RASEM Squared: Assisting Students in their Transition to the STEM Workforce

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Abstract: RASEM Squared works to increase the number of people with disabilities pursuing careers in science, technology, engineering, and mathematics (STEM) fields. To accomplish this goal, it provides funding directly to students to support their college education and to educators who accommodate students with disabilities in their STEM curricula. This paper describes several projects that illustrate RASEM Squared's activities, and identifies six major issues that have arisen in its work. These issues involve student self-disclosure, transition from supports under the *Individuals with Disabilities Education Act* (IDEA) to those under the *American with Disabilities Act* (ADA), training of special education and science education teachers, use of assistive technology (AT) devices, compatibility of software and hardware, and links between services.

Key Words: transition, STEM, careers

Introduction

People with disabilities are natural problem-solvers. Each day, they improvise on-the-spot solutions to human and physical barriers. Honed in such a way, their skills and talents are prepared for tackling complex high-tech problems requiring a team-oriented approach for solution and implementation. Yet, persons with disabilities are underrepresented in science, technology, engineering, and mathematics (STEM) fields. Currently, persons with disabilities are 14 percent of all employed persons and five percent of employed scientists and engineers (National Science Foundation, 1999). This is problematic since advances in technology and the need for highly trained military personnel to operate high-tech equipment presently strain the demands on an already depleted workforce. For example, Minor (2003) has observed:

> "[While] women, minorities and people with disabilities have come to represent a significant proportion of the labor force, they continue to be underrepresented in the computer science arena…. The full utilization of our nation's human resources through continued progress in achieving diversity in information systems is considered by many policy makers to be a vital factor in achieving improved international competitiveness in and alleviating the staffing shortage crisis."

RASEM Squared

As suggested by the President's Commission on Excellence in Special Education (2002), all post-secondary institutions receiving federal funding need to be held accountable for helping students with disabilities complete a high quality post-secondary

education. While bringing persons with disabilities into the STEM workforce appears to be an appropriate application of this priority, the question remains, "Has higher education begun to succeed in this endeavor?" From our perspective as an organization established to increase the number of students with disabilities who pursue courses and careers in STEM, the answer is *yes*.

The Regional Alliance for Science, Engineering, and Mathematics (RASEM) Squared is a program primarily funded by the National Science Foundation (NSF) and administered from the New Mexico State University College of Engineering in Las Cruces. RASEM Squared encompasses a service area that includes all of New Mexico; the Navajo Nation of eastern Arizona and western New Mexico; and far west Texas from Oklahoma to the Rio Grande and from El Paso to the Pecos River. The Alliance is composed of 67 partners consisting of 19 two-year colleges, one of them in Texas; eight four-year colleges and universities, two of them in Texas; 15 regional education cooperatives, six of them in Texas; two national research laboratories; nine NSF regional sister organizations, and 14 governmental education agencies, including advocacy and service provider organizations.

The primary goal of RASEM Squared is to increase the number of students with disabilities who graduate with baccalaureate degrees leading directly to graduate training or to employment in their desired field. Toward that goal, 37 RASEM-sponsored students with disabilities have graduated from NMSU and its partner institutions to STEM careers since 1995. An additional 77 students are currently enrolled at NMSU and partner institutions in STEM undergraduate and graduate training programs. In recognition of this work at the college level, RASEM Squared has been identified as first in the Nation each year since 2002 by the American Association for the Advancement of Science's *Entry Point* program in securing co-op positions, summer employment and career employment opportunities for students with disabilities. At the pre-college level, 816 New Mexico and Far West Texas K-12 students are currently engaged in RASEM Squared-funded science education environments.

To help accomplish its primary goal, RASEM solicits and funds one-year projects varying in amounts from $2,500 to $10,000. Requests for proposals (RFPs) are provided to potential grantees with awards based upon adherence to RFP guidelines and the potential for stimulating interest in STEM careers among students with disabilities. Programs supported by RASEM address the following six initiatives:

- Hands-on science experiences for pre-college students
- Formal research experiences for pre- and post-baccalaureate students
- Preparation of faculty for full participation of students with disabilities in STEM curricula
- Bridge programs between academic levels
- Mentoring by successful STEM professionals and STEM students with disabilities
- Securing co-op, summer internships, and professional employment.

Table 1 outlines the three major components of RASEM Squared. All projects receiving support from RASEM Squared must address at least one of the six initiatives listed above.

Table 1: Major Program Components

Component	Purpose & Funding Level	Example of Funded Project
Teacher Outreach Projects (TOP)	To provide K-12 teachers an opportunity to obtain mini-grants for projects that include students with disabilities in innovative, hands-activities in STEM curricula. One-year projects are funded for a maximum of $2,500.	*Get Wet* was a funded TOP Project at Gadsden High School in Anthony, New Mexico. The Project Director was a chemistry teacher who intended to provide her students with information related to water quality and its impact on the community. Participating students studied mock newspaper articles describing dead fish in a local river, collected water samples on field trips, tested the samples for purity and softened water in their lab, and participated in a simulated town council meeting. Twenty-five students representing all categories of exceptionality were recruited for the project through their science classes.

Partner Projects	Partner Projects are funded for one year at a maximum of $10,000. Funding is intended to enhance the opportunities and involvement of students with disabilities in the STEM areas. Partner Projects address the same initiatives as TOP Projects but require a higher funding level due to their scope.	*Science, Engineering and Math: Introduction to Academics* (SEMIA) is a Partner Project conducted annually at the University of Texas, El Paso (UTEP). This project brings local area high school students with disabilities to the UTEP campus for a three-week summer orientation program that provides guidance and counseling, information and referral, and training. Major foci are on computer skills, science laboratory and mathematics experiences, and career exploration coupled with self-management skills.
Mentor Projects	Merit-based mentorships or stipends are awarded to qualified students who are enrolled fulltime at NMSU or partner higher education institutions, qualify as a student with a disability, are a STEM major, and carry a 3.0 plus GPA. The Mentor program provides a $1,200 per calendar year award. For students whose GPAs fall between 2.0 and 3.0, a $750 stipend is available	The major expectation for Mentors is that they succeed in their post-secondary academic coursework. However, Mentors are often called upon to assist in programs such as the *Robot Project* that engages up to 30 elementary through high school students for two days in an inclusive environment. Participants learn basic electronic concepts, build robots from kits and race them to see which team was most successful in applying newly learned knowledge and skills.

Transition Issues

RASEM Squared staff members have encountered several persistent problems while assisting students with disabilities make the transition to STEM careers. When the problems have arisen, staff members have attempted to deal with them on a case-by-case basis. The list that follows categorizes problem areas, describes specific issues connected with those areas, and suggests strategies for others at the pre-college or college level who may attempt to assist students in the transition process.

Student Self-Disclosure

Resources are available on most college campuses to assist students with their academic pursuits. The problem is however, students are often hesitant to disclose their

disability in order to obtain needed resources. Twenty-year-old Ray (not his real name) left the university with a 2.8 GPA after two semesters and one summer session. Ray understood the material and was observed to apply it well but felt *burned out* from working three times as hard (his estimate) as his fellow students. Ray chose not to disclose his learning disability in order to obtain available resources such as a reader or notetaker which *were* available on campus and could have been used with his computer to cut down the time required to prepare written assignments.

Suggested strategies for Assistance:

- Instill in students the attitude that they (not the faculty) are in control of their destiny at the college level. That, *yes*, a negative image of disabilities persists at the college level, but that pride associated with success may only come about by taking advantage of the resources made available through disclosure.

Transition Between IDEA and ADA Support

Under the *Individuals with Disabilities Education Act* (IDEA) (American Youth Policy Forum, 2001), the school takes the lead in seeing that K-12 students promptly receive free services to meet their unique needs including non-academic needs. This is not true under the *Americans with Disabilities Act* (ADA) at the college level where students must take the lead in securing services and services are limited to academic assistance.

Suggested Strategies for Assistance:

- Provide information to students and their parents regarding the transition from IDEA and ADA. Make sure that students understand that the burden of responsibility for obtaining resources shifts from school personnel to the student upon entry into post-secondary programs.
- A training course in transition is currently being developed by RASEM Squared. It is a semester-long 3-credit course for mid-school students and their parents and teachers designed to avoid the pitfalls of transition between IDEA and ADA. RASEM is currently seeking support to teach the course via interactive television.

Teacher Training

At present, science education and special education teachers have very little training in common. Thus, while special education teachers may understand district, state and federal special education requirements such as written transition plans for students with disabilities ages 14+, science educators may not. Similarly, science educators may understand Newton's laws of motion but not know how to modify their instruction to teach these concepts to students with disabilities who may have interest and potential for STEM careers.

Suggested Strategies for Assistance:

- Take action to get pre-college teachers and college faculty members to increase communication across disciplines in relation to involvement of students with disabilities in STEM areas.
- RASEM Squared has addressed this issue on a local level by funding a series of workshops in Farmington, New Mexico. These workshops have brought science and special education teachers together to discuss important issues including disclosure and IDEA-ADA transition, and the importance of increasing the number of students with disabilities in STEM fields.

Assistive Technology (AT)

Although AT devices are available including text-to-voice software for students with visual impairments, many teachers feel unprepared to integrate such technology into the subjects they teach. According to the National Science Board (2002), "Only one-third of teachers reported feeling well prepared or very well prepared to use computers or the internet for classroom instruction…For many instructional activities, teachers who reported feeling better prepared to use technology were generally more likely to use it…"

Suggested Strategies for Assistance:

- Assist teachers in obtaining available training in AT.
- RASEM Squared has developed AT workshops for science and special education teachers to obtain training in new and unfamiliar AT devices. This graduate-credit workshop requires development of a curriculum project that includes use of AT in classroom activities.

Hardware and Software Compatibility

Today's college campuses provide an impressive array of computer stations and software available for students to do homework and research. However, when moving from one department's computer lab to another, students encounter a lack of compatibility. For example, word processing software may be different in terms of model and/or version. As a result, it is difficult for students with disabilities to move from machine to machine because AT devices are not compatible and/or formatting characteristics are lost in the process.

Suggested Strategies for Assistance:

- Work to assure compatibility across environments for students who must rely on assistive technology.
- RASEM Squared is collaborating with the NMSU College of Engineering, the New Mexico Division of Vocational Rehabilitation (DVR), and the NMSU Office of Facilities Services to create a model system that will allow students to move across campus environments with a minimum of downtime needed to employ their AT devices.

Linkage Between Services

Many services exist on modern post-secondary campuses whose mission is to assist students in their academic work and career preparation. Two typical services at NMSU are the Placement and Careers Office and Special Student Services. The problem is that these services may not overlap on a case-by-case basis when necessary. For example, when a placement and careers office is facilitating campus-based employer interviews, it may not be aware of the accommodation needs of students with disabilities already known to special student service personnel.

Suggested Strategies for Assistance:

- Work to get various offices and agencies to work together to identify overlapping, redundant, or missing efforts used to reach their mission.
- RASEM Squared has joined in a partnership across several NMSU offices and IBM to create a streamlined process for persons with disabilities engaged in the interviewing/hiring process.

Conclusions

The greatest difficulties faced by students with disabilities as they enter the area of higher education are:

- The need to disclose in order to receive assistance;
- Ignorance of transition issues between IDEA and ADA;
- Special education teachers, general education and science teachers who are unprepared to teach outside of their topic areas;
- Teachers who are unprepared to integrate such technology into the subjects they teach;
- Hardware and software incompatibility between departments, and
- Lack of overlapping services between departments.

The solutions rely on the students' own initiative, which must be nurtured and encouraged by organizations and services designed to provide such accommodations, and the re-training of teachers both at the secondary and post-secondary levels of education. The result will be students who learn how to live independently and to have careers as high-tech professionals. In addition, resources that promptly and efficiently respond to students' needs will also create an environment that supports the goals of transition. Ultimately, the workforce will be enlivened and enriched by a new wave of natural-born problem solvers who are currently underrepresented.

Readers from the RASEM Squared catchment area are encouraged to contact project representatives at <http://rasem.nmsu.edu> or by calling 1-888-646-6051 to obtain information about funding of Partner and TOP projects as well as mentorships and/or stipends for college students with disabilities majoring in STEM fields.

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