Students with Disabilities and STEM: Lessons Learned from a Decade of NSF Funding

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Abstract

An NSF award to Kansas State University funded the Research in Disabilities Education Synthesis Project (RDE-SP), a four-year synthesis research project that investigated the contributions of the NSF's Research in Disabilities Education (RDE) program to the field of STEM education over a 10-year period from 2001-2011. The focus is on post-secondary projects. Findings include successful practices, common challenges and solutions, and resources.

The Future of STEM

- By 2018, ten of the top thirty fastest growing occupations will be in STEM fields, requiring a bachelor's or higher degree
- There is a need for larger, better, and more diverse STEM workforce
- About 14% of the U.S. school aged population has a disability which increases as the population ages

Students with Disabilities in STEM Education

Federal laws and regulations enacted over the past four decades have increased access to post-secondary education for individuals with disabilities, thus the proportion of students identified with a disability in both two-year and four year post-secondary settings has increased dramatically in the last three decades *(do a footnote reference here) (National Center for Education Statistics [NCES], 2007)*. However, high rates of students with disabilities leave college without earning a degree *(footnote the reference – just use the latest one. – if you can find a later reference that would be great! Wolanin & Steele, 2004)*. Many of these students succeed in postsecondary STEM education, but many more could succeed in STEM courses and careers if barriers associated with including individuals with disabilities in STEM majors and careers could be overcome.

Post-Secondary STEM Enrollment
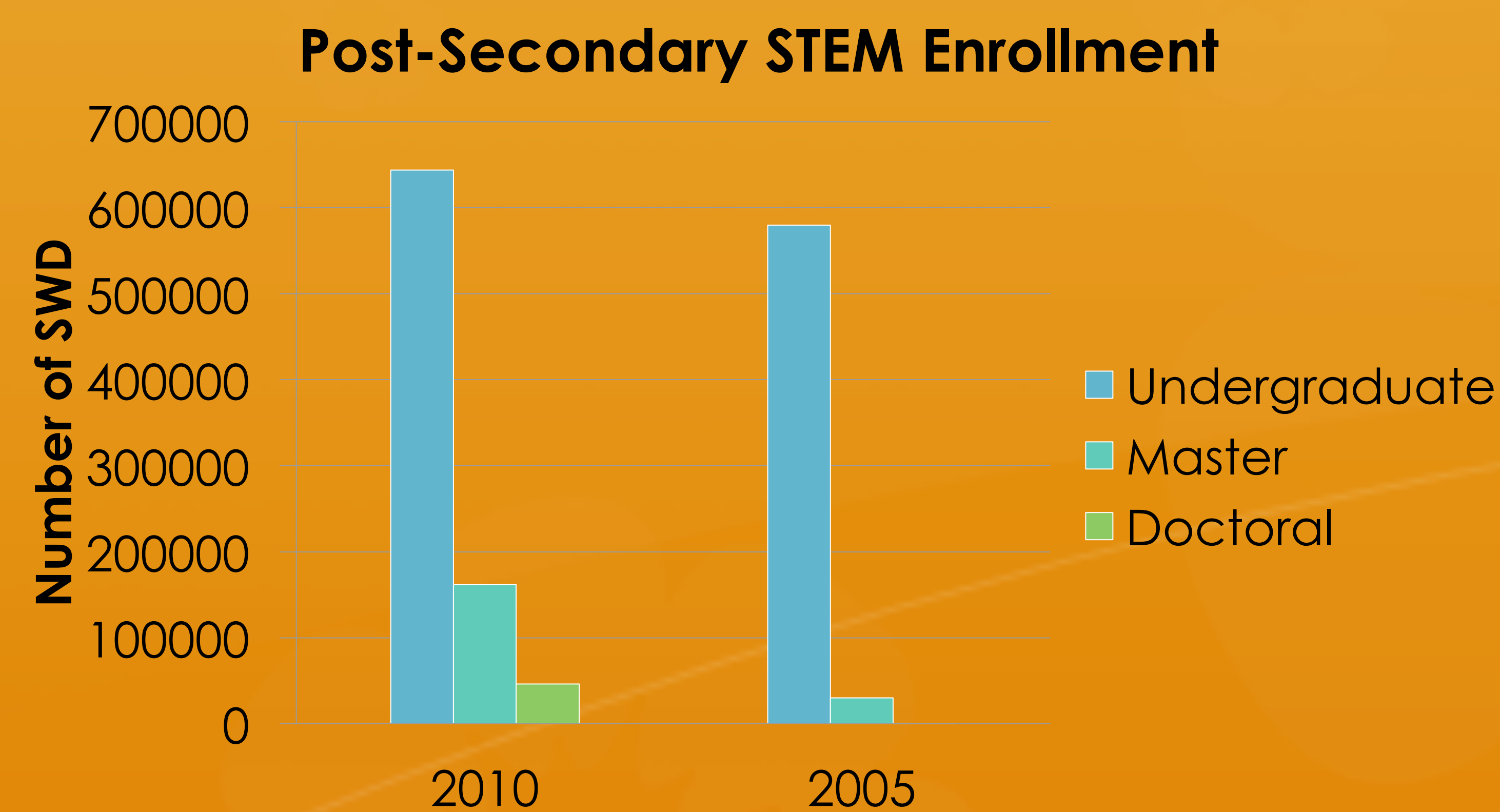
NSF Research in Disabilities Education (RDE)

Since its inception in 1950, NSF has played a significant role in maintaining U.S. preeminence in STEM research and innovation. Integral to the success of NSF's strategic goals is the improvement of STEM education of all Americans, including and to access previously untapped sources of STEM talent, which includes women, underrepresented minorities, and persons with disabilities. The RDE program at NSF, part of the Directorate for Education and Human Resources, invested in projects to broaden the participation and achievement of individuals with disabilities in science STEM education and associated professional careers.

RDE Synthesis Project Methodology

The RDE-SP at Kansas State University investigated 117 projects funded from 2001 – 2011 a using mixed methods approach. In order to capture the breadth and depth of this decade of work, the team analyzed annual and evaluation reports provided by PIs; conducted a focus group of PIs and Co-PIs; implemented a comprehensive survey of PIs; and conducted a citation analysis and social network analysis using publications of the projects. These data sources were used to capture lessons learned, challenges, recommendations, and the overall project results. Particular emphasis was placed on these issues: contributions to the knowledge base of STEM education and students with disabilities; research specifically related to postsecondary STEM learning by students with disabilities; successful practices at the secondary and postsecondary level that promote student interest, academic performance, and retention in STEM degree programs, STEM degree students with disabcompletion, and career choices; and effective practices for transitioning ilities across critical academic junctures.

Research Contributions

- Created faculty and staff learning communities
- Created numerous resources for SWD success (figure below)
- Developed broader understanding of the needs and capabilities for students with disabilities (SWD)
- Developed models for retention of SWD in STEM fields
- Demonstrated the efficacy of STEM mentoring
- Increased awareness among faculty and staff
- Increased SWDs in STEM graduate programs (figure below)

Resources

- Campus Access Centers
- DO-IT at the University of Washington
  - www.washington.edu/doit/RDE/
  - www.washington.edu/doit/Faculty
- Council for Exceptional Children www.cec.org
- University of Connecticut, Center on Postsecondary Education and Disability (2010) www.facultyware.uconn.edu
- *Beyond Rigor* Website www.beyondrigor.org
- Special Education / disability studies faculty

- Association for Higher Education and Disabilities (AHEAD) www.ahead.org
- The Center for Assistive Technology and Environmental Access (CATEA) http://catea.gatech.edu/
- National Center on UDL http://www.cast.org
- Institute for Accessible Science www.stemedhub.org/groups/iashub
- *Journal of Postsecondary Education and Disabilities* (JPED)
- Sevo, R. *Basics about Disabilities in Science and Engineering Education.* free at www.lulu.com

Common Challenges

- Establishing, maintaining, and respecting collaborations and other relations with the target communities
- Faculty/staff biased perspectives of SWD capabilities
- Lack of authentic lab experiences for SWD
- Lack of institutional support for projects
- Lack of structural and pedagogical accommodations
- Providing effective training for participating faculty and staff
- Recruiting from a small population; identification of students
- Too few resources; tools were not publically or easily available

Effective Strategies

- Accommodations for disabilities benefit all students
- Contact and maintain relations your student access center or disability student services
- Create and maintain collaborative relationships with the disabilities community
- Develop multi-faceted interventions / programs
- Develop quality mentoring programs
- Incorporate inclusive tools and activities for labs
- Provide disabilities training for all faculty and staff (socio-cultural model of disability)
- Provide inclusive social support
- Provide professional development and support for Universal Design for Learning (UDL)
- Provide quality lab, field, and internship experiences in STEM
- Provide self-advocacy training for SWD