

2009

## A Working Conference on Students with Disabilities in STEM Coursework and Careers

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### Recommended Citation

Rule, Audrey C.; Stefanich, Greg P.; Haselhuhn, Charlotte W.; and Peiffer, Belinda, "A Working Conference on Students with Disabilities in STEM Coursework and Careers" (2009). *Faculty Publications*. 5566.  
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## A Working Conference on Students with Disabilities in STEM Coursework and Careers

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Structured Abstract Submitted June 5, 2009

**Background:** Few teachers and special education specialists are aware of the materials and resources available to support science, technology, engineering, and mathematics instruction for the scattered and isolated 3000 students with sensory and motor disabilities in Iowa's K-12 schools. Additionally, faculty at many community colleges and regent institutions are not aware of possible accommodations for their students with disabilities who have interests in pursuing STEM careers. Unfortunately, this often leads to discouragement and lack of success for students with motor or sensory disabilities. This conference brings together experts and conference attendees involved in instruction, support, or transitions for these students with sensory or mobility disabilities to plan ways to remedy the problem.

**Purpose:** This document provides a summary of a two-day conference related to assisting secondary and post-secondary students with disabilities in Science, Technology, Engineering, and Mathematics (STEM) areas. Highlights of the conference and the need for self-advocacy of students with disabilities are included in the narrative. In particular, this conference focused on students with sensory and mobility disabilities, including students with vision impairments, hearing impairments, students using wheelchairs, and students with movement-related health and motor impairments. The purpose of this two-day working conference was to stimulate dialog to (a) improve attitudes toward, (b) investigate ways to better support, and (c) plan accommodations/supports for students with disabilities who have interests in Science, Technology, Engineering and Mathematics (STEM), in secondary and post-secondary settings. This included examining ways to support students with STEM interests transitioning from high school to post-secondary education, investigating ways to support students with STEM interests transitioning from community colleges into STEM majors in 4-year colleges and universities, exploring options for resolution of issues; and advancing recommendations for improving the quality of STEM education for students with disabilities.

**Research Design:** This is a descriptive conference report with quantitative and qualitative conference evaluation responses.

**Setting:** The conference took place at the University of Northern Iowa on April 1<sup>st</sup> and 2<sup>nd</sup>, 2009.

**Study Sample:** A group of 67 professionals from across the state of Iowa and from Midwestern institutions with exemplary programs were invited as collaborative partners. The professional positions of these individuals included high school science teachers instructing students with disabilities, special education support staff, persons from post-secondary offices of student disabilities, community college and four-year institution STEM instructors/professors, with high school, college, and matriculated students with disabilities, and engineering students in senior design (with research projects focused on wheelchair modifications and other mechanical aids for students with mobility impairments), and representatives from business and industry. The conference was also attended by 159 preservice teachers.

**Data Collection and Analysis:** The two-day conference was organized to include three 30 to 50 minute panel presentations each day followed by 15 to 20-minute eight person table discussions. Attendees addressed critical issues through panel presentations. Discussions addressed focus questions in small groups related to the panel members' presentations. Responses from these discussions were recorded by volunteers typing into laptop computers during the discussions. Responses to these questions are reported elsewhere (Rule & Stefanich, in review; Rule, Stefanich, & Boody, in review). Data for this report were obtained from responses to questions on a post-conference evaluation form. These ratings were tabulated and remarks were qualitatively sorted into groups.

**Findings:** Participant comments and ratings on the conference evaluation indicate that the organizers were successful in providing speakers who presented interesting, useful information for stimulating discussions. The most often-reported participant comment was that the conference provided an ideal setting for networking for professionals working with students with disabilities. Overall conference ratings were high, also supporting conference efficacy.

**Conclusions:** Response to the conference from professional participants was overwhelmingly positive. Future conferences should provide opportunities for participants to try out assistive technology and provide more discussion of classroom supports.

**Citation:** Rule, A. C., Stefanich, G. P., Haselhuhn, C. W., & Peiffer, B. (2009). A Working Conference on Students with Disabilities in STEM Coursework and Careers. ERIC Document Reproduction Service No.

## A Working Conference on Students with Disabilities in STEM Coursework and Careers

Audrey C. Rule, Greg P. Stefanich, Charlotte W. Haselhuhn, & Belinda Peiffer

### Introduction and Rationale

There are about 3,000 students with profound physical disabilities or sensory impairments in Iowa's K-12 schools. These students make up a relatively small percentage of the school population and are scattered over the wide area of the state. Because of low incidence and isolation, few teachers and accommodation specialists are aware of materials and resources to support science, technology, engineering, and mathematics (STEM) instruction for these students. Similarly, many community college and regent institution personnel are not aware of possible accommodations for their students with disabilities who have interests in pursuing STEM careers. Unfortunately, this sometimes leads to discouragement and lack of success. Therefore, a conference was organized to bring together stakeholders in this enterprise of supporting students with disabilities in STEM areas.

### Organization of the Conference

The two-day conference consisted of three panels of speakers each day, with each panel followed by 15 to 20 minutes of discussion of ideas by conference participants. The only exception was that questions for presenters and a final summary with concluding remarks followed the last panel of presentations. The first panel consisted of community college personnel who discussed support services for students with disabilities pursuing degrees in STEM fields. The second panel consisted of disability specialists from regent universities. The third panel focused on internships and mentorships. On the evening of the first day, participants attended a banquet and listened to comments from students with disabilities, their teachers, and parents. The second day of the conference focused on assistive technologies and transition services for students with disabilities. The final panel consisted of a set of oral and poster presentations of assistive technology devices designed by senior students in engineering from the University of Wisconsin-Madison. Tables 1 and 2 delineate the conference schedule.

**Table 1. Conference Schedule for Day 1**

Wednesday, April 1, 2009	
10:00AM	Continental Breakfast and completion of pre-assessment on attitudes toward students with disabilities in STEM classes/careers.
10:30AM	Welcome from Dr. William Callahan, Dean of the College of Education, University of Northern Iowa
10:45AM	Panel 1 – Community Colleges
	Sharon Bittner, Director, Program Development/Academic Support Services, Section 504/ADA Coordinator at Des Moines Area Community College (DMACC) shared information about support services for students with disabilities pursuing degrees in STEM fields.
	Melissa Klein, Director of Disability Services at Hawkeye Community College, gave information about support services for students with disabilities pursuing degrees in STEM fields.
	Lisa Vance, Counselor, Disability Services at North Iowa Area Community College (NIACC), provided information about support services for students with disabilities pursuing degrees in STEM fields.
12:00 noon	Lunch
1:00PM	Panel 2 – Regents Universities
	Jill Smith, Director of the Office of Disability Services at the University of Northern Iowa, shared information about support services for students with disabilities attending UNI, noting specific elements relating to STEM fields.
	Steve Moats, Director of the Office of Disability Services at Iowa State University provided information about support services for students with disabilities pursuing degrees in STEM fields.
	Mark Harris, Director of the Office of Disability Services at the University of Iowa presented information about support services for students with disabilities pursuing degrees in STEM fields.
	Ashley Lerch, Program Associate in Student Disability Services, shared experiences as a student with a disability pursuing a STEM major.
2:15PM	Break
2:30PM	Panel 3 – MIDWEST and Iowa Department of Education
	Tina Lam Rolfe, Outreach Coordinator from the MIDWEST Alliance, University of Illinois, shared information about the MIDWEST Alliance and the internship program in MIDWEST.
	Liam Martin, Mentorship Coordinator from the MIDWEST Alliance, University of Wisconsin-Madison, provided information about the mentorship program in MIDWEST.
	Susann Heft Sears, from the University of Illinois, will share information about disability services (Beckwith, DRES) at the University of Illinois.
	Yvette McCulley, Secondary Science Consultant, Iowa Department of Education, presented information about DE work in the areas of math and science with students with disabilities
3:45PM	Wrap up of first day
6 – 7PM	Reception in Georgian Lounge, UNI Commons
7:00PM	Evening Banquet
	Informal personal stories of students with disabilities in STEM fields from students, teachers, and parents
8:15PM	Closing comments by Dr. Greg Stefanich, conference co-organizer, University of Northern Iowa

**Table 2. Conference Schedule for Day 2**


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Thursday, April 2, 2009

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8:30 – 9:00AM Continental Breakfast

9:00AM Welcome, Dr. Jeff Weld, Associate Professor of Biology, University of Northern Iowa, Director of the Iowa Math Science Education Partnership (IMSEP)

Keynote Address - Increasing Access to Science, Technology, Engineering, and Mathematics for Students with Disabilities by Jay K. Martin, Professor, Mechanical Engineering, Principal Investigator, Midwest Alliance in Science, Technology, Engineering and Mathematics, University of Wisconsin - Madison

Students with disabilities face many challenges that limit their participation in science, technology, engineering and mathematics (STEM). This presentation included descriptions of these challenges and presented what has been discovered related to the source of the challenges. Different approaches designed to mitigate some of these challenges, and in the process, increase access for student with disabilities to STEM, were presented.

9:35AM Panel 4 – Assistive Technology

Jane Gay, Coordinator for the Iowa Program for Assistive Technology presented information about support services for students with disabilities in secondary schools and post-secondary settings in Iowa.

Donna Sennert, Prairie Lakes Area Education Association (AEA) #8 Assistive Technology Coordinator, gave information about assistive technology support services for students with disabilities in secondary schools in Iowa.

Nancy Oddo, Transition/Work Experience Facilitator for the Cedar Rapids Community Schools, shared information about their transition/work experience program.

Dr. Norma Stumbo, recently retired from Illinois State University, former Director of the Midwest Alliance, provided detailed information on a variety of federal funding programs (e.g., National Science Foundation and National Institute of Health) available to individuals with disabilities.

10:45AM Break

11:00AM Panel 5 – Assistive Technology

Sara Larkin, statewide mathematics consultant for the Iowa Braille School, presented information about services that the Braille school provides in terms of support during the high school years in math and science and how cooperation of all adults working with the students can help make the transition easier.

Megen Johnson, transition coordinator for the Iowa Braille School, gave information about services that the Braille school provides in terms of support during the high school years in math and science and how cooperation of all adults working with the students can help make the transition easier.

Curtis Chong, Program Administrator Field Operations and Access Technology Iowa Department for the Blind, shared information about services that are available from the Iowa Department for the Blind.

Jim Stachowiak, Coordinator for Iowa Center for Assistive Technology Education and Research (ICATER) and the University of Iowa, College of Education, will share information about assistive technology opportunities at the University of Iowa and opportunities for support for high school students.

12:00 noon Lunch

12:45 Assistive Technology Showcase (Panel 6)

Jay K. Martin, Professor, Mechanical Engineering, University of Wisconsin-Madison, and Students from Capstone Design in Mechanical Engineering: Eyleen Chou, Sarah Wilmer, Emmett Yule, Jonathon Martens, Richard Smith, Brent Keller, Cassy Schuette, and Jared Kahn. This session provided a brief overview of latest research in assistive technology for individuals with physical disabilities. In addition, a number of current rehabilitation engineering research projects at the University of Wisconsin-Madison's UW-CRETe (Center for Rehabilitation Engineering and Assistive Technology) and the Assistive Technology Rehabilitation Laboratory (ARTe) were presented and displayed at stations around the room. Audience members had ample opportunity to interact with the designers and see how each of the devices operates.

2:00PM Synthesis and Sharing

2:45PM Post-Workshop Assessment

3:00PM Adjournment of conference

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### Highlights of Conference Presentations

About 7% of the US noninstitutionalized population aged 16-20 years has a disability with about 3% being sensory or physical disabilities (NSF, 2009, Table A-3, p. 22). Students with disabilities tend to choose programs in the social/behavioral sciences including education rather than math/engineering or computer sciences more than peers without disabilities (NSF, 2009, Table D-9, 131). However, many of these students could succeed in STEM (Science, Mathematics, Engineering, and Technology) courses and careers if provided the appropriate accommodations. In this section, Belinda Peiffer, a teacher of students with visual impairments who is working collaboratively with the science teacher to ensure that proper accommodations are being made for a 10th-grade student who is blind, gives her perspective as a participant in this working conference.

This conference brought people together from varied backgrounds but who had similar interests in encouraging students with disabilities in STEM areas. These included professionals from community colleges, regent institutions within the

state and from neighboring states, the state department for the blind, area education associations, middle schools, and high schools, along with students with disabilities and their parents. The goal of the meeting was for participants to become more familiar with the systems that are in place for students with disabilities who are interested in pursuing coursework or careers in STEM areas, to support that system, and find ways to improve it. The conference was designed and hosted by Dr. Greg Stefanich and Dr. Audrey Rule from the Department of Curriculum and Instruction at the University of Northern Iowa in Cedar Falls, Iowa. The meeting provided opportunities to learn what tools are in place to help students with disabilities who are taking classes in the STEM areas, as well as the chance to share information, brainstorm, and network.

Students with disabilities frequently state that they are unable to fully participate alongside their peers in STEM classes. Students with vision impairments are often asked to merely listen to a summary of an experiment without having the chance to determine and interpret results themselves. Assistive technology such as talking balances and thermometers can begin to provide students with a more hands-on experience during many labs. There are additional low-cost laboratory adaptations available such as a notched plastic syringe with Braille labels, a submersible audible light sensory for detection of light intensity and color changes, and a host of other devices (See Rankel, Amorosi, & Graybill, 2008, and Lunsford & Bargerhuff, 2006). Oftentimes, teachers do not feel qualified to teach students with sensory or motor disabilities, nor do they have the proper professional preparation for making accommodations. Classrooms generally are not set up to meet the needs of these students. Without the proper hands-on experiences and exposures in the STEM classes, a student with disabilities does not feel confident enough to choose a career in a field that requires higher levels of knowledge in science, technology, engineering, and math.

On the opening day of the conference, during the panel sessions, representatives from colleges and community colleges shared information about personnel and technology supports available to help students with disabilities while in college and taking classes. These included assistive technology equipment such as voice-activated word processing software, software for translating print into spoken words, and Braille texts. An informative handout provided during the conference from the Iowa Center for Assistive Technology Education and Research is available in Appendix A. Other frequent accommodations included student note-takers, additional test-taking time, and private test-taking. A barrier for students who use wheel chairs is the inaccessibility of laboratories on upper floors of buildings without elevators and the high lab tables of many science labs. Instructors need to be willing to set up lab equipment on accessible lower lab tables so that students with mobility disabilities may fully participate.

Other presenters spoke of mentoring programs and internships which are available to students with disabilities. These programs allow students to become more familiar, to imagine their place, and to network with professionals and potential employers in fields in which they have expressed interest.

Educators know that students with disabilities have the capability to be successful given the appropriate accommodations; however, educators just aren't sure what, beyond their current practice, to do to help a struggling student. Participants had many questions about who to turn to for guidance and what other tools or assistive devices might be helpful. Although there are agencies available that might be able to offer support, many schools and employers are unaware of their existence or how to tap into those resources. Many post-secondary students with disabilities are not aware of those organizations either, leaning heavily on the "Disabilities Office" staff at their university, college or community college for guidance.

Throughout the conference two main ideas were expressed by participants during discussions. The first idea was that there is a strong belief that students with disabilities can be successful in college STEM courses and later in a STEM career, given the appropriate education and the opportunity to participate alongside peers without disabilities in laboratory and other hands-on inquiry experiences. Second, educators are highly concerned that they are not providing students with disabilities the proper accommodations to ensure their success. A general consensus of many conference attendee discussions was that the students with disabilities need the opportunity for "hands-on" experiences with their peers. However, the majority of STEM teachers and the disability advisors don't always know how to modify existing activities to provide a similar experience. Instructors and support personnel came to this conference hoping to find someone who could give them guidance in how to make the appropriate accommodations to insure a solid educational foundation for students with disabilities who are taking or will be taking STEM classes.

Conference presenters offered examples of successful accommodations for science and mathematics classes that were talked about by participants during the group discussion sessions. Simple science models, such as life-size or larger-scale replicas of organisms can be provided for students with sight impairments for tactile exploration or dissection. A special type of

"paper" that produced a raised line when drawn upon was demonstrated for use with students with visual impairments who could then feel geometric drawings and use special compasses to draw bisectors of angles or other geometric lines and figures.

Following dinner on the first day of the conference, Dr. Stefanich spoke about his research grants that involve collaboratively working with educational organizations such as Iowa Braille School, area education agencies, STEM teachers at the junior high and high school levels, and collaborating post-secondary faculty from the University of Wisconsin, Madison and the University of Illinois at Champaign-Urbana. The grants have supplied funds that are being used to provide internships and mentorships for students with disabilities, present workshops for preservice and practicing educators, provide STEM classroom teachers with adaptive equipment and supplies, and share information about resources that share information about resources for accommodating students with disabilities in their classes. Dr. Stefanich's goal is that these added tools will allow more "hands-on" opportunities for the student with disabilities to participate alongside his/her peers, resulting in a more solid foundation and greater success in more advanced STEM classes and perhaps eventually carry over into a STEM career.

After an explanation of the STEM Research Study, Dr. Stefanich invited high school STEM participants to share their feelings about how their school year had unfolded thus far. One of the students who was blind, a 10<sup>th</sup>-grade science and math student, shared that science has always been her hardest subject. She stated that her inability to see makes it difficult to participate in science experiments. She expressed the need for hands-on experiences with her peers to comprehend the concepts. This year, with the extra supports in place through grant funding, this student confided that science is one of her "best classes this year!"

Being aware of the audience, the student with visual impairments spoke directly to the college representatives. She strongly encouraged them to talk to their students with disabilities to find out what accommodations worked best for them as individuals. She shared that although two people have the same disability, it does not mean the same accommodation will work for both of them. Accommodations need to be individualized. This student explained that some teachers are better at making accommodations than others, but when the appropriate tools were in place, she was able to be successful in the STEM classrooms and others will too.

Later that evening the student with visual impairments who had spoken after dinner talked informally to some participants. She confided that just knowing the colleges were willing to work with her as an individual, recognizing her individual needs, and hearing that they wanted her to succeed, made her feel more at ease about attending college in the future. This student also said that she will now reconsider pursuing her first choice of careers, which is in the STEM area, as long as the accommodations continue to be made so she can fully participate in STEM classes for the duration of high school and in college! Science is now one of her favorite classes. She is dreaming about her future again, just as her teenage peers without disabilities. This change in attitude has happen since hands-on science kits were put in place at her school.

On the final day of the conference, there were other presenters on panels that spoke about the supports in place at the pre-college levels and younger. Vendors shared some of their tools which have been beneficial in helping students with disabilities become independent and successful, providing a great opportunity to see how the entire educational system works for a person with disabilities. Speakers discussed supports beginning in the elementary years from high school and the college level, including transitions and internships. Areas of both success and deficit were examined.

This conference provided attendees with many opportunities to learn from one another. Throughout the conference, while participating in small group activities, participants discussed how important it is to provide accommodations and modifications to people of all ages, infants through adults. Of course, there were varied opinions on how that should look, but everyone agreed that anyone can be successful given an appropriate education and with the proper tools in place. There is still a lot of work to do in order to bring everyone to the same level of understanding. Participants realized they must do their part in helping everyone understand that people with disabilities can compete with their peers if given the proper education and with the appropriate tools in place.

Disabilities are doubly-challenging because they are so specific: what works for one student with a disability may not be appropriate for the next. Several participants thought it might be helpful to provide all STEM teachers with some additional professional preparation in the area of "special needs." Participants generated some ideas on how that would look or how that professional development could be incorporated. Although it would be a huge undertaking, this professional preparation is necessary to provide our students what they need for success.

### **The Pressing Need for Self-Advocacy of Students with Disabilities**

A recurring message of conference speakers was the need for self-advocacy of students with disabilities. Several speakers suggested that students become experts in their own disabilities so that they may better understand the accommodations that will be most helpful to them. In this section, conference participant and school psychologist Charlotte Haselhuhn explores this important concept.

The proportion of students identified with a disability in 2-year and 4-year post-secondary settings has increased in the last 25 years from less than 3% in 1978 (American Youth Policy Forum and Center on Education Policy, 2002) to over 11% in 2003-2004 (National Center for Education Statistics [NCES], 2007), but the majority of students with disabilities do not receive services at the post-secondary level. NCES reported that in the 1999-2000 academic year, the most recent year for which data are available, only 26% of post-secondary students with disabilities received services and 22% of those students reported that they did not receive needed services or accommodations.

A baccalaureate degree can improve the quality of adult life for students with disabilities, yet students may not have the supports and services they need to complete a college education. A recent NCES (2008) report indicated that young adults who have completed 4 years of post-secondary education have a median salary that is 50% greater than the median salary for students with only a high school education, but a smaller proportion of students with disabilities who enter postsecondary education finish a 4-year degree than those students without disabilities. The National Science Foundation [NSF] (2002) reported that for students who enrolled in a 4-year post-secondary program in 1989-1990, only 53% of the students identified with disabilities earned a baccalaureate degree within 5 years, compared with 64% of those without disabilities.

One of the reasons students with disabilities may not access needed services at the post-secondary level at the time of transition is because of the differences in requirements as they move from high school, where they received services under IDEA, to the postsecondary setting where they receive services under ADA or Section 504. Schutz (2002) noted that although students receive services without self-advocacy in high school, when they enter college they must request disability services. Colleges are not allowed to request information about disability status in the application and admissions process (Protection and Advocacy for People with Disabilities, 2009). In addition, post-secondary institutions may have requirements for documentation of disabilities that are different from those collected in K-12 settings, and students may be required to pursue independent assessment. For example, IDEA (2004) no longer requires documentation of a severe discrepancy between ability and achievement to identify a student as learning disabled. In some areas of the country, students may be identified with a disability without identifying a specific disability such as learning disability or mental disability (e.g. State of Iowa, 2006). The Association on Higher Education and Disability (2008) identifies seven essential elements for documentation of a disability, including a best practice guideline that post-secondary institutions may require a diagnosis consistent with DSM IV. Students with disabilities may not only need to self-identify when they enter a post-secondary setting, many must persist to meet qualifications and self-advocate to access needed services.

Schutz (2002) defines self-advocacy as the ability of a student to take responsibility to express needs, communicate appropriately with professors and the university disability office, and to resolve conflict. Van Reusen, Bos, Schumaker and Deschler (as cited in Cummings, Maddux, & Casey, 2000) included the need for students to take responsibility for their decisions and make informed decisions in their description of self-advocacy. Despite the importance of self-advocacy in transition, students may be inadequately prepared in this area. Janiga and Costenbader (2002) surveyed 74 secondary disabilities coordinators in New York State to assess their perceptions of transition preparation of students with learning disabilities. The coordinators expressed particular dissatisfaction with students' preparation in self-advocacy.

Several researchers have studied self-advocacy as a component of self-determination (Durlock, Rose, & Bursuck, 1994; Getzel, 2008; Webb, Patterson, Slyverud & Seabrooks-Blackmore, 2008). Getzel found students with good self-determination skills to be more persistent and more likely to complete college than those without good self-determination skills. In addition, students who have better self-determination skills have a greater likelihood of attaining positive adult outcomes (Webb et al.). Webb and others conducted a review of the literature and interviewed college students with disabilities who demonstrated strong self-determination skills to identify the most important components of success in the post-secondary environment. In addition to social skills, academic preparation, accommodations, and assistive technology, self-determination (including self-advocacy and internal locus of control) was one of the most important components of success. Important self-determination skills included problem solving, understanding of their disability, setting goals, and self-management.

Despite the need for self-advocacy and self-determination, a nonexhaustive ERIC search (using keywords in various combinations: secondary, postsecondary, transition, and disability) revealed few empirical studies of interventions to support students' acquisition of self-determination and self-advocacy skills and their application in transition. Four articles that described



empirical studies were located (Durlock et al., 1994 ; Halpern, Herr, Wolf, Doren, & Johnson [as cited in Webb et al.]; Palmer & Roessler, 2000; Wehmeyer, Palmer, Argan, Mithaug, & Martin, 2000). In addition, Webb and others identified a program that appears promising. The efficacy of the majority of programs was studied with students with learning disabilities.

Durlock and others (1994) provided a total of 8 hours of instruction in self-determination to high school students with learning disabilities. They used a multiple baseline design to test the effects of instruction. Behavior in classrooms during the course of instruction and during follow up was directly observed, and several scales including scales of self-advocacy and assertiveness were administered before and after the training. Direct observation demonstrated that students improved in their knowledge and classroom skills in self-determination and completed most generalization tasks, but pre-post measures showed no significant differences.

Palmer and Roessler (2000) provided training in self-advocacy, communication skills, and conflict resolution to 50 post-secondary students with disabilities. Twenty-six students with disabilities made up a control group. Outcome measures included a written measure of knowledge and direct observation in simulated settings. After training, students in the treatment group demonstrated more self-advocacy and conflict resolution behavior, more general knowledge, higher self-efficacy in requesting accommodations, and higher scores on a measure of social competence than the control group.

Wehmeyer and others (2000) developed and tested a program called The Self-Determined Learning Model of Instruction. They reported that students who participated in the program progressed toward their goals, improved in self-determination and were happy with model and the outcomes of training.

Halpern, Herr, Wolf, Doren, and Johnson (as cited in Webb et al., 2008) developed a program called Next S.T.E.P (Student Transition and Education Planning). Zhang (as cited in Webb et al., 2008) reported a study in which high school students were instructed in specific self-determination skills using the S.T.E.P program. Zhang used a non-treatment control group and reported that the treatment group improved in self-determination score from pretest to posttest, but the control group did not show a significant difference between pretest and posttest.

Although empirical work indicates that students can acquire self-determination skills, the studies described used methods that limit generalization of the results. Two of the studies (Durlock et al., 1994); Wehmeyer et al., 2000) did not use control groups, and two used non-treatment controls (Palmer & Roessler, 2000; Zhang, as cited in Webb et al., 2008). In addition, only one study investigated actual classroom behaviors (Durlock et al.), although Palmer and Roessler assessed behavior of postsecondary students in simulated situations. The study conducted by Durlock and colleagues involved only high school students and did not investigate self-advocacy during transition. The training programs show promise, but should be studied in actual transition situations using appropriate control groups

Although the need for self-advocacy and self-determination skills during transition for students with disabilities is established, students' knowledge and skills may not be adequate. The majority of students with disabilities receive no services or inadequate services in postsecondary settings. Although the small number of studies described here may not be representative of all available self-advocacy programs for students with disabilities, outcomes demonstrate that some programs and interventions for increasing self-advocacy skills show promise. Student outcomes, including in acquisition and application of self-advocacy skills during transition, should continue to be evaluated.

## Conference Evaluation

At the close of the conference, participants responded to a conference evaluation form on which they provided comments and rated different aspects of the meeting. Table 3 provides a summary of participants' responses to "Overall, what did you like best about the conference?" In general, participants responded that the conference provided a great setting for networking. The presentations of senior engineering students on assistive devices were viewed very favorably, as were all of the assistive technology information sessions and displays. Participants reported satisfaction with conference discussions and felt that hearing the experiences of persons with disabilities was valuable. The participation of preservice teachers and displays of effective materials were also acknowledged as positive contributions to the meeting. Several participants also mentioned other presentations as being beneficial. Outcomes of the conference discussion questions and pretest-posttest results of an attitude survey are discussed in detail in two other manuscripts (Rule & Stefanich, in review; Rule, Stefanich, & Boody, in review).

Table 3. What participants liked about the conference

Frequency	Statements of what was liked concerning the conference
12	Networking with others, making connections to other agencies, sharing ideas, learning what others do in their professional positions; acquiring new resources.
7	Seeing the presentations of engineering students concerning assistive devices for people with disabilities; engineering device presentations that were very interesting and professional.
7	Seeing assistive technology displays and hearing about the many devices; the product displays; learning about ICATER
4	Listening to students or professionals with disabilities share their experiences.
4	Significant interaction during the conference discussions, especially with moving people around
3	Inclusion of preservice teachers at the conference; talking to preservice teachers.
3	Inclusion of displays of new teaching materials and assistive technology; being able to walk around and see the displays.
3	Presentations of support services of community colleges, regent universities, mentorship, internship, and transition programs.

Table 4 provides a summary of responses to, "In what ways could the conference have been improved?" The most frequent responses requested more information for what teachers can specifically do. Participants also suggested that the conference be better advertised to reach a wider audience and that assistive technology devices be available for participants to try out during the conference.

Table 4. Ways the conference might be improved as mentioned by participants on the conference evaluation

Frequency	Statements of how the conference might be improved
5	More information on what teachers can do and the materials they can use; align more with the needs of teachers and those who prepare them.
4	Provide more snacks and beverages between meals; have ice water available throughout the conference.
3	The conference was well-organized.
3	All presenters need to have visuals or PowerPoints to make their presentations more engaging.
2	Advertise the conference better so that it reaches more people.
2	Have assistive technology stations set up for participants to try out.
2	Have more time for discussions.
2	More introductory and concluding remarks on the conference.
1	Focus more on how to change dispositions of instructors toward students with disabilities in their STEM classes.
1	Discuss students with invisible disabilities or psychological impairments and accommodations more.
1	More sharing from high school and college students who have disabilities.
1	Be able to ask more questions of the panelists.
1	Have more K-12 educators present so they hear these important ideas.
1	Better signage on campus to find the conference center.

Participants rated the conference on a scale of one to six with "1" being "very dissatisfied" and "6" being "very satisfied." Table 5 presents the mean results of this conference assessment. In general, participants expressed strong satisfaction with the conference.

Table 5. Numerical ratings of the conference

Conference Session or Component	Mean rating on 1-6 scale (standard deviation)	Number responding
Overall satisfaction with the conference	4.7 (1.0)	72
Overall satisfaction with tables or displays	4.7 (1.0)	69
Based on total experiences with the conference, will you attend or recommend someone else attend a similar conference in future years?	4.9 (1.0)	71

## Conclusion

The preceding information provided through conference attendee comments and conference ratings indicate that the conference was a success in providing stimulating information and discussions for participants. Conference participants noted that a major outcome of the conference for them was professional networking. Attendees suggested that future conferences provide the opportunity for participants to try out assistive technology and focus more on specific accommodations that classroom teachers might make. Overall, participants responded favorably to the conference, indicating they would attend or recommend another similar conference.

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### **Acknowledgements**

The information contained in this article is based upon work for the Iowa Mathematics, Science, and Engineering Partnership (IMSEP) with the funded project titled, "Planning for success in STEM for students with disabilities: A working conference," and with collegial support from "Midwest" a Regional Alliance supported by the National Science Foundation under Grant No. 0533197. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the Iowa Board of Regents or the National Science Foundation.

The authors wish to thank: Allison Ruhser, student assistant, for her help in word-processing, correspondence, and technical assistance; Julie A. Johnson and Darnell Cole Taylor for clerical and analytical work related to preparation and fiscal management; Robin Galloway for assistance with technology applications; and Dr. Robert Boody for assistance with statistical data analysis.

#### **Following Page:**

**Appendix A. Remarkable Technology:** Handout from the Iowa Center for Assistive Technology Education and Research.



## Iowa Center for Assistive Technology Education and Research

The ICATER lab maintains a number of assistive technology devices integrated into a typical computer lab setting for University of Iowa students with visual, cognitive, or physical disabilities. The lab allows equal access, through the use of assistive technology, to the standard software and computer programs offered at all University of Iowa Instructional Technology Centers. Through ICATER, University of Iowa students with disabilities have access to a variety of assistive technology devices to aid them in accomplishing their educational goals leading to graduation.

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### ICATER Lab Assistive Technology Devices and Software

#### Adaptive Computer Access Devices

BAT Personal Keyboard	One-handed, compact input device that replicates all the functions of a full-size keyboard, but with greater efficiency and convenience
Fingerprint Scanner (Log in)	Provides users a convenient and secure way to manage and access multiple security phrases and codes with a fingerprint
Head Mouse Extreme	Replaces a standard computer mouse for people who cannot use their hands
Intelli Switches	Provides the user an alternative to the mouse click
IntelliKeys Keyboard	Adaptable keyboard that enables the user to customize it in any manner that facilitates efficiency and comfort
Jelly Bean Switch	Control unit that gives students the ability to control most electrical items (e.g. computers), appliances, tools and toys with single switches
Joy Stick	Alternative to using the mouse for movement on the computer
Kensington Track Balls	Roller ball that can be used as an alternative to the mouse
USB Switch Interface	Allows for up to four augmentative devices to be plugged in through its USB to the computer

#### Adapted General Access Devices

Sip/Puff Switch	Head mounted accessory used to actuate a two-position switch by a simple sip or puff
Talking Calculator	Handheld talking calculator
Talking Money Calculator	Handheld talking coin-counting calculator

<b>Low Vision Aids</b>	
CCTV (Closed Circuit Television)	Magnifier that increases the size of printed materials (e.g. books and magazines)
Duxbury Braille Translator	Used to translate created and imported documents into Braille
Juliet Interpoint Embosser	Used to print translated Braille documents into Braille
PowerBraille 65	Transforms a standard keyboard into a Braille keyboard
Reading Edge Reading Machine	Scan and read hardware

#### Adapted Writing Aid

AlphaSmart 3000	Allows individuals to create, edit, and store their own original compositions and essays
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#### Adapted Teacher/Student Aids

Lottie Kit 2002	A collection of low- and mid-tech tools designed for teachers, classroom aides, and support professionals to use with students (grades K-12) who have special needs
Lottie Kit Literacy	A collection of low- and mid-tech tools designed for teachers, classroom aides, and support professionals to use with students (grades K-12) who have special needs
Test Taker	Voice output test program designed for use by children who are blind or have low vision, learning disabilities, cognitive disabilities, or fine motor disabilities
Test Talker	Provides a talking computerized version of tests, worksheets, or forms

**Software**

<b>IntelliTools Software</b>	
ClickIt!	Provides mouseless access for students who can't use a mouse effectively
IntelliMathics	Mathematics authoring program that lets individuals explore math and how it integrates into everyday life
IntelliPics	Teachers can create activities for students in every curriculum area and grade level
IntelliTalk III	Allows users to track activity responses and quiz answers, then record, report, and print records for assessment
IntelliTools Balanced Literacy	Nine-unit program that provides a full year of literacy instruction at a K-8 grade skill level
IntelliTools Classroom Suite	Curriculum-based, standards-aligned activities and templates through utilizing IntelliMathics, IntelliPics, IntelliTalk and Intellitools Balanced Literacy
MathPad Plus	Electronic worksheet that enables students to do addition, subtraction, multiplication, and division directly on the computer
Number Concepts 1 & 2	Software programs designed to develop maths skills and concepts
Overlay Maker 3	Create custom overlays for any activity made with IntelliTools Classroom Suite and its tools, IntelliPics Studio 3, IntelliMathics 3, and IntelliTalk 3
<b>Scan and Text Reader Software</b>	
Complete Reading System	Screen reader and scan-and-read software
Kurzweil 3000	Scan-and-read software that reads documents and Windows applications
Open Book	Scan-and-read software
Scan and Read Lite	Changes printed text into understandable sound
Scan and Read Pro	Changes printed text into understandable sound
Scan and View	Changes printed text into understandable sound
Wynn Scan and Read Literacy System	Scan-and-read software

<b>Screen Enlarging Software</b>	
Close View	Program that allows the screen to be magnified up to 16 times
Jaws 70	Screen reader
<b>Screen Reader Software</b>	
Window Eyes	Scan-and-read software
ZoomText 9	Enlarges and enhances images on your computer screen, making applications easy to see and use
<b>Text Readers</b>	
CAST eReader	Adds speech and visual highlighting to any electronic text
Doc Reader	A part of ZoomText Xtra! that can be used for reading text from any Windows application
Text-to-Audio	Converts documents to audio files
Universal Reader	Reads text to user
<b>Voice-to-Text Voice Recognition Software</b>	
Dragon Naturally Speaking 80 Professional	Voice recognition software
Dragon Naturally Speaking 80 Preferred	Voice recognition software
Dragon Naturally Speaking 90 Preferred	Voice recognition software
Dragon Naturally Speaking French	Voice recognition software
MathTalk	Allows user to use voice recognition for math applications (e.g. algebra)
<b>Writing Tool Software</b>	
Clicker 5	Writing support and multimedia tool that enables user to write with whole words, phrases, or pictures
Pen Friend	Word prediction tool that works with any word processor and most other software
Talking Word Processor	Word processing program designed to help people who have difficulty with reading and writing
WYNN Wizard	Scan-and-read software
Co: Writer 4000	Word prediction program to use Linguistic Word Prediction™ intelligence



## Iowa Center for Assistive Technology Education and Research

### Improving Quality of Education, Life for Community



“There are tools now available to increase a student’s independence, self confidence and academic skills that are underutilized in our schools.

I strongly believe that our teachers need to be better versed in technology and its application for student and classroom support. ICATER serves as a resource for education majors and student teachers to learn about the most current technology supports available.

This knowledge will serve them greatly as they enter into their teaching professions. I will continue to utilize the expertise of the ICATER staff to provide hands on training for the student teachers I supervise.”

Karla Sigrand, AEA consultant,  
student teacher supervisor,  
parent

“Dylan was an autistic student with a number of additional behavioral and intellectual disabilities in my classroom during Practicum. It was difficult to reach out to him due to his lack of understandable speech. When it came time for me to become head teacher, I feared that I was not yet qualified enough to provide this particular student with the proper education.

However, upon entry into the middle school’s computer lab, I saw a note attached to a computer labeled “Kurzweil 3000. Do not turn off.” Instantly, I summoned a reluctant Dylan over so I could show him all that I had learned from ICATER about Kurzweil 3000.

After introducing Dylan to the reading, writing, and organizational aspects of this device, I asked him to “play” with it for a while. Within two class periods, Dylan had read, with assistive technology’s help, an entire five page article – much more than I had seen him do all semester.



While it frustrated me to think that this technology could have been provided earlier in Dylan’s academic career, I am thankful for the opportunity to introduce him to a device that will continue to prove, to be beneficial to his learning.

In a school environment where Dylan felt dejected by the achievements of others and unmotivated due to fear of failure, he is finally able to accomplish tasks independently thanks to this form of assistive technology.”

Elizabeth Stokes, student teacher

“ICATER is a very innovative and effective source of support for special needs students and their families.

The staff is devoted to all the best principles of education for pupils in an individualized instructional environment.

ICATER is constantly employing technology to reach students unique needs. Our son was very lucky to find such great help from such great people.”

Candi Bowsby, wife of former UI Athletic Director Bob Bowsby



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 THE UNIVERSITY OF IOWA  
College of Education

Be remarkable



# Iowa Center for Assistive Technology Education and Research

## ICATER At-a-Glance

ICATER is a College of Education assistive technology resource center serving The University of Iowa as well as communities throughout the state. The Center provides students with disabilities, parents, College of Education students, and education professionals hands-on training, information, and materials.

ICATER conducts and collaborates on research projects, resulting in innovative methods and best practices of assistive technology usage.

Through these training programs and research projects, ICATER impacts all students with disabilities by providing access to a variety of assistive technology devices, helping them accomplish their educational goals.

### The Lab

ICATER's lab, dedicated to assistive technology demonstrations, trainings and trials, consists of eight desktop computers (six PCs and two Mac). The computers are mounted on adjustable desks with monitors on adjustable arm.

The computers are equipped with various assistive technology software including screen readers, screen enlargers, speech recognition, word prediction and on-screen keyboard typing aids, as well as scan and read software.

ICATER's lab is located within the Education Technology Center in the College of Education. All computers in the Education Technology Center come equipped with ICATER's assistive technology software applications. This provides an ideal setting for training sessions because each participant is able to experience the technology being presented.

ICATER's capacity also includes a MATlab (mobile assistive technology lab) consisting of sixteen laptop PCs loaded with AT software. This has increased ICATER's ability to provide offsite training while also creating an opportunity for College of Education students to gain hands on assistive technology experience by checking out a laptop and exploring the technology at home or in their student teaching setting.

### The Advisory Board

In September 2006, ICATER established an Advisory Board comprised of 22 members who come from the UI Colleges of Medicine, Law, Liberal Arts and Sciences, Education as well as from state and community agencies and organizations including Iowa Braille and Sight Saving School, Iowa Department of Education, University of Northern Iowa, Iowa School for the Deaf, Grant Wood AEA, Iowa Legal Aid, and the Iowa Department of Vocational Rehabilitation Services.

### The Service

The activity level of ICATER is unparalleled. ICATER Faculty and staff dedicate themselves to research, teaching, and service activities throughout the community and state. Since its inception, ICATER has:

- developed assistive technology curriculum for the College's teacher education program, including modules in Orientation to Elementary and Secondary Education, Technology in the Classroom, Foundations of Special Education, Characteristics of Disabilities, and Student Teaching Practicum
- presented to 2,300 undergraduate, graduate and professional students on campus and at area colleges
- received a \$30,000 University of Iowa Vice President of Research grant to conduct a needs assessment on assistive technology in Iowa's K-12 schools
- received a three year \$337,000 grant from the US Department of Education to create a demonstration project to ensure students with disabilities receive a quality higher education.
- hosted the First Annual ICATER AT Summer Institute, attended by 18 teachers and parents of students with disabilities from across the state
- presented "Mat Lab: Integrating Hands-On AT Training in Pre-Service Teacher Education" at several national AT conferences
- presented keynote address "Assistive Technology for Students with Dyslexia" to the Iowa Dyslexia Association's Spring Conference
- presented "Creating and Conducting Effective Large Scale Needs Assessments" at the Closing the Gap Conference
- published an article titled ICATER and MAT Lab: Implementing Innovative Assistive Technology Training in Pre-Service Teacher Education in the August/September issue of Closing the Gap Magazine
- created and conducted an online course titled Introduction to assistive Technology
- became a training center for Cambium Learning technologies
- been featured in local tv and radio news stories
- exhibited and presented at the Iowa Parent-Educator Connection Conference sponsored by the Iowa Dept. of Education
- hosted a dyslexia simulation and assistive technology workshop for the UI Branch of Council for Exceptional Children
- received 2008 UI President's Innovate Instructional Technology Award for the Mat Lab

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