importance of the RAD services to their degree progression and entry into a STEM career, all stated that the services available were helpful and valuable to persons with disabilities, even if they themselves did not access them frequently. The participants we spoke with had different levels or contact with the RADs based on the different kinds of support they needed. Some individuals used the RADs for purely practical reasons, such as financial support, technology needs, networking and access to internships with STEM business/industry, and job-seeking skills. For example, one individual commented, "When I heard from a friend about the stipend through the RAD, I thought, hmm, that sounds like I could qualify for that. So I applied and it really helped me financially when I wanted to switch careers."

Another participant told us,

> The RAD staff forwarded the job application materials to me and helped with process. I spoke with some staff members about some differences between interviewing in person and on phone.

Most participants reported that the internship opportunities in STEM business/industry provided by the RADs were extremely valuable. One participant said, "The internships provided me with two of the most wonderful summers of my life." Another said of a summer internship opportunity,

> It was a great experience to be there and be in an environment with other students with disabilities. It was great to be in the city and be connected with national groups.

This participant explained that she heard about the internships through the RAD and that the staff helped her prepare her application and provided references.

All participants perceived the networking opportunities—social and professional—as very valuable to them in finding employments during college or after graduation. For example, one participant stated, "The connections I made are most valuable. I was able to call businessmen and women I met socially and arrange internships." Another individual said,

> I think that the cool thing about the RAD was that it had lots of contacts all over … it plugged me into this network. A lot of the people who run the program knew a lot of other people, some previous scholars, who helped me.

Several participants reported less tangible but equally important benefits from their RAD experiences. Three participants explained that they gained confidence in themselves and their abilities in STEM because of their contact with RADs. Two participants linked this increase in confidence to specific activities such as internships or mentoring activities in the public schools, another reported that the RAD provided a community and created a sense of belonging and a crucial support system during the degree program. Two participants reported that meeting people with other disabilities gave them a greater appreciation of the barriers and challenges that people with disabilities face.

Three participants reported that they had a high degree of involvement in the RAD. For example, one participant explained that she attended summer camps held by the RAD while in high school, accessed mentor services and later acted as a mentor for other students with disabilities, presented at career panels, attended social gatherings, became involved in job shadowing, went on two summer internships through the RAD, and had experience working in a laboratory while she was an undergraduate supported by funds from the RAD.

Section IV: Summary and Implications

In this section, we reflect on the lessons learned from the first phase of this preliminary evaluation of the RDE program and present recommendations for Phase 2, to be conducted in 2009 with the RDE-RAD programs of AccessSTEM at the University of Washington and the Eastern Alliance at the University of Southern Maine.

Lessons Learned

1. The three year periods in which both RASEM2 and AccessSTEM served the most students were 2005–2006, 2006–2007, and 2007–2008. These years are the time frame for the findings presented in this report.
2. RASEM2 and AccessSTEM collected demographic data on participants including race/ethnicity, gender, and self reported disability classification.
   - Both RADs served students with disabilities for multiple years, with a majority participating for 2 or more years
   - Both RADs served more males than females.
   - Both RADs served students with a range of disabilities, including specific learning disabilities, orthopedic impairments, and sensory impairments.
   - Both RADs served postsecondary students with disabilities in 4-year colleges and in community colleges.
3. RASEM2 and AccessSTEM collected outcome data, e.g., graduation with a STEM degree and employment in a STEM career; but most participants were still undergraduates at the time of data collection for Phase 1.
   - Sixty-three (23%) students with disabilities who participated in activities conducted by either RASEM2 (as of April 2008) or AccessSTEM (as of June 2008) during the focal period graduated with a postsecondary degree.
   - As of June 2008, 144 (54%) postsecondary students with disabilities who participated in activities provided by either RASEM2 or AccessSTEM are still enrolled in a STEM major.
4. A set of RDE-RAD practices and constructs emerged from Phase 1 that link to an existing theory of college persistence for persons with disabilities. Since the early 1970s, researchers have been studying student retention and attrition and have developed causal theories and theoretical models (Astin, 1984; Bean, 1980; Chickering and Reisser, 1993; Tinto, 1975). These models describe ways the student and the institution interact to form and re-form student attitudes, behavior, and commitments to graduating from college. Drawing on this earlier research and on the general literature on retention, Belch (2004) developed a theory of retention

specifically for the population of students with disabilities. These constructs are confirmed in the findings from Phase I of this preliminary evaluation as important components of an RDE-RAD model. Each is defined below.

- **Belonging**. The construct of belonging encompasses the concept of academic and social integration (Tinto, 1975; 1993) and also the need for safety and inclusion (Rendon, 1994; Schlossberg, 1989; Strange, 2000). Activities that foster a sense of belonging include financial security, peer study groups, social events, information on accommodations, and self-advocacy. In the emerging RAD STEM model, past participants reported that they received financial support either during the semester or from participating in STEM internships, attended social events, participated in peer study groups with other students with disabilities enrolled in STEM disciplines, were part of an online STEM learning community, were connected with STEM mentors with disabilities, and had access to information on accommodations and self-advocacy skills.
- **Involvement**. Much of the research in student retention concludes that involvement in the academic and social life of college or university is crucial for learning, persistence, and student success (Astin, 1984). Involvement can take many forms, such as participation in clubs and organizations, working or spending time on campus outside of class, attending social gatherings, student-faculty interaction and collaboration, and involvement in the co-curriculum (extra curricular activities that complement the curriculum). In the emerging RAD STEM model, past participants reported that they were involved in STEM clubs and activities organized by the RADs, attended STEM conferences, participated in the co curricular by mentoring students in secondary schools, and participated in STEM work-based learning opportunities on campus.
- **Purpose**. In the postsecondary environment, developing a "sense of purpose" is intertwined with student persistence (Tinto, 1993). This "sense of purpose" is seen as a prerequisite to choosing a major and subsequent career direction. Belch (2004) pointed out that students with disabilities may have limited knowledge of certain disciplines and career options. In the emerging RAD STEM model, former participants who were interviewed reported that they participated in STEM internships and research opportunities NSF arranged by the RADs, attended career networking events and skill-building workshops, and had access to STEM mentors with disabilities already employed in STEM careers.
- **Self-determination**. Many professionals in the field of disability and special education regard the development of self determination skills as crucial to the success of students with disabilities (Belch, 2004; Durlak, Rose, and Bursack, 1994; Wehmeyer, Agran, and Hughes, 1998). Self determination

includes "…assertiveness, self advocacy, creativity, and independence" (Durlack, Rose, and Bursack, p. 51.) This is particularly important in the postsecondary arena where students are expected to exercise greater independence than in high school. In the emerging RAD STEM model, past participants reported that the RADs provided information on the legal rights of students with disabilities, how to work with faculty to obtain necessary accommodations, and how to improve self-advocacy skills.

Next Steps

1. NSF should establish a longitudinal tracking system for recipients of RAD services to provide data on the RDE program's effectiveness in retaining students with disabilities in the STEM pipeline. Required data elements include the number of participants served each year, demographics (gender, race/ethnicity, disability classification), GPA, name and type of institution, status each academic year, RAD supports accessed by the participants, and career choice and location after graduation. RAD project staff must have access to an electronic database, potentially linked to NSF-RDE, and resources to enter and maintain it
2. NSF should establish a longitudinal tracking system for past participants to provide data on their career paths, including STEM careers, as a source of information to determine the RDE program's effectiveness in retaining persons with disabilities in STEM careers. RDE could administer this survey through the RADs every 2 years or as an independent evaluation.
3. Finalize the guiding framework, research questions and methodology for Study 2.

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