Talking about Disability: The Educational and Work Experiences of Graduates and Undergraduates with Disabilities in STEM Majors

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Purpose of the Study

Students with disabilities, although often acknowledged as the "largest minority," are still significantly **underrepresented** in college science, technology, engineering and mathematics (STEM) majors.

This study contributes to understanding of the causes of under-representation of students with disabilities in STEM fields and in careers based upon them. We explored what experiences during college, and in their working, family, and social worlds beyond academe, ***support*** or ***discourage*** entry to and persistence within this group of educational and career fields.

Study Design

Study site—an ideal case:

- Institute of Technology (IT) at the University of Minnesota
- degrees in engineering, physics, astronomy, chemistry, geology, mathematics, computer science
- strong reputation in science and engineering
- record of enrolling many students with disabilities
- one of the best systems of accommodation and support

Method

- 65 participants - graduate and undergraduates
- focus groups and individual interviews, emphasizing participants' access to and progress in STEM education & work
- focus groups included 7 students who were active in the Disabilities Services Cultural Center (some non-science majors)
- interviews transcribed and coded; grouped by content themes and frequencies counted to estimate weight of opinion

Profile of participants by disability type, degree status, & gender

Disability Groups	*Graduates*		*Undergraduates*		*Total*	
	Men	*Women*	*Men*	*Women*	*N*	*%*
Learning disabilities	5	1	11	1	18	*28*
Mobility: systemic condition or injury	1	1	7	4	13	*20*
Systemic conditions	5	1	2	3	11	*17*
Emotional/psychological	1	0	3	4	8	*12*
Sight: legally blind, visual impairment	2	0	2	1	5	*8*
Hearing impairment	2	0	1	1	4	*6*
Chemical dependency	1	1	2	0	4	*6*
Speech impairment	0	0	2	0	2	*3*
TOTALS	**17**	**4**	**30**	**14**	**65**	***100***

Fully 75% (N=49) of participants had a disabling condition that was either **entirely hidden or not immediately apparent**.

Key Findings

Despite the greater barriers they face, students with disabilities can be regarded as **more likely to persist** in STEM majors than some others. Students with disabilities demonstrated a **high level of commitment** to their major and a **high degree of clarity** about what they want to accomplish and why.

Yet these students do encounter significant obstacles in completing a university STEM education. The three major **barriers** common to STEM undergraduates and graduates with disabilities are:

- *Faculty attitudes* regarding certain accommodations
- Some aspects of the *financial aid* system
- The *disability itself* and its *limitations*

Sources of Problems in Completing STEM Majors

Sources of Problems	*N. of Problems Reported*	*% of all Problems Reported*
S.M.E. FACULTY	**(282)**	**(20.3)**
"Gatekeeping" attitudes	148	10.7
Refusal, resistance, sabotage of accommodation, giving-in under pressure	121	8.7
Unintentional discrimination or problem-creation	13	0.9
FINANCIAL	**(156)**	**(11.2)**
Specific financial difficulties	83	6.0
System of financial aid incoherent, cumbersome, unfair, over-discretionary	42	3.0
Working full or part time; poor job availability/pay	31	2.2
EFFECTS OF DISABILITIES & THEIR TREATMENT	**(153)**	**(11.0)**
NATURE OF S.M.E. MAJORS	**(130)**	**(9.3)**
Experience same problems as other S.M.E. majors	88	6.3
Problems exacerbated, or negative consequences greater, because of disability	42	3.0
POOR ACCESS TO SOURCES OF HELP	**(114)**	**(8.2)**
Difficulty in knowing what services/help are available, or finding it	54	3.9
Difficulties in registering as "disabled"	30	2.2
Disclosure as the price for help	30	2.2
STUDENTS' OWN "CONTRIBUTIONS"	**(104)**	**(7.5)**
Not using available services	93	6.7
Difficulties in asking for help	11	0.8
ISSUES RELATED TO TIME	**(91)**	**(6.6)**
Academic pace set by aspects/consequences of disability	63	4.5
Time-related needs	24	1.7
Coping strategies require time	4	0.3
UNIVERSITY SYSTEM (other than mobility or financial issues)	**(71)**	**(5.1)**
Inflexibility, incoherence, obscurity	51	3.7
Limited/no access to facilities (i.e., classrooms, labs, computers, tutors)	16	1.2
Attitudes of university administrative staff limiting educational access	4	0.3
MOBILITY ISSUES	**(69)**	**(5.0)**
Getting around campus/getting to classes, labs, etc., on time	46	3.3
Physical difficulties in classrooms and labs	10	0.7
Physical stress of coping with mobility problems (e.g., class registration)	7	0.5
Getting to campus	6	0.4
MEDICAL/THERAPEUTIC ISSUES	**(60)**	**(4.3)**
Late recognition/diagnosis and consequences	24	1.7
Difficulty getting appropriate help	21	1.5
Lack/loss/cost of medical help	15	1.1
ELEMENTARY & HIGH SCHOOL EXPERIENCES	**(52)**	**(3.8)**
Poorer educational preparation in science/math than non-disabled	33	2.4
Ignorance, misperception, lack of help from teachers/advisors	19	1.4
DISABILITY SERVICES & COUNSELORS	**(27)**	**(2.0)**
Services	18	1.3
Counselors	9	0.7
FAMILY ISSUES	**(26)**	**(1.9)**
Family-of-origin discouraging/over-protective	19	1.4
Family responsibilities (mature students, single parents)	7	0.5
COMMON NEGATIVE ATTITUDES	**(24)**	**(1.7)**
Stigma	10	0.7
Impatience, irritation, unthinking discrimination,intolerance of accommodations	10	0.7
Lower expectations of disabled students (teachers/advisors)	4	0.3
GENDER & ETHNICITY: DOUBLE BURDEN	**(15)**	**(1.1)**
OTHER (NON-DISABLED) STUDENTS	**(14)**	**(1.0)**
TOTALS	**1,388**	**100.0**

Faculty Attitudes

Faculty **responses to formal accommodation requests** from students included:

- Discounting the need for accommodation,
- Refusing accommodation as a way to "prepare" the student for "real-world" competition,
- Encouraging students to drop the class or change major,
- Placing students in inappropriate testing places (subject to noise or interruptions),
- For arranged tests, forgetting to send the test, or not communicating changes or errors,
- Insistence on knowing personal details about the disability,
- Embarrassing students by talking about the disability or accommodation in front of peers.

Faculty behaved as:

- gatekeepers to the STEM professions and protectors of an assumed meritocracy,
- judges of fairness in deciding, on their own, whether to grant approved accommodations,
- lay diagnosticians, defining "approved" and "disapproved" types of disabilities depending on the visibility of the disability.

Disability as a Disadvantage of Time

Coping with time-related problems was a **universal experience** of all study participants. It distinguishes their circumstances from those of other STEM majors, is a facet of every type of barrier they encounter, and transcends differences in disabilities of different types. One way to understand this commonality is to see these students as "time-disadvantaged."

Participants raised five broad types of **time issues**:

- Problems of course pace,
- Speed of learning, comprehension and recall,
- Temporal disruptions in physical and mental functioning,
- Time-related educational needs,
- Time expended in coping with difficulties raised by their disabilities.

These issues were exacerbated by the variable character of many disabilities.

The strength of **faculty resistance**—especially to time-related accommodations—supports findings from our earlier study, *Talking about Leaving* (Seymour & Hewitt, 1997). Whether STEM majors switch or persist, they experience problems with STEM pedagogy, curriculum, and assessment practices shaped by long-standing traditions about appropriate ways to teach. Because particular requests for accommodations depend on the nature of the disabilities themselves, students are, inadvertently, obliged to challenge some of the pedagogical rules that STEM faculty see as necessary to protect high academic standards.

CONCLUSION: Students with disabilities have high motivation and strong intrinsic interest in their STEM studies. They experience constant tension between these personal characteristics that favor their persistence and success, and cultural and structural barriers to academic progress. Thus, even in an institution with good support, these students simultaneously demonstrate high potential for success and high risk of being lost.

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