

Hidden walls: STEM course barriers identified by students



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Takeaway: Students with disabilities identified the following barriers in STEM courses: 1) challenges effectively engaging with course content, and 2) courses causing severe anxiety. To address the barriers, we recommend instructor provide training for learning skills, provide study/notetaking guides, encourage campus counseling services, and normalize accommodation use.

STEM course design doesn't consider students with disabilities

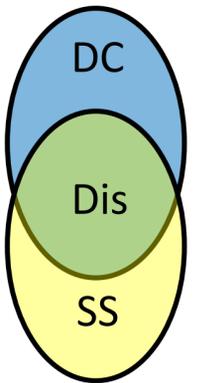
- Students with disabilities make up 10-20% of post-secondary students^{1,2}
- Barriers identified for general college experience³
- Little work investigating specific barriers from STEM courses⁴

Interviewed students with disabilities to identify barriers experienced in STEM courses

Participant	Diagnosis shared by participant	Age diagnosed (years)
1	ADHD	16
2	Adult ADHD	22
3	ADHD	11
4	Bipolar disorder, anxiety, clinical depression	12
5	X-Linked juvenile retinoschisis	1
6	Asperger's, depression, migraines, sleep apnea, driving anxiety	12
7	Dysthymia and generalized anxiety	15
8	Autism	Not specified
9	Severe anxiety	Not specified (during college)

Social Relational Perspective of Disability⁵

- Disability (Dis): Restriction of activity from interaction between diagnosis characteristics (DC) and social structures (SS)
 - DC: personal characteristics individuals associate with diagnosis (e.g., being prone to distractions)
 - SS: Anything generated by people for people (e.g., physical environments, learning environments, media)

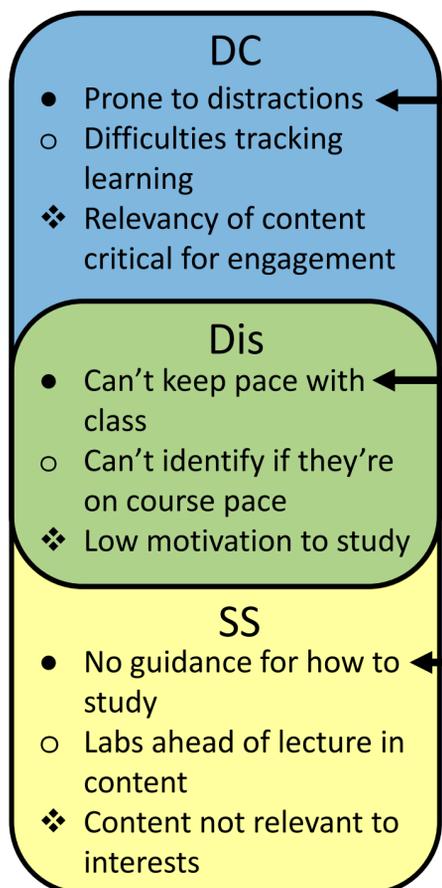


Analysis

- Four researchers brought diverse perspectives to the analysis

disability diagnoses	level of study	area of study
diagnosed	graduate	physics
undiagnosed	undergraduate	health-sciences
"able-bodied"		biomedical-sciences
- Using, Interpretive Phenomenological Analysis (IPA)⁶, researchers:
 - Aimed to take side of participant and see event from participant's perspective; interpreted participants' interpretations of experiences
 - Collaborated to generate factors/themes
 - Made connections participant may be unaware of
 - Selected themes regarding STEM experiences

Challenges effectively engaging with course content

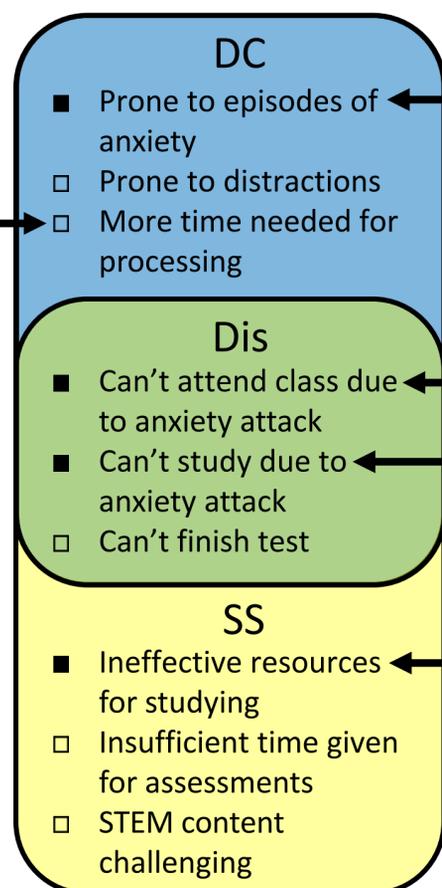


"Cause generally what takes another person an hour to study it'll take me like 2-4 hours to study... it takes me a while because I just get distracted..." - Participant 1

"...and so the test was for um... chapters one through four, but I had only gotten up to chapter one. So, I did get a low grade on a test, but I knew everything of chapter one and I knew like half...on chapter two." - Participant 2

"I've never been in a class like this [SCALE-UP], so it was kind of different ... I wish I would've known how to prepare for the class before 'cause I'm like showing up to the class like any other class..." - Participant 2

Courses causing severe anxiety



"I'd always had, like, stuff like that [episodes of anxiety]. Like, I was always, like, a, leg shaker. I always bit my nails. I was always a very nervous child." - Participant 7

"Yeah. Before one [chemistry] exam, I had such, like I had never ... I've had like anxiety attacks, but I usually calm myself down. But that was the first time that I got an anxiety attack so bad that I just had to go to bed.... Like, I just, I was crying, bawling. And a ton of anxiety, and I just had to go to bed..." - Participant 9

"And plus the answers weren't, when I was doing the practice problems, the answers weren't like explained, So I didn't know what to do. And it was going to take me a ton of time." - Participant 9

Recommendations

- Challenges effectively engaging with course content
 - Support development of learning skills (e.g., metacognition, critical thinking)
 - Provide checklists for studying/notetaking
 - ❖ Provide content in contexts relevant to student majors
- Anxiety
 - Encourage the use of campus counseling services
 - Shift reflections on aptitude to reflections on how the student can improve
 - Normalize accommodation use

Note: Bullet point types (●, ○, ❖, ■, □) denote connections within themes.

Digital version: tiny.cc/wjperc19



[1] W. S. Harbour, Huntersville, NC: Association on Higher Education And Disability (AHEAD), 8 (2008).

[2] N. J. Evans, E. M. Broido, K. R. Brown, and A. K. Wilke (2017).

[3] L. Mullins and M. Preyde, Disabil. Soc. 28, 147 (2013).

[4] E. da Silva Cardoso, B. N. Phillips, K. Thompson, D. Ruiz, T. N. Tansey, and F. Chan, J. of Postsecond. Educ. and Disabil. 29, 375 (2016).

[5] C. Thomas, in *Implementing the Social Model of Disability: Theory and Research*, (2004).

[6] J. A. Smith and M. Osborn, Qualitative Psychology, 28 (2004).