

Work-based learning experiences help students with disabilities transition to careers: A case study of University of Washington projects

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Abstract. This case study describes evidence-based practices employed by a collection of University of Washington projects that engage high school and postsecondary students with disabilities in work-based learning experiences such as industry and research internships, career development activities, job shadows, field trips, and mock interviews. The purpose of the article is two-fold. First, authors share best practices with others who wish to increase the participation of students with disabilities in work-based learning and thereby contribute to their academic and career success. The article discusses methods used to recruit students, employers and mentors, match students with specific opportunities, and prepare students for success. Second, authors share outcomes from studies regarding participation in these work-based learning opportunities, which include increased employment success, motivation to work toward a career, knowledge about careers and the workplace, job-related skills, ability to work with supervisors and coworkers, skills in self-advocating for accommodations, and perceived career options.

Keywords: Disability, careers, internships, self-advocacy, accommodations, work-based learning

1. Access challenges for people with disabilities

The shortage of qualified professionals in science, technology, engineering, and mathematics (STEM) fields is due in part to the underrepresentation of specific subgroups of individuals, including women, racial/ethnic minorities, and people with disabilities [1, 2]. In particular, individuals with disabilities experience a lower level of career success than those who do not have disabilities [3–5]. They are less likely to complete a postsecondary education, to pursue academic studies in STEM, and to earn a degree [5–9]. People with disabilities who are also racial/ethnic minorities

and/or females face additional challenges to pursuing STEM careers [10–12]. Support services at postsecondary institutions vary greatly and have been found to fall short in helping college graduates with disabilities transition to employment [13]. However, the success stories of the relatively few individuals with disabilities in STEM fields [14–17] demonstrate that opportunities for success exist for those prepared to meet the challenges that they encounter. These individuals develop academic, technical, and self-determination skills. They find ways to overcome barriers, such as inadequate access to role models and lack of encouragement from support staff [5,8,18,19]. Technology-rich careers are potentially open to individuals with disabilities due to advancements in assistive technology. However, equal participation is hindered by inaccessible facilities, software, web pages, and online learning options.

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2. Research to practice

Since 1992, the National Science Foundation (NSF) has funded multiple projects directed by the DO-IT (Disabilities, Opportunities, Internetworking and Technology) Center at the University of Washington (UW) – all designed to increase the participation of people with disabilities in STEM fields – most recently as part of alliances called *AccessSTEM* (award #'s HRD-0227995, HRD-0833504). In addition, the Department of Computer Science and Engineering and the DO-IT Center have partnered in leading the *Alliance for Access to Computing Careers (AccessComputing)*, grant #'s CNS-0540615, CNS-0837508, and CNS-1042260).

3. Student participants

Students participating in the activities described in this article represented a range of academic levels from high school to graduate school. Some were involved in projects that were national in scope (*AccessComputing*) and thus came from across the United States, while others were involved in projects focused on the Pacific Northwest (*AccessSTEM*). Many students were from the Seattle area who were attending or interested in attending the University of Washington. Activities occurred both online and in-person.

4. Activities to promote work-based learning

Through these projects, staff developed several tools and activities to recruit research and industry partners, who are critical to providing work-based learning experiences. Staff also developed activities to prepare students for careers, as summarized in Table 1 and described in the following paragraphs.

4.1. Multiple work-based learning options

DO-IT staff offer a variety of options to secure employer support for work-based learning offerings for students with disabilities. This effective strategy invites employers to initially become involved in work-based learning activities with a low level of commitment. Staff members have consistently observed that an employer who agrees to meet a student with a disability for a 30-minute mock interview or a half-day job shadow is more likely to provide further opportu-

nities in the future. In addition to mock interviews and job shadows, employers are invited to host informational interviews, participate in a diversity job fair, deliver a presentation to students, join a mentoring community, and ultimately offer internships or seek to fill positions with project participants. For example, one partner, the Microsoft Corporation, has participated in all of the options described above. After initial collaborations to provide mock interviews and participate in a diversity job fair, the company went on to offer presentations, workshops, and mentors. Subsequently, Microsoft hired DO-IT participants as interns. Three participants in work-based activities described in this article now work at Microsoft.

4.2. Testimonials flyer

Another employer recruitment tool is a flyer that shows company logos of those who have hired interns with disabilities along with supportive comments by supervisors. The flyer is given to employers as they are informed of the variety of options described above. It includes statements such as:

- “A DO-IT Intern worked at [our company] for 12 weeks. Her forthright approach to her disability put people at ease and allowed us all to learn from her. Thanks to our DO-IT Intern, we now have a way to train new staff on complex database procedures and excellent technical documentation.”
- “I recently had the pleasure of working with a DO-IT Intern whom I hired as an Internet Research Assistant. His motivation and cheerfulness were infectious! I would not hesitate to take on another DO-IT Intern. In fact, I am actually excited to get started with someone new.”

4.3. Job shadows and informational interviews

Staff and mentors provide many opportunities for students to engage in job shadows and informational interviews throughout the year. New mentors are added to electronic communities and encouraged to consider students for internships. Each year in October, staff members facilitate Seattle-area Disability Mentoring Day (DMD) activities, which are nationally promoted by the American Association of People with Disabilities. Students learn about careers by shadowing or interviewing a mentor. DMD mentors, many of whom have disabilities, are encouraged to weave disability-related information into the experience. To

Table 1
Activities to promote work-based learning

Activities to promote work-based learning	Recruit partners	Prepare students
Multiple work-based learning options	X	
Testimonials flyer	X	
Job shadows and Informational interviews	X	X
Career panels of professionals with disabilities	X	X
Student workshops and academies	X	X
Mentor and Peer Support	X	X
Product Development	X	X
Student competitions		X
Student professional development		X
Student leadership development		X
Internships		X

date, more than 400 DMD mentees have visited companies that include the Boeing Corporation, the Federal Aviation Administration, the National Oceanographic and Atmospheric Administration, Seattle Children's Hospital, the Transportation Safety Administration, the Equal Employment Opportunity Commission, Starbucks Corporation, and Microsoft.

4.4. Career panels of professionals with disabilities

Each year, staff members host a panel of professionals with disabilities for 60 youth with disabilities in high school and college. The six members of the panel share experiences about education, employment, and career decisions, as evidenced in the following statement from a recent panelist: "One of the most important pieces about any new workplace is understanding the work style of teammates, and regardless of disability, being clear about how long it's going to take me to complete a task. I try to set an expectation that's acceptable to everyone and communicate very clearly up front [20]." Staff members maintain contact with panel members, who are encouraged to provide internships and additional experiences to students.

4.5. Student workshops and academies

Workshops and academies enhance student job skills and help build their professional network. Alumni return to the programs for work experiences as instructors, tutors, and program assistants. New mentors are encouraged to consider participants for further work-based learning opportunities. Examples include:

- A Summer Academy for Advancing Deaf and Hard-of-Hearing in Computing, an academically challenging 9-week program, has been offered to deaf and hard of hearing students pursuing computing fields. Each participant lives in UW dorms

during the summer and takes a computing course for college credit, completes a certificated class in animation, and takes field trips to computing companies to meet mentors and learn about cutting-edge technology. Students meet deaf and hard of hearing computing professionals to learn strategies for career success and self-advocacy.

- The Saturday Computing Experience introduces deaf and hard of hearing students to computer programming. Project-based learning strategies, which transfer well to the workplace [21], require students to work in teams and persevere over a number of weeks to reach the goal of solving a problem.

4.6. Mentor and peer support

Participants use electronic communications and personal meetings to connect with peers as well as adult mentors, most of whom have disabilities themselves. From mentors, students learn about career options and how to be more independent, to advocate for themselves, and to persevere. Experienced students mentor younger ones. Staff and mentors pose discussion questions to the group via electronic mail and share information about career preparation, employment accommodations, internships, and resources.

4.7. Student competitions

Staff members offer competitions to student participants who want to share their progress and engage in additional career development with peers. Examples include:

In the semi-annual STEM Resume Contest, project staff provide a series of Internet-based resume lessons and offer prizes to students who share their updated resume within the contest period. Resume feedback is

Table 2
Respondent ratings of gains from internships

Survey statement:	Average response ($n = 60$)*
I am more motivated to study and work toward a career.	4.39
My knowledge of my career interests has increased.	4.38
I have learned skills I need to effectively work with co-workers.	4.33
I have learned the skills I need to effectively work with supervisors	4.32
I have learned the skills I need to succeed in specific job tasks.	4.20
I learned about disability-related accommodations I may need at work.	3.66

*Responses on a 5-point scale, where 1 is strongly disagree and 5 is strongly agree.

provided and the best resumes receive special recognition. The competition is designed to help students improve resumes, learn more about their peers, and build a sense of community.

In the Elevator Pitch Contest, students are guided through the process of writing a 60-second description of their career goals, work experience, and employment skills. Students share their unique “pitch” online and receive feedback from peers and mentors. Prizes are awarded to students who participate, and excellent examples are highlighted.

4.8. Product development

Project staff develop and promote publications and videos, which can be viewed online, to prepare students for work-based learning and to recruit partners. For example:

- In *Finding Gold: Hiring the Best and the Brightest* (<http://www.washington.edu/doit/Video/index.php?vid=14>), employers instruct others about fully including participants with disabilities in internships.
- In *College Preparation and Careers in Computing for Deaf and Hard of Hearing* (<http://www.washington.edu/accesscomputing/dhh/academy/careers.html>), computing professionals who are deaf and hard of hearing discuss careers.
- In *Returning from Service: College and IT Careers for Veterans* (<http://www.washington.edu/doit/Video/index.php?vid=52>), veterans with disabilities and postsecondary administrators discuss strategies for encouraging veterans with disabilities to pursue computing and IT fields.

4.9. Student professional development

Students are eligible for travel awards to attend professional development conferences. Students attend conferences in their field of study, as well as conferences that promote leadership and diversity, such as

the STEM Diversity Career Expo hosted by Equal Opportunities Press; the regional Student Summit meetings hosted by Career Opportunities for Students with Disabilities; and the California State University International Conference on Technology and Persons with Disabilities.

4.10. Student leadership development

Staff offer a wide variety of opportunities for students to develop and enhance leadership skills. Examples include:

- Project Leadership Student Teams. Teams of students with disabilities support project activities. One such group of paid interns, supporting the *AccessSTEM* project, call themselves the “A Team”. The A Team is charged with validating potential activities from the perspective of students with disabilities and to help design, schedule, and implement them.
- Web Accessibility Trainings. Participants have completed a series of multi-day web accessibility trainings, which teach students how to analyze existing web pages (e.g., those of postsecondary institutions) and create reports suggesting improvements to web developers to increase the ability of users with assistive technology to access websites. Students who demonstrate skills and enthusiasm by the end of the training are offered internships to further evaluate websites.
- Student Leadership Panels. Each year, students serve as panelists to describe how they have overcome barriers presented by their disabilities and negotiated reasonable accommodations for academic programs, internships, and jobs. Panels are assembled for different audiences, such as those that include peers, academic advisors, college faculty and administrators, parents, and employers. By sharing experiences related to self-advocacy and career success, students strengthen their sense of empowerment and efficacy.

4.11. Internships

Student participants of the projects described in this article have completed hundreds of challenging internships, mostly in the areas of science, technology, engineering, and mathematics. A significant number of these students participated in paid research internships in university laboratories. Subsequently, many students became more interested in graduate-level study and research careers.

5. Evidence of outcomes

Examples of outcome data are described in the following paragraphs.

5.1. Work experience survey

Data has been collected since 2002 from interns with disabilities in the projects described in this article. Interns were asked to estimate changes in knowledge of careers, skills needed for success in the workplace, their motivation to pursue academics and work toward a career, and understanding of disability-related accommodations. Specifically, they rated six statements on a 5-point scale, where 1 is “strongly disagree” and 5 is “strongly agree”. The items and average responses from a 2009 analysis are represented in Table 2 [22].

Students with disabilities reported increased motivation to work toward a career, knowledge about careers and the workplace, job-related skills, ability to work with supervisors and coworkers, and skills in self-advocating for accommodations [15,22,23]. Students were asked what they gained most from their internships. The most common responses involved communication skills, problem-solving, understanding how organizations function, and increasing self-confidence. High school students placed more importance on learning to take directions from and work with supervisors, whereas college students placed more emphasis on learning complex job tasks. The most common themes for “what was gained most” were the same for both groups – gaining marketable skills and learning to work with others. High school students, however, were more varied in their responses and included more information about independence and self-determination [23]. The range of career options perceived by both genders increased during the course of involvement; however, female participant perceptions of their range of career options increased even more than that of males [24].

5.2. AccessSTEM/AccessComputing/DO-IT Longitudinal Transition Study (ALTS)

This research study tracks the college and career progress of students with disabilities who have participated in activities sponsored by multiple projects since 1993. To date, about 300 students with a wide range of disabilities are participating in the study. The goal of the study is to identify which activities best benefit students and which activities are most important for achieving positive postsecondary outcomes. Research questions include:

- What are the educational achievements of participants in DO-IT interventions?
- What are the employment outcomes of participants in DO-IT interventions, and do they differ from other youth with disabilities with regard to employment achievements?
- Which interventions are regarded as most valuable?

Recruited through their participation in project activities, respondents in this study were interviewed in person, by email, and/or by phone. Students were asked about assistive technology usage, involvement in program activities, stages of progress through critical junctures leading to careers, reasons for discontinuing progress toward a career, and career outcomes. Participants are periodically interviewed to update the data set. When asked about the value of internships and other work-based learning experiences such as those described in this article, 59% of respondents rated them “very valuable,” 30% “valuable,” and 12% “somewhat valuable.” Seventy percent of post-college students who participated in extracurricular STEM organizations and activities such as those described in this article were employed, a significantly higher number than the percentage of those who did not (44%) [25].

5.3. Mentoring research

One research study, in which a total of 12,539 e-mail messages exchanged between 40 Scholars and 34 Mentors were collected and analyzed over a period of two years, addressed the following questions:

- Can computer-mediated communication be used to initiate and sustain peer-peer and mentor-protégé relationships?
- How do the functions of peer-peer and mentor-protégé electronic communications on the Internet compare in psychosocial, academic and career areas?

Results suggest that computer-mediated communication can indeed be used to initiate and sustain both peer-to-peer and mentor-protégé relationships. The Internet gives these young people support from peers and adults otherwise difficult to reach, connects them to a rich collection of resources, and provides opportunities to learn and contribute. Participants note that benefits over other types of communication include the ability to communicate over great distances quickly, easily, conveniently, and inexpensively. They noted the elimination of the barriers of distance and schedule, the ability to communicate with more than one person at one time, and the opportunity to meet people from all over the world [26].

6. Discussion and summary

Data collected from work-based learning participants with disabilities offered through UW projects suggest that they increased motivation to work towards a career, increased knowledge about the workplace, believed that work-based learning experiences were valuable, experienced greater employment success when compared to those who did not engage in work-based learning, and developed meaningful relationships with peers and mentors. As project activities are research-based and can be replicated by others, it is expected that they will ultimately benefit society by making STEM opportunities available to more citizens and enhancing STEM fields with the perspectives of people with disabilities.

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