

You Have to See It to Be It

How a STEM student with a disability plans to educate teachers and students alike BY LAURA CARNEY



▲ Joe Schneiderwind

HE'D NEVER THOUGHT TO LOOK FOR IT.

In 2016, Joe Schneiderwind was close to earning his doctorate degree. His specialty was the seismo-acoustic environment of the Arctic Ocean — he'd studied it for the U.S. Navy as part of his National Defense in Science and Engineering fellowship. He'd scanned the deep for treasure — if by treasure one means underwater sound.

The speed of sound, the absorption of sound, the scattering and reflection of sound, the refraction and dispersion of sound — water is a highly unpredictable element, and many factors change how sound travels through it. Schneiderwind had published his findings, which included complex mathematical formulas, in places like the *Journal of the Acoustical Society of America*.

But publishing your work is considerably more difficult when your diagnosis of multiple sclerosis at the age of 18 has progressed, making it now impossible for you to write out formulas — and when the computing software, there to assist you, hasn't caught up with you yet.

"[Multiple sclerosis] didn't start to affect me until college graduation, and even then it was mostly invisible," Schneiderwind says. "I needed extra time on tests and note-taking assistance. It wasn't until my master's that I needed walking assistance. ... After my master's, I became heavily reliant on a wheelchair. I didn't have the tools to do computation — heavy mathematics and science. As it currently stands, I am heavily dependent on a wheelchair. I use a touch screen to do math, whatever little stuff I still can when I'm able to, but that's super limiting compared to what I did 10 years ago."

Schneiderwind had no idea he'd encounter these obstacles. He had no idea anyone would. He'd never thought to look for it — because it hadn't pertained to him.

But what really surprised him, once it did, was how few other people had either.

New Path

Schneiderwind had always loved teaching science and

math, so he dropped his doctorate program for a new field. But he couldn't know what world he might find there — the classroom experience of a STEM teacher with a disability or a STEM student.

That all changed when he took Professor Janelle Johnson's course on multicultural education at the Metropolitan State University of Denver School of Education. She'd challenged her students to research an issue they were passionate about and design a "call to action." Schneiderwind chose the underrepresentation of students with disabilities in STEM fields. He didn't bank on the dearth of research he'd uncover.

But a man who can study sound in the murky depths doesn't give up easily.

"It was absolutely something I didn't know or consider until I read about it ... or *didn't!*" Schneiderwind jokes.

But what he did find motivated a research paper, published alongside Johnson's findings. Among his discoveries, paraphrased from his editorial for Education Week, a website for educators:

- ◆ Students with disabilities are less likely to complete high school than other students — and school and classroom practices are contributing factors. Elementary students with disabilities tend to be tracked away from pursuing advanced academic endeavors, which school funding formulas incentivize, since students with disabilities tend to receive lower scores on standardized (high-pressure) exams.

- ◆ Ten percent of students entering post-secondary education have some type of self-identified disability, but few secondary students with disabilities take Advanced Placement or STEM classes. Though they make up 12% of the student population in secondary school, they only make up 1% of those in AP.

- ◆ High school students with disabilities acquire about the same number of credits in English as other students but far fewer credits in math or science, which can lead

people to assume students with disabilities are less capable, particularly in STEM. Similar to the notion that girls are bad at math, this can result in the "expectancy effect." Few studies talk about how the expectancy effect hurts students with disabilities. After an exhaustive search for peer-reviewed articles in four of the top academic journals, only 1% of the work had to do with this topic.

- ◆ Published work on students with disabilities has *decreased* in the past 20 years while college admissions of students with disabilities have increased. And the research that does exist tends to focus on all students with disabilities as a whole rather than differentiating.

"There needs to be more people willing to do the research or write about it," Schneiderwind says, in his warm, calm voice. "There seems to be a social stigma about talking about disabilities, especially talking about your own. A lot of what I was reading was suggestive, but these professors aren't in the position that I'm in — I want to combat that stigma."

You need to see it to be it. And Schneiderwind wants to be seen.

"As far as teachers with disabilities, there was even *less* research out there than I found about students," he adds. "All of the articles I have been able to find on teachers have come from outside of the United States. In one literature review, they looked from 1990 through 2018 and were only able to come up with 30 articles in 28 years. That's a supreme lack of information."

"Having teachers with disabilities could be a great role model," he explains. "When a student sees a teacher with a disability, they think, 'Oh, I can do this, this is something that's possible.'"

In his efforts to be that teacher, Schneiderwind has written three blog posts with Johnson, presented at an academic conference and accepted invitations to speak at two more. But another focus is developing better tech for students and teachers. "There's less accessible tech for STEM in the first place," Schneiderwind says. "This is because the attitudes of society tend to follow post-secondary attitudes, disabled is almost synonymous with 'less able.' The large majority of students with post-secondary education tend to not be in STEM fields."



▲ A consummate teacher, Schneiderwind, right, leads neighborhood children in a science lesson in his driveway.

Another reason: transcribing formulas used by, say, a Ph.D. student in seismo-acoustics is just plain hard for a computer.

"There seems to be a lot of tech available for other subjects like English or history, but it's a lot harder to match mathematics and science — it would be very valuable to get into developing something like that," Schneiderwind says. "And I don't think it would only help students with disabilities. I think it could help everyone."

Schneiderwind will soon earn his post-baccalaureate teaching licensure. In the meantime, he tutors undergraduate students in physics — and sometimes holds science demonstrations in his driveway. Most recently, he showed a group of neighborhood kids how liquid nitrogen churns ice cream in only five minutes. He's not only representing in the classroom, tech lab and conference hall — he's representing in his own backyard, too.

"I think it's a blessing now, compared to how I felt before," he says about his progressive condition. "I really loved what I was doing. And I do think it would have been helpful, though less visible."

"It's one of those fortunate things, I guess — I really hope I can make some things happen." ■