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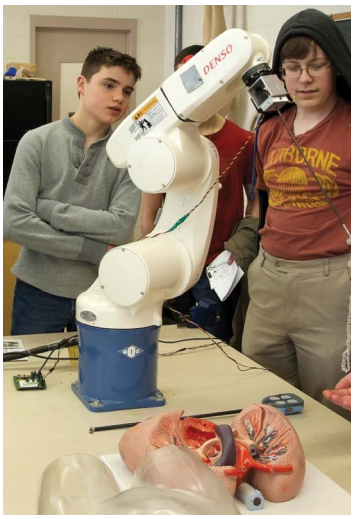
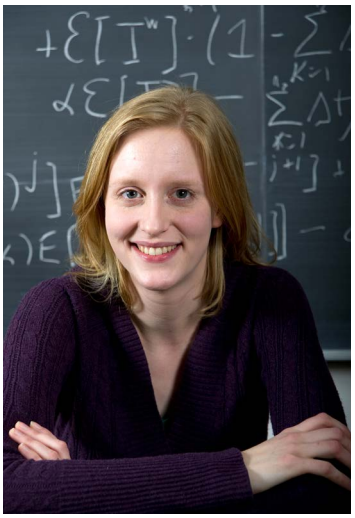
Increasing Access and Success in the

STEM Disciplines

A Model for Supporting the Transition of High School Students with Disabilities into STEM-Related Postsecondary Education





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Increasing Access and Success in the STEM Disciplines: A Model for Supporting the Transition of High School Students with Disabilities into STEM-Related Postsecondary Education

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and
Maine EPSCoR

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Introduction

The University of Maine Center for Community Inclusion and Disability Studies, Maine's University Center for Excellence in Developmental Disabilities (UCEDD), in collaboration with Maine EPSCoR (Experimental Program to Stimulate Competitive Research), has developed and evaluated a model for supporting the transition of Maine high school students with disabilities into Science, Technology, Engineering and Mathematics (STEM)-related postsecondary educational opportunities within the University of Maine System.

The model and this publication were developed as part of the *Maine EPSCoR: Increasing Access and Success in the STEM Disciplines* project (2011-2014), supported by a National Science Foundation EPSCoR award **#EPS-0904155** to Maine EPSCoR at the University of Maine.The model contains a package of evidenced-based supports for participating high school students with disabilities and their families and includes information and instructional activities related to the following: self-advocacy and self-determination; exploring STEM careers; disability disclosure; the accommodations process in college; identifying assistive technology; mentoring relationships and internships; and using student-and family-centered planning to plan for college.

Many high school students are unfamiliar with the range of opportunities that are available to them in STEM-related professions. Students with disabilities often have even less exposure to STEM-related fields and currently access postsecondary education, especially in the STEM disciplines, at rates far below other students. The *Increasing Access and Success in the STEM Disciplines* project began in 2011 as an effort to introduce high school students with disabilities to STEM careers and to assist them with developing the skills needed to successfully pursue STEM majors in college.

The content of this publication, *Increasing Access and Success in the STEM Disciplines: A Model for Supporting the Transition of High School Students with Disabilities into STEM-Related Postsecondary Education* was developed and compiled by project staff and field-tested with high school students with disabilities over the duration of the three-year project. It includes both group and individualized activities.The group format is comprised of a series of five workshop sections: Section One - STEM Careers and You; Section Two - Getting What You Need; Section 3 - Making It Meaningful; Section 4 - College Bound; and Section 5 - Person-Centered Planning Toolbox. Sections One, Two, and Four are designed to be held in a classroom setting and led by adult facilitators. The emphasis of Section Three is experiential learning: it provides detailed information about the project's annual tour of STEM facilities at the University of Maine or other programs or laboratories where STEM activities are performed. Almost all of the students reported that the STEM tour was one of the most beneficial activities of the project. Section Five, Person-Centered Planning Toolbox, contains activities that can be used in person-centered planning that follows instruction. We believe this process is critical to effective post-secondary transition planning for youth with disabilities who want to attend college. During the project, staff facilitated three student-centered planning meetings for each high school student and found these meetings were vital in helping students take the next steps in their transition to postsecondary education. We strongly recommend that you use this process with your students, as well. The Universty of Maine Center for Community Inclusion and Disability Studies and other University Centers for Excellence in

Developmental Disabilities (UCEDDs) around the country are good resources to contact for more information about person-centered planning.

A key document appearing in Section One of this publication is "Critical Steps to Postsecondary Education and STEM Careers Checklist." Critical steps are tasks that need to be addressed in a timely fashion during a student's high school career. For example: a student may need to sign up for courses that will be required when she or he applies to college with the intent to major in a STEM field. There are a number of checklists and activities within this publication that highlight critical steps, the importance of staying on track, and the need to keep this documentation (in either an electronic or paper format) in the student's personal portfolio.

Each of the five workshop sections includes an overview of the topic, followed by activities (including guidance for the instructor) and are designed to engage the students using a variety of teaching and learning strategies. **A two-page overview of Universal Design for Learning Principles follows this introduction**. Session materials may be provided to the students in either an electronic or paper format. Students who prefer working with hard copies can keep them in a 3-ring binder. Students who prefer using a computer can be provided with electronic copies of the materials on a flash drive.

The goal of this publication is to empower more high school students with disabilties to find their niche in STEM postscondary education and careers. As the National Science Foundation noted in a budget request to Congress,

> In the 21st century, scientific and technological innovations have become increasingly important as we face the benefits and challenges of both globalization and a knowledge-based economy. To succeed in this new information-based and highly technological society, students need to develop their capabilities in STEM to levels much beyond what was considered acceptable in the past. (NSF, FY2010 Budget Request to Congress)

About the University of Maine Center for Community Inclusion and Disability Studies

Founded in 1992, the University of Maine Center for Community Inclusion and Disability Studies (CCIDS) is Maine's University Center for Excellence in Developmental Disabilities, and part of a national network of centers congressionally authorized under the Developmental Disabilities Assistance and Bill of Rights Act of 2000. CCIDS conducts interdisciplinary education, research, and community engagement to positively affect the lives of people with intellectual and developmental disabilities and their families throughout Maine and beyond. For more information, please visit the CCIDS website: http://ccids.umaine.edu.

About Maine EPSCoR

Maine EPSCoR (Experimental Program to Stimulate Competitive Research) at the University of Maine oversees and implements Maine's National Science Foundation (NSF) EPSCoR programs. Since 1980, Maine has received more than $62M in NSF EPSCoR funding. These statewide programs advance Maine's research capacity and competitiveness for a sustainable future through cutting edge science, STEM education, workforce development, cyberinfrastructure, and economic development. For more information, please visit the Maine EPSCoR website: http://umaine.edu/epscor/.

Universal Design for Learning

The Center for Applied Special Technology (CAST, 2006) defines Universal Design for Learning (UDL) "as an approach to developing curricula that promotes the access, participation, and progress in the general curriculum for all learners." According to Meyer and Rose (2006), UDL is grounded in both neurological research and in assumptions about the heterogeneity of learners. They believe that three general neural networks (recognition, strategic, and affective) must be addressed through the use of maximally flexible curricula. Recognition is addressed in UDL through multiple means of representation, strategic networks by multiple means of expression, and affective learning through multiple means of engagement.

UDL can be provided without the use of electronic technology, but proponents believe that these technologies make it much easier for both representation and expression. Printed media are limited by their relative permanence and are not easily subject to modification (Meyer & Rose, 2006). In contrast, digitized text "can be transformed, marked, linked, networked and customized for each individual learner" (p.18).

In order to provide materials that can be accessed by the greatest number of individuals without significant modification, the materials in this publication are available in a digital format. This allows individuals who have difficulty accessing printed material in typical ways to access the content. For example, printed materials or downloadable materials referenced in this publication can be accessed using text-to-speech software. We strongly encourage you to make all materials available in multiple formats (e.g., hard copy, digital versions, large print versions) and make sure that your students have access to the technology they need to access those materials. For example, if you have a student who has difficulty reading printed text, we recommend that he or she be provided with access to a device that can read digitized text aloud. Similarly, a student with a visual impairment will need audio description to fully access the content of a video. Audio description is "commentary or narration which guides the listener through concise, objective descriptions of new scenes, settings, costumes, body language . . . slipped in between portions of dialogue" (Audio Description Project, 2014). Also consider how you can make any materials typically presented in a lecture format available to students who have difficulty processing auditory information.

UDL is also about people expressing themselves through different modalities. For some, this might involve using speech-to-text software or expanded keyboards. We have found that many of the students in the *Increasing Access and Success in the STEM Disciplines* project were much more motivated to complete assignments on a computer than in completing pencil and paper tasks. For some, the motor difficulties would make using a pencil or paper impossible. We have also found that some students have difficulty participating in small group discussions. As you engage students in group activities, consider alternatives that would allow them to participate to the fullest extent possible. For example, a student could present information as a PowerPoint© presentation or type out their contributions.

Finally, provide students with multiple means to become engaged with the materials. Engagement or motivation can be enhanced in a number of ways: (1) providing students with choices in specific topics covered; (2) providing students with choices about working in groups or alone; and (3) providing students with multiple sources of information and types of information. For example,

in Section 1 of this publication, students are invited to explore STEM careers at the Futures Channel website. This is a great opportunity to let students choose videos that are of interest to them. Alternatively, for students who learn better through print, information about different career possibilities can be provided in printed documents. You can also encourage students to explore these topics independently in class, thus maximizing their opportunities for choice.

For each activity in this publication, we include the following questions at the bottom of the page to prompt you to think about UDL:

How are you addressing Universal Design for Learning Principles in this activity? Are you:

- Presenting the information flexibly in multiple ways?
- Providing multiple and flexible means for expression?
- Providing multiple and flexible ways to engage the learner?

If you have students who are unfamiliar with the types of assistive technology that can be used to help them access classroom materials, you may wish to include the assistive technology activity from Section Four in the first or second section. Additional resources on UDL may be found at the following sites:

- About Universal Design for Learning —
  CAST, Inc. (n.d.). *About Universal Design for Learning.* Available online at http://www.cast.org/impact/universal-design-for-learning-udl
- Equal Access: Universal Design for Instruction. —
  University of Washington - DO-IT. (2014). *Equal access: Universal design for instruction.* Available online at http://www.washington.edu/doit/Brochures/Academics/equal_access_udi.html
- Universal Design for Learning Guidelines version 2.2 —
  CAST (2018). *Universal Design for Learning Guidelines version 2.2*. Retrieved from http://udlguidelines.cast.org
- Maine CITE.
  Maine CITE. (n.d.). Available online at https:/mainecite.org.