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insights on inclusion
The disability and accessibility issue
VOLUME 3

611 million adults in the United States live with a disability.

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re:think

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CONTRIBUTORS

Tim Faiella
Brendan Hemp
Nadege Pierre
Shelby Cappacio
Beth McElroy
Terry Hogan
Lucy Sanders

Design and Illustrations by Heavylifting Design

A special thank you to Brad Feld and Amy Batchelor for funding re:think and for their support of the work we do at NCWIT.

Welcome to the third issue of re:think magazine, created by NCWIT

In this third edition of re:think magazine, we turn to issues of disability and accessibility and how they relate to inclusion and the creation of inclusive cultures.

Discussions of inclusion often focus on navigating "visible" differences between people, yet we must always be mindful of all the invisible identities people inhabit, and the importance of creating inclusive cultures across these identities. This is true in organizations as well as in our community at large, and governmental organizations are no exception.

In my dual roles as a member of NCWIT's Board of Directors and as the CIO and Executive Director in the Governor of Colorado's Office of Information Technology (OIT), I think a lot about how to ensure that the state's digital platforms are inclusive and accessible for all Coloradans. The State of Colorado ranks in the top 10 nationally for customer experience, according to a digital government study, and it continues to be a leader in delivering innovative services to residents. But if you are among the 20% of Coloradans with a disability, navigating state government services can be challenging.

This work takes time, energy, and investment, but we are here to serve all Coloradans and that's exactly what we plan to do. As part of our journey, we are listening to Coloradans to understand the various ways with which they engage and consume government services. Our Equity, Diversity & Inclusion (EDI) Action Alliance is championing initiatives that address inequities in state systems. Our Technology Accessibility Program (TAP) is providing tools to improve the accessibility of state and local government websites and applications. And the Colorado Digital ID™ now has a disability identifier symbol for residents to indicate that they may be unable to effectively communicate with first responders and law enforcement due to neurological diversities, mental health disorders, sensory needs, chronic illness, or cognitive or physical disabilities.

I am proud of the work we are doing at OIT to make state government easy and equitable. As technologists it is incumbent upon us to think differently about how we deliver services and ensure that accessibility is part of the design process. It's not only the mark of good technology; it's simply the right thing to do.

As you read the articles in this magazine, I invite you to join us and NCWIT in this journey and do your part in creating cultures that are inclusive for all.

ANTHONY NEAL-GRAVES, GOVERNOR'S OFFICE OF INFORMATION TECHNOLOGY CHIEF INFORMATION OFFICER & EXECUTIVE DIRECTOR AND NCWIT BOARD MEMBER

The National Center for Women and Information Technology (NCWIT) is the farthest-reaching network of change leaders focused on advancing innovation by correcting underrepresentation in computing.

reflecting on disability and Information Technology

BRIANNA BLASER AND RICHARD E. LADNER

Through our work with AccessComputing, a National Science Foundation Broadening Participation in Computing Alliance, we work to increase the participation of people with disabilities in computing. Over the years, we have mentored more than a thousand students with disabilities studying computing fields and partnered with hundreds of organizations looking to be more accessible and inclusive. Increasingly, disability is included in conversations about equity, but there is still more work to be done. >

In work we did that looked at women with disabilities in computing fields, women with disabilities noted facing barriers similar to those faced by other groups, including lack of mentors and isolation.

The disability community is particularly heterogeneous when you consider the abilities and needs of people with disability.

Keep in mind that the disability community includes not only individuals with apparent disabilities — individuals who are blind or deaf, wheelchair users, amputees, and others with mobility impairments — but also people with non-apparent disabilities such as learning disabilities, mental health conditions, autism, attention deficits, and health-related disabilities. Moreover, people with disabilities are a diverse population.

In work we did that looked at women with disabilities in computing fields, women with disabilities noted facing barriers similar to those faced by other groups, including lack of mentors and isolation. Women with disabilities, however, also noted barriers specific to disability, including those related to accessibility, disclosure, and accommodations.

Disability cuts across all other demographics:

gender, sexuality, race, age, religion.

A note about language

In the disability community, there are ongoing conversations about preferred language. Whereas some people prefer person-first language, such as "person with a disability," to emphasize a person over their disability, others prefer disability-first language, such as "disabled person," to signify that their disability is a central part of their identity. We use both person-first and disability-first language to reflect these varied opinions.

It's also important to note that many deaf, blind, and autistic individuals do not identify as having a disability but rather see being deaf, blind, or autistic as being part of the natural variation among people. It is always good practice to ask a person what language they prefer to identify with.

Disability participation in education and the workforce

In conversations about diversity, equity, and inclusion (DEI), disability is often left off the table. President Biden's Executive Order 14035, issued on June 25, 2021, has begun to shift conversation at the national level. The order is titled "Diversity, Equity, Inclusion, and Accessibility in the Federal Workforce." The word "accessibility" is added to DEI to indicate the importance of making sure the federal workforce supports the hiring and advancement of people with disabilities. Thus, DEI is becoming DEIA.

Many efforts that work to diversify computing fields don't collect data on disability.

The few data sources that exist use different criteria to determine who has a disability, making it difficult to make comparisons from one to the other. The National Center for Education Statistics survey reports that in 2015-16, 19.4% of undergraduate students reported having a disability. On the other hand, the 2019 American Community Survey done by the U.S. Census Bureau reports that only 12.7% of the U.S. civilian non-institutionalized population have a disability. These surveys use a different set of questions to ask about disability status, and this inconsistency makes it hard to understand the level of participation of people with disabilities in higher education and the workforce.

In 2022, the annual Taulbee Survey conducted by the Computing Research Association reported on disability data for the first time. In this case, 51 computing departments at U.S. institutions reported that 4.1% of undergraduate computing majors received disability-related accommodations from their universities. This low percentage may indicate that some students with disabilities do not need or want accommodations, or perhaps cannot afford to obtain a professional diagnosis, which many universities require in order to receive accommodations. It could mean that some qualified students may request an accommodation that is denied because it is not deemed "reasonable." It could also mean that computing departments are not as welcoming and accessible to students with disabilities as they could be.

Leaders in increasing disability inclusion

Established in 1994 as the U.S. Business Leadership Network, Disability:IN has worked for almost 30 years to increase disability inclusion in business. Today, it has more than 400 corporate partners and runs a number of programs to help companies diversify with respect to disability. In recent years, more tech companies have developed inclusive hiring programs to recruit talent with disabilities to their companies. In 2016, Microsoft named deaf woman Jenny Lay-Flurrie as its Chief Accessibility Officer. In the years since, the company has become a leader for its Inclusive Hiring Program. Since 2017, the Neurodiversity @ Work Employer Roundtable has worked together to increase the success of neurodiverse individuals in their companies.

It has resources related to starting neurodiverse hiring initiatives and a job board for neurodiverse job seekers. In recent years, we've also seen efforts such as Inclusively emerge. Inclusively works to match disabled job seekers with employers looking to them to improve and diversify their workforce. In our experience, rather than competing, companies are working together to make their companies more inclusive workplaces for people with disabilities.

We've also seen more engagement in computing education related to increasing the participation of people with disabilities. The Center for Minorities and People with Disabilities in Information Technology (CMD-IT) makes disability and accessibility a central part of its platform. The disability community at CMD-IT's Tapia Celebration of Diversity in Computing has grown significantly over the past five years. The Computing Research Association's Widening Participation (CRA-WP) program has also increased efforts to include disability in its diversity workshops, including in the IDEALS workshop (Grad Cohort Workshop for Inclusion, Diversity, Equity, Accessibility, and Leadership Skills). It has also become increasingly clear that we need to think about people with disabilities as faculty members and leaders within the computing community.

Post-pandemic life

As we write this in 2022, schools and employers are continuing to emerge from the pandemic into a "new normal." Many people with disabilities have found that the opportunity to participate in classes, conferences, or other opportunities online opened doors that were previously closed. Because of this, it's important to reflect on practices that have become more commonplace since 2020 that make our schools and workplaces more accessible. What activities can become hybrid (without online participation being a second-class experience) to allow individuals to participate remotely? Who can benefit from the use of tools such as automatic captioning or text-based chat during in-person events? How can these changes improve the experience of not only people with disabilities, but also parents of young children, non-native speakers of English, or other diverse groups?

Accessibility of technology

Beyond studying and working in computing fields, many people with disabilities have an intimate relationship with technology in their day-to-day lives. For example, blind people often use screen readers to access computers. A screen reader allows them to navigate the computer screen and read out loud or produce in refreshable Braille any text that is in focus. Microsoft Windows, Apple iOS, and Google Android smart devices and computers all have built-in screen readers. There are several other computer access technologies that support people who cannot use the keyboard, mouse, or touch screen. Apple computers have both switch control and voice control to allow these users to access them.

In spite of these wonderful access tools, computer applications and websites are not accessible unless they are specifically designed to be so. Designing accessible applications and websites requires the application of some technical knowledge that is not often taught in computer science curricula. A starting point for learning about accessibility is the Web Content Accessibility Guidelines (WCAG) produced by the World Wide Web Consortium (W3C). The non-profit organization Teach Access, a collaboration among industry, academia, and advocacy organizations, is dedicated to helping computing departments improve their curricula by including accessibility topics.

The accessibility of applications and websites is not just an option; it may be a legal requirement by the federal government through the Americans with Disabilities Act (ADA) or Section 508 of the Rehabilitation Act, or by individual states. The accessibility of computing tools used in K-12 computer science education is particularly problematic in spite of the requirement for equal access for students with disabilities. One notable exception is the Quorum programming language developed by Andreas Stefik at the University of Nevada, Las Vegas. Quorum and its accompanying integrated development environment (IDE) Quorum Studio are screen-reader accessible and used in schools for the blind throughout the country. We often say of products like Quorum that it was "born accessible" – that is, accessibility was a primary consideration from the outset, not something added on later. Indeed, it can be much more expensive to add accessibility after a product is developed, as it may require a complete redesign and implementation. It is best to put accessibility into product requirements at the very beginning.

Conclusion

Disability and technology are inexorably intertwined. Speech recognition technology was in early development to support access to computers by people who cannot use a keyboard or mouse. Deaf people were using Sorenson video phones to converse in sign language well before personal video applications such as Skype and FaceTime became popular. Moreover, disabled scientists and engineers have played an important role in the development of technology regardless of whether it was designed to improve accessibility. Generally speaking, many people with disabilities are problem solvers because they are constantly solving their own accessibility challenges. Forefronting conversations about disability and accessibility can help ensure that technology is innovative and accessible, and that people with disabilities are part of the technology workforce. ■

Brianna Blaser *is part of the DO-IT (Disabilities, Opportunities, Internetworking, and Technology) Center at the University of Washington, working to increase the participation of people with disabilities in science and engineering careers. She is the associate director for AccessComputing and AccessADVANCE. Her work includes direct interventions for individuals with disabilities and working with faculty, employers, and other stakeholders to create institutional change.*

Richard E. Ladner *is a Professor Emeritus in the Paul G. Allen School of Computer Science and Engineering at the University of Washington, where he began his faculty career in 1971. He conducts research in accessible computing that studies the intersection of computing technology and disability. He is the principal investigator for the NSF-funded AccessComputing, which helps computing students with disabilities at all levels complete their degrees and enter the workforce. AccessComputing also helps academic computing departments and organizations be more accessible and welcoming to people with disabilities.*

NOT ALL DISABILITIES ARE VISIBLE

"DISABILITIES CAN BE VISIBLE AND/OR INVISIBLE; WITH INVISIBLE DISABILITIES, THERE AREN'T NOTICEABLE SIGNS THAT SOMEONE IS DISABLED." - HANA GABRIELLE BIDON

"I WAS IN AN EXISTENTIAL CRISIS WHEN PICKING MY MAJOR. I WANTED TO MAJOR IN MECHANICAL ENGINEERING WHEN I FIRST ENTERED COLLEGE; HOWEVER, I DIDN'T ENJOY PHYSICS, AND DIDN'T KNOW WHAT TO DO FROM THERE."

Seeking inspiration, Bidon tried out a variety of courses: a history class, a government class, and Introduction to Computing. While considering her new path, she also discovered she loved teaching younger students about Computer Science with the partnership of Girls Who Code (GWC) and Women in Computing at Cornell (WICC) Together, these experiences confirmed she liked computing and humanities best and showed her that she could combine her passions for tech and community support. In the fall of her sophomore year, Bidon dove into studying Information Science, Systems, and Technology in the College of Engineering and joined Women in Computing at Cornell (WICC).

From that launch point, Bidon went to work at an educational tech lab on campus, the Future of Learning Lab, as an undergrad researcher. There, she took part in creating a qualitative study that gave her first-hand experience with data science. With that foundation, she joined another research lab in the fall of 2019 and built on what she'd learned by analyzing mental health communities on Reddit to identify similarities and differences between conditions, which included, but were not limited to, bipolar disorder and borderline personality disorder (BPD). Shortly thereafter and during the spring semester of her junior year, the COVID-19 pandemic brought closures and challenges that inspired a new interest rooted in Information Science: Science Communication

"I HAD TO LEARN HOW TO COMMUNICATE ABOUT ARTIFICIAL INTELLIGENCE, TECH ETHICS, AND TECH APPLICATIONS IN VARIOUS AREAS TO PEOPLE OUTSIDE OF THE TECH ATMOSPHERE."

In addition, Bidon was able to meet disabled people in STEM through AccessSTEM. That was particularly eye-opening, especially since there weren't many openly disabled people in the STEM programs at Cornell. Whether due to stigma or lack of awareness, it was hard to find disabled mentors and community on campus in computing — both in undergrad and postgrad. Furthermore, when talking about accessibility in tech, Bidon soon found herself wishing that more people would learn about invisible disabilities — which range from autism, ADHD, dyslexia, and other learning disabilities to auditory and sensory processing disorders, epilepsy, and more. Regrettably, a lack of awareness about disability — invisible or otherwise — remains present in many STEM environments. For Bidon, this became especially challenging when dealing with Zoom University. Before the pandemic, she recounted a time when a TA yelled at her during office hours because she did not look them in the eye, which resulted in a huge meltdown. Over time, Bidon began to blame herself for not operating as efficiently as others, or for not understanding social cues in the way others expected.

"PERSONALLY, MY 'WEIRD' BEHAVIORS ... WERE SEEN AS ME BEING LAZY OR WEIRD," BIDON RECALLED. "PEOPLE COULDN'T EASILY TELL THAT I HAD DIFFICULTIES PROCESSING AUDITORY INFORMATION."

To overcome these roadblocks and misperceptions, Bidon took an intense interest in psychology and learning the importance of social cues. Yet, while it's helpful to learn about body language and give more welcoming nonverbal signals, she emphasized that it's not an option that's entirely applicable for everyone all the time. That's why it's also important for people without disabilities to also learn about the social cues disabled people send, and the accommodations that can make spaces more accessible and welcoming to all.

"I HOPE THAT PEOPLE WITH AND WITHOUT DISABILITIES CAN COLLABORATE WITH EACH OTHER TO MAKE MORE INCLUSIVE ONLINE SPACES AND TECHNOLOGIES."

Bidon also met more peers through Rewriting the Code, and found support in groups on Facebook. She also turns to tech-enabled tools — such as the YouTube channel "How to ADHD"– for help with writing and finishing projects. These accessible supports, along with the groups that helped her engage her passions, now connect Bidon with a community of women and disabled people who are all interested in tech. ■

Hana Gabrielle Bidon, *also known as HG, is a Technology Business Systems Associate at a bank. She recently graduated from Cornell University with a B.S. in Information Science, Systems, and Technology. For fun, she likes to read anything she can get her hands on and write on her Medium blog about a variety of topics, such as disability awareness, mental health, tech for social good, and everything in between. Additionally, she likes exercising (dancing, rock climbing, hiking, swimming) and volunteering at non-profits, including All Tech Is Human (ATIH), Coronavirus Visualization Team (CVT), Reinvented Magazine, Verste, and Upchieve.*

Making CS education inclusive for students with mental health conditions

Chris Murphy

Recent years have seen an important and long overdue increase in the number of diversity, equity, and inclusion (DEI) initiatives in computer science (CS) programs, designed to increase participation and students' sense of belonging. Additionally, innovations in curricula, assessment, and pedagogical approaches have been developed to help students learn CS more effectively and at greater scale.

However, all these efforts will be for naught if students feel mentally unhealthy, associate CS with their mental health concerns, or feel marginalized — or, in many cases, further marginalized — because of ongoing mental health conditions such as anxiety, depression, bipolar disorder, ADHD, and many others.

Even prior to the COVID-19 pandemic, the number of CS students living with mental health challenges was becoming a concern.

38%

A 2018 paper reported that 38% of undergraduate engineering students at a large public university exhibited a high risk of serious mental illness, which is nearly 10 times the rate among the U.S. adult population. [1]

10x

A 2020 paper found that CS students at the study's target institution had a prevalence of anxiety and depression symptoms at 51.9% and 64.9% respectively, much higher than the general population, and also higher than other undergraduate students. [2]

As our community seeks to broaden participation in computing and make CS education more accessible, it is becoming increasingly urgent to be inclusive of students who are living with mental illness. Failure to do so will not only harm individual students, but will also have an effect on recruitment and retention going forward.

1. A. Danowitz and K. Beddoes, "Characterizing mental health and wellness in students across engineering disciplines," Proc. of the 2018 Collaborative Network for Engineering and Computing Diversity Conference, 2018.
2. L. M. Soares-Passos, C. Murphy, R. Z. Chen, M. Gonçalves de Santana, and G. Soares Passos, "The Prevalence of Anxiety and Depression Symptoms among Brazilian Computer Science Students," Proc. of the 51st ACM SIGCSE Technical Symposium on Computer Science Education, March 2020.

Destigmatizing mental illness

Because mental illness is considered an "invisible disability," and because of the stigma that is often associated with it, it can be difficult for instructors to identify the students who are living with mental illness and who need support.

One step CS instructors can take to address stigmas around mental health conditions and foster a welcoming environment is to make a statement (e.g., on their syllabus, as an in-class announcement, etc.) that they acknowledge that some of their students may be living with mental illness, and that they understand those students face unique challenges, and may require special accommodations.

Fostering community

Although support from their instructors is critical to the success of students living with mental illness, they must also feel that they are not alone in their academic community, and that there are "other students like me" with whom they can share experiences and find encouragement. As there is a pronounced overlap with already marginalized communities, students may find kinship in affinity groups for students of color, members of the LGBTQ+ communities, students with physical disabilities, etc.

Recent years have seen an uptick in the creation of student wellness groups that advocate for the use of wellness resources and healthy lifestyles. These groups often have a mental health-related focus as well, and provide opportunities for students living with mental illness to have an impact on their classmates and community. Instructors should increase awareness of these groups, encourage students to join them, and participate in their activities.

Mentorship and role models are also important when it comes to members of any marginalized community. Even instructors who do not identify as living with mental health conditions can serve as mentors to these students, and if they are not comfortable doing so, they should consider connecting students with alumni who would be, or pointing students to organizations such as AccessComputing, which aims to increase the participation in computing of people with disabilities of all types.

Pedagogy

When it comes to CS courses themselves, specifically modes of instruction and assessment, there are three key principles that instructors should follow to be supportive of students living with mental illness: flexibility, options, and empathy.

Instructors should recognize that students living with mental illness may unexpectedly need extra time to manage their condition, and flexible policies in terms of class and lab attendance, and assignment submission deadlines can give students the time they need should such a situation arise. Although students with neurodevelopmental conditions such as ADHD may receive academic accommodations from their institution's disabilities services office,

students living with anxiety, depression, bipolar disorders, and other similar conditions may receive little to no institutional academic support,

saddling them with the extra burden of having to advocate for themselves, in addition to managing their condition and completing their coursework.

Instructors should also provide options for things like group work in labs and projects and in-class presentations so that students are not forced into situations that are unnecessarily stressful or even triggering. For instance, students could have the option of completing part of a group project on their own, and then integrating their code with the other students' via an API, which would mimic the approach in distributed software development teams; or instead of doing an in-class presentation, students could record a video in advance.

Recognizing that group work and presentations can be an important part of students' learning experience, the suggestion is not that individual students be singled out or treated as a special case, but rather that these options exist for all students. Instructors should think about why they are asking their students to do these things, and consider alternatives so that their students can achieve the course learning outcomes in a manner that suits them best.

Last, instructors should be empathetic toward their students who are living with mental illness, and acknowledge that it can be just as debilitating as a physical disability.

Certainly no instructor would expect a student to "just get over it" when it comes to something such as vision impairment or mobility impairment, and yet students are often expected to "power through" issues such as anxiety and depression, either because instructors do not understand the effects of those conditions, or they simply do not believe students who say they are living with them.

Although it certainly is not in the students' interest to lower standards or reduce rigor, instructors must "meet students where they are" in terms of their mental health, and be willing to make adjustments as needed in order to help their students succeed.

Expanding the community

In the same way that advocacy efforts for marginalized communities require allies from outside that community, the same holds true when it comes to supporting students living with ongoing mental health conditions.

The faculty, staff, and administration who put in the effort to destigmatize mental illness and foster inclusive communities for students living with mental health conditions tend to be the ones who are living with mental illness themselves, which places upon them the extra burden of doing this work in addition to managing their health.

Thus, all CS instructors should be considerate of the unique needs of their students who are living with mental illness in order to continue efforts to broaden participation in CS and to help these students succeed while staying healthy. ■

Chris Murphy *is a Senior Lecturer in Computer Science at Bryn Mawr College, where he teaches undergraduate CS courses and helps build community as Department Program Coordinator. Outside the classroom, Chris leads advocacy and awareness efforts regarding CS student mental health and fostering supportive environments for students living with mental health conditions. Prior to joining the faculty at Bryn Mawr, Chris was an instructor at the University of Pennsylvania, where he received the Provost's Award for Teaching Excellence by Non-Standing Faculty. Chris holds a PhD in Computer Science from Columbia University and a BS in Computer Engineering from Boston University.*

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More than 8 million people have some sort of vision impairment (including color blindness).

cdc.gov

INTERVIEW

ATHER SHARIF is a PhD student at the University of Washington, focusing on the intersection of Accessibility, Visualization, and Personalization. He is also a Software Engineer at Comcast and the Founder of EvoXLabs, an initiative dedicated to bridging the gap between technology and disabled people. Ather serves as an Executive Board Member for the Disability Empowerment Center and Accessibility User Advisory Group for the Office of the ADA Coordinator at the University of Washington. He has pioneered several initiatives, including the evoHaX Hackathons and Accessible World Conference, and is dedicated to making technology equitably accessible to disabled people.

NOTHING ABOUT US WITHOUT US

THE DISABILITY GAP

RE: For those who aren't familiar — could you tell us about the "disability divide"? How can we work toward eliminating this gap?

AS: The disability divide, in the simplest of the explanations, is the equity gap between disabled and able-bodied people. Accessibility, and disabled people, for that matter, are regularly an afterthought. Like "Oh, right, I didn't think about how this digital content is completely inaccessible to a blind person."

How do we eliminate this gap? That's a great question. A lot of people try to find a checklist that they can go through. Something short and simple. And easy. And that's exactly what the issue is. These quick solutions do not advance society. They're band-aids, at best. If we are to eliminate this gap, we really need to go back to the fundamentals. Why does this gap exist? How did it start? What does having a disability mean? What challenges do disabled people face in this society? We need to educate ourselves. We need to give disabled people and their voices a platform. And we need to listen and understand. And then try to work with them in finding solutions. In my humble opinion, I think that's how we eliminate the disability divide.

RE: What's the first thing you'd recommend companies (or educators) do to be more inclusive of people with disabilities?

AS: As I mentioned in my previous answer, I think all of this starts with education. We need to educate ourselves. We need to improve the workforce to include diverse voices and perspectives. But not just for diversity's sake, but to actually learn and make systemic adjustments to incorporate long-lasting changes. We need to build environments where mindsets can change, grow, and become more inclusive. As a starting point, I would recommend companies have regular opportunities for their employees to interact with and learn from disabled people. Brown-bag lunches, perhaps? Panels? Talks? And not just because it's disability awareness month, but as a regular occurrence.

RE: What are some of the challenges in appealing to people who are resistant to change? What are some strategies you've found useful to overcome this inertia?

AS: It's challenging to change the corporate culture. There's always pushback on priorities and funding and all sorts of justifications that are really just ways to focus more on tangible corporate profits and less on corporate social responsibility. So, yeah, organizations and people often do not think of making society better but instead to "get something out of it." What I've personally found helpful is to show them exactly that. How they can "get something out of it" — such as, hey, if you make your website accessible, it also improves your SEO (search engine optimization). If you put subtitles or closed-captions on your videos, you attract a broader audience, including people who aren't native English speakers. But at the same time, providing them with user stories, where their systems and products really made the day of a person with a disability, and also how someone was just unable to access their products. For example, COVID-19 graphs and visualizations were largely inaccessible to blind and low-vision folks. So, you go to these people and tell them, hey, this is a matter of life and death and these demographics can't access this information at all. Public accountability can play an important role in overcoming this inertia.

RE: How can companies work to remove unintentional bias from their recruiting, hiring, training, and promotion processes?

AS: Well, first, the whole "equal" thing doesn't work anymore. That's what we wanted two decades ago. It's about "equity" now. If you want to hire a diverse group of people, you can't just put a label and say we're an equal opportunity employer and leave it at that. If you're a recruiter, then you should reach out to marginalized groups and actively find people in these groups. Because there's a reason if you're not seeing disabled people applying to jobs. Maybe the advertisement platform isn't accessible, maybe the whole education system is so inaccessible that they never had the opportunity to develop the skills that everyone else had. So, I really think that companies need to make an intentional effort to improve their processes and make them more inclusive. >

THE MORE DIVERSE THE WORKFORCE, THE MORE WE'LL ALL UNDERSTAND THE STRUGGLES OF MARGINALIZED GROUPS AND USE OUR PRIVILEGE TO IMPROVE THE CURRENT STATE OF THE WORLD.

RE: Why is it imperative to include people with disabilities in product design?

AS: It's "nothing about us without us." Disabled people aren't just testers or subjects in studies. Their inclusion in the workforce makes this society better. It provides the next generation and the next platform and motivation to go out there, pursue their dreams, and have the job titles that traditionally have been immediate shut-downs for them. Like, can a disabled person with limited hand function be a software engineer? Well, yes. But we need living examples. And it's also about changing mindsets. There are people who have never encountered people with disabilities in their daily lives. And they have no idea what to do or say if they ever did. The more diverse the workforce, the more we'll all understand the struggles of marginalized groups and use our privilege to improve the current state of the world.

RE: What else can companies do to make workplaces more welcoming and inclusive of people with disabilities?

AS: Again, I would refrain from providing a checklist because systems have a tendency to get comfortable with their processes and resist change. But, of course, there's a starting point. And that begins with education and exposure to societal disenfranchisements. We have to incorporate accessibility from the beginning. Think about what happens when a person joins a company. They're given a bunch of resources, usually as printed materials, digital PDFs, or websites. Are those accessible? Are people who they're about to spend 40 hours a week with educated on what they should and shouldn't say? Terminologies and actions that are acceptable and those that are not? All this requires a lot of thinking and a preliminary set of intentional and conscious efforts. And companies need to do that. And if they're not sure where to start, hiring a disability consultant to review and advise on their processes would be a wonderful place to start.

RE: What else do you want people to know about these issues?

AS: I wish people could understand the difference between equality and equity. Equality is an obsolete concept. Equity is what we're striving for. Personally, I knew nothing about the disability world until a car accident resulting in a spinal cord injury forced me to learn about it. And I wish I had known more about this world beforehand. And that's what I want people to know. Don't wait to know about the disability world until they or their loved ones become a part of it — do it proactively. We have to make this society better, and the tiny steps that we take may not be visible to us, but they will shape society for the generations that come after us. Someone before us put in the effort that we today enjoy. It's time for us to do the same. ■

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One billion people need assistive products today.

cdc.gov

INTERVIEW

VICTORIA CHAVEZ (they/she) is a Joint PhD student in the Computer Science + Learning Sciences Program at Northwestern University. Victoria's research interests stem from asking "How can we make computer science a safe and joyous experience for Black, Disabled, Indigenous, and Latine/x college students?". They are also broadly interested in issues of accessibility, civic tech, equity, and social justice.

& ADVOCACY ACTIVISM

IN THE DISABILITY COMMUNITY

RE: First, I'd love to hear a bit more about you. Could you tell me a little bit about yourself and your background?

VC: For starters, I go by Victoria and use they/she pronouns. I'm currently a PhD student at Northwestern University, in the Joint Computer Science + Learning Sciences program. I'm broadly interested in computer science education, accessibility, civic technology, and social justice. Most of my research interests stem from asking "How can we make Computer Science a safe and joyous experience for Black, Disabled, Latinx, and Indigenous college students?" Before starting my PhD program, I was a CS lecturer and before that, previous lifetimes include me as a high school CS teacher as well as working in industry. I think I've done a lot of the possible CS career routes at this point, spanning education, non-profit, for-profit, and startups.

RE: What initially attracted you to tech?

VC: Some of my origin story into STEM is in the Technolochicas video and in the Wogrammer feature. A lot of my attraction to math in particular came from being an English language learner and finding a refuge in numbers. I first encountered CS in high school, taking it on a whim to avoid taking the music and art classes I had to take (and my mom wanted me to take). I had always had an interest in cars and was curious about the new technologies that were starting to make their way into vehicles at the time. I fell in love with CS from the moment I encountered my first bug while programming in Alice. For the first time in my schooling experience, I felt challenged in a way I didn't know I needed. Rather than being challenged to memorize terms, dates, and formulas, I was being challenged to solve a problem for which there was no 'right' answer (beyond expected behavior).

RE: Are there role models in tech that you particularly identify with? What about them fuels your passion?

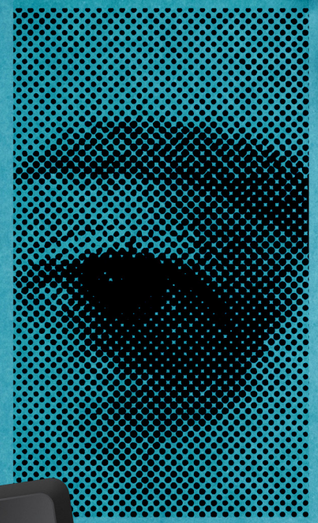
VC: There are SO many people I look up to, in tech activism, education, and academia, whose passion and advocacy inspire and energize me. I have so much love and respect for my Papaya Project (https://the-papaya-project.github.io) friends, peers, and colleagues, who remind me often to rest and practice self-love while working together to identify, disrupt, and prevent harm in our field. In tech more broadly, Dr. Ruha Benjamin, Dr. Timnit Gebru, and Dr. Safiya Noble are paving a path toward a more just technological future. And in CS education, Dr. Nicki Washington, Dr. Shani B Daily, and Shana V. White work relentlessly to foster a more inclusive and equitable field.

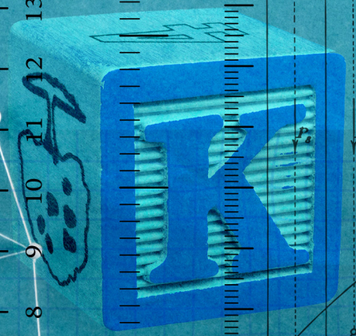
RE: What are some challenges you've encountered along your journey, and what are some strategies that helped you overcome those roadblocks?

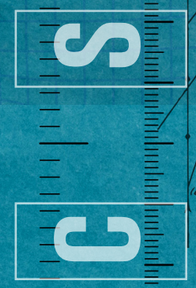
VC: I always struggle with this question because when you're a queer, non-binary, disabled person of color, existence is a challenge in and of itself. We're constantly fighting to justify or even prove our existence, and those fights multiply tenfold in heavily white-, man-, and abled-dominated spaces like tech and academia. And now, the (ongoing!) pandemic has exacerbated the ableism and exclusion many of us face. Things that are already challenging, like grad school for example, become intolerable when I've got to constantly fight for bare minimum accommodations that continue to get rejected and then fend for myself with no institutional support. We spent two years normalizing virtual and hybrid accommodations, and suddenly they are no longer available because they're 'too expensive' or 'logistically challenging.' We're told to 'stay home' while the world passes us by, pretending we don't exist or aren't worthy of a full existence: It's exhausting, dehumanizing, and humiliating.

I'm incredibly grateful for all of the advocacy and activism in the disability community. So much, if not all, of the progress we've made has been thanks to the relentless fighting of our community. We need more allies who will join the fight! For me, being in community with amazing groups and organizations like Covid Safe Campus, The People's CDC, and The Disabled Academic Collective has been a huge source of validation and support. ■

Maya Israel







ACCESS

AND INCLUSION IN K-12 CS EDUCATION: INCLUSIVE MINDSETS AND PEDAGOGICAL PRACTICES

I began my career as a special education teacher, and I was doing work around developing games and technologies to support engagement and learning for students with disabilities. We were doing participatory design studies and including students, many of whom had disabilities, in these efforts. At some point I had this "Aha" moment, where I started to shift from "Why is it that we are designing for students?" to "Why don't we start to consider how to support the instruction of kids in computer science in developing technologies?" And now, many years later, I find myself in a department of computer science education and educational technology.

The work that I'm going to share is done in collaboration with a lot of very talented faculty, teacher educators, doctoral students, postdocs, and staff.

My primary goal is actually three goals: I look at access, I look at participation, and I look at learning of all students, including students with disabilities.

I want to position this information in terms of the larger discussion around K-12 computer science for students with disabilities. The first area is the Individuals with Disabilities Education Act, the IDEA. It's an educational entitlement law that essentially provides a right to a free and appropriate public education — FAPE — in the least restrictive environment. When it comes to special education services in K-12, we have this assumption that there is a range of instructional approaches that are individualized, and that students should be in what we call the "least restrictive" environment.

It doesn't mean that everybody is, all the time, in a general education setting. It means that we have this continuum from all day, every day in this general education classroom all the way through residential programs, hospital programs, and so forth.

What does it mean when I think about computer science education in K-12 from the perspective of equality of opportunity, full participation, independent living, and economic self-sufficiency?

STUDENTS WITH DISABILITIES ARE A VERY WIDE RANGE OF LEARNERS, so equality of opportunity is going to look different. Full participation will look different. What does it mean to have this goal of independent living and economic self-sufficiency? It pushes me to think about everything I do from these four areas.

Another area of law that's impacting students with disabilities is the Rehabilitation Act of 1973, specifically Section 504, and the Americans with Disabilities Act (ADA). These laws essentially prohibit discrimination; they are civil rights laws. This is where a lot of students receive accommodations. They may not qualify for services under the IDEA, but access, accessibility, and accommodations come from these legislations.

IT IS VERY DIFFICULT TO ACTUALLY GET THE NUMBERS OF HOW MANY STUDENTS WITH DISABILITIES ARE RECEIVING SERVICES AND SUPPORTS IN U.S. SCHOOLS.

According to the latest statistics we have from the IDEA, it's about 7.2 million students: roughly 15% of the learner population. It's much harder to know how many students are receiving accommodations and supports under Section 504 of the ADA. I've seen everything from 1.5 to 2.3 million, but that is a difficult number, and it makes the work of trying to understand the level to which kids with disabilities are receiving computer science really complicated when we don't have these numbers.

In terms of who the learners are, the largest category is students with learning disabilities, about 33%. Then, we have students who have speech and language impairment, which is about 19% of kids in public schools. "Other health impairments" is about 15%. Then, autism and autism spectrum disorders are around 12%. From there, we have other categories with fewer learners.

It's important to note that even though we have the least restrictive environment, for most students with disabilities, that is considered the general education setting. That gives an overview of who we are talking about, at least in terms of learners with identified and disclosed disabilities.

7.2 MILLION

STUDENTS WITH DISABILITIES ARE RECEIVING SUPPORT SERVICES

33%

ARE STUDENTS WITH LEARNING DISABILITIES

19%

ARE STUDENTS WITH LANGUAGE IMPAIRMENT

12%

ARE STUDENTS WITH AUTISM AND AUTISM SPECTRUM DISORDERS

One of the primary approaches we take in our lab is to look at systems change in three ways. The first is in our research, and much of that research happens with our practice partners, with the school personnel. Second, we think about implementation with our practice partners, and third, advocacy that comes out of that research and implementation.

What's important here is that many of the research questions we have around participation come from our implementation work, from our practice partners. Then, we are able to work with them to design research studies to come up with the questions, to come up with the interventions, and then we implement them, and we learn. Our aspiration is to have this research-to-practice loop, where we're co-constructing knowledge together. So, our research is informing practice, our practice is informing research; our ideas are all coming together that way. Then, we use the knowledge that we co-construct to work on advocacy as well, and to work on systems change.

When I talk about the research, it's going to seem very, very basic, because I feel like we are just scratching the surface. But I wanted to start with some of the big questions I have.

ONE OF THE MAJOR QUESTIONS I HAVE IS AROUND THE INTERSECTIONALITY OF DISABILITY, GENDER, SOCIOECONOMIC, RACE, ETHNICITY, CULTURE, AND THE INTERPLAY IN TERMS OF K-12 COMPUTER SCIENCE EDUCATION.

I'm also interested in how we provide professional development in an effective way to a broad range of folks who work with students with disabilities: general education teachers, special education teachers, parent educators, and so forth.

I have a lot of questions about how to encourage student voices to guide intervention development so that we're not doing to kids, we're working with kids and families. And I have lots of questions about effective practices. We come up with a lot of interventions. So, which ones have the biggest impact on learning, and for whom?

Enter one of our projects: It's called UDL4CS, and it is a research practice partnership. We think about how to develop professional development materials. How do we collaborate on data collection and analysis? It's called UDL4CS, so universal design for learning is about being proactive in how we design instruction to meet the needs of all learners.

?

ARE STUDENTS WITH DIFFERENT DISABILITIES INCLUDED IN COMPUTER SCIENCE COURSEWORK?

I'm interested in performance gaps. This becomes complicated once we start to say it's very hard to identify who the learners are. So, actually understanding performance gaps becomes really difficult at scale.

And then also, how do we change mindsets? This is a very important and difficult question too. We all have our own biases. We all have our own ideas about who belongs and who doesn't belong. Those are shaped from our own experiences. So, how we change mindsets is an important question that I have.

ASKING THIS QUESTION ALLOWS US TO DIVE PRETTY DEEPLY INTO SOMETHING THAT SHOULD BE REALLY, REALLY SIMPLE, BUT IT IS DIFFICULT FOR US TO ACTUALLY GET.

From that perspective, we don't often think about, "This is an intervention for a student with a learning disability," or "This is a support for students with autism." We think about the functional needs of kids, and how we provide all of that within a classroom. But, there's a tension here. We want to focus on the broad range of learners, and we talk about learner variability as the norm, rather than disability focus — but we have to acknowledge disability, and we have to collect data and look specifically at learners with disabilities within that. This tension is real, in terms of providing instruction for all and having a very specific focus on disability at the same time.

Those questions that I just mentioned — here is where we are in this work. Even though I want to be able to study learning, at this point we have no research about who participates in computer science education in K-12 at scale. It's just not out there. It's very difficult to get this information for a wide range of reasons. Confidentiality is one. Another one is, a lot of times, people don't collect this information. So, we can't find it. So, I have to start here.

Are students with different disabilities included in computer science coursework? It's a yes/no, looking at students from this perspective. Is this happening in different settings? Because we have this idea of least-restrictive environment, are students along the continuum also receiving computer science education? Asking this question allows us to dive pretty deeply into something that should be really, really simple, but it is difficult for us to actually get.

SO, THAT'S WHERE WE ARE: WE'VE COLLECTED SOME OF THIS DATA.

Here is our next step. Not only is it hard to tell where students, or if students, are receiving computer science education, it's also difficult to actually tell — even if they are enrolled — if they are actually receiving computer science education. Because oftentimes, a student might be enrolled in a class that has computer science, but they may be pulled out for part of that time to receive services. Or there may be other reasons behind why a student may not have access to that course.

What we're doing to be able to actually get this data is sending out a lot of surveys to teachers and asking them, "How many students in your CS class have IPs or receive supports under Section 504?" Then, of those, "How many of them are getting pulled out for some reason or another?" Those surveys are going out this fall.

We're going to take the data we have in this particular setting, and others, to see the participation data, and then compare that with what teachers are saying. Then, the next step, and where I'm hoping we're going to get — but we're just not there yet — is that ultimately, we need to know whether instruction in computer science is actually resulting in learning gains for students with disabilities. We do this at a small scale with our intervention studies, but we have not done this at scale yet.

We know in other content areas that there are performance gaps — in math education, in science education, in literacy. Those performance gaps are very widely known and have been known for a long time, for multiple reasons. We suspect that is probably the case in computer science education, but we don't know. So, being able to look at that at scale is super important. Again, it's difficult to do, but we are hoping to get there.

That's where we are in terms of the studies that we're doing under the umbrella of universal UDL4CS. Earlier, I mentioned that this is a research practice partnership. The questions that are being asked were asked because they were important to our practice partners. That's really important, to be able to inform them. None of this is happening in isolation.

So, "Are students with disabilities taking CS? Yes? No? Maybe? It's complicated?" When we look at all kids — and we put all kids with disabilities into a single category, and we compare them to students without disabilities — at the elementary, middle, and high school levels, there are differences in participation, but they're not extreme.

Let me back up by saying that in this particular setting, there is a CSforAll initiative.

FOR STUDENTS AT THE ELEMENTARY, MIDDLE, AND HIGH SCHOOL LEVELS, THE AIM IS TO HAVE EVERYBODY HAVE ACCESS TO COMPUTER SCIENCE EDUCATION.

AT THE ELEMENTARY LEVEL,

it's much more integrated into regular instruction. As children move into middle school and high school, it becomes much more of an opt-in to computer science. So it's not surprising that there is a decrease from elementary, to middle, to high school. It's also not surprising that we're seeing these differences between students with and without disabilities.

This is what happens when we lump everybody together, but what happens when we disaggregate the data and we look at kids of different disability types? Earlier I mentioned the largest categories of students with disabilities: learning disabilities, speech/language, other health impairment, and autism. In looking at some of these high-incidence disabilities, it's a little different when we don't lump all kids together. When we look at students with learning disabilities, they're doing pretty well at the elementary school level, but then there are some pretty significant drops from middle school to high school. But when we look at students with autism, or we look at students with emotional behavior disorders, the story is a little different too. So, we can't lump all students with disabilities into the same category. That's one of the other things that I'm hoping is acknowledged in this work.

In looking at some of the students with some of what we call low-incidence disabilities, though we don't have as many numbers, it's still important to look at their participation. So, we put some categories together here, though we do not lump students together in our data.

If we look at students who are deaf, have deafness/blindness, or a hearing impairment, their profile looks very different, for example, from students with intellectual disability, or students with multiple disabilities. In looking at this data, what does it mean for a student who, for example, has a visual impairment? They are participating, but what does that look like?

Taking this data, and then asking what happens when we put in race, ethnicity, socioeconomics, gender, is where we're going next, and that is data we are currently analyzing.

Let's now ask another question: Is this happening the same in different instructional settings? Typically, students with disabilities are taught in the general education setting. There are different models, too. There is co-teaching, when you have a computer science teacher and the general education teacher working together with the special education teacher, and they're all responsible for all the students learning. Another model is students who are generally taught in the general education classroom but are pulled out for part of the day to receive some intensive supports. In another model, students are receiving all of their education in what we call "self-contained settings," primarily with a special education teacher. All of these are happening in regular schools as well.

"DOES COMPUTER SCIENCE EDUCATION MEET EVERYBODY'S NEEDS ACROSS ALL THESE SETTINGS?" IS ANOTHER QUESTION THAT WE ASK — AND NO, IT DOESN'T.

In co-teaching settings, things are looking pretty good. Students who have both a special education teacher and a general education teacher primarily throughout the day are receiving computer science education.

For students who are in self-contained settings, and students who are receiving resource room support for at least part of their day, things look a little different. This is what I mean when I say that it's a little complicated.

Let's look at what we're doing about this. Of course, we're working together. We are going to talk about a couple of models. I'm actually going to just mention them very briefly, and then go into our intervention.

One of them is to look at where the issues are, and what we can do at the systems-change level, at the school level, and at the classroom level.

Another way to do this is to think about it from this multidimensional approach. Thinking about a school at the organization level: Is there time for planning?

AT THE ACADEMIC LEVEL:

Are there tools available in the school that are accessible? It doesn't matter how engaging and how universally designed instruction is — if the tools are not accessible, then the students cannot actually learn computer science.

AT THE ASSESSMENT LEVEL:

Are the assessments actually measuring students' strengths, and not just their deficits?

AT THE SOCIAL LEVEL:

Are students with disabilities proportionally included? Do they feel like they belong?

In terms of UDL4CS, we're creating professional development materials and case studies, and we're sharing strategies across our partnerships. The hope is that these materials can be used across different settings, so those working on professional development or doing teacher preparation, and looking at how to do those from a universally designed perspective, will have those resources available to them.

One of the things we've created is an interactive table of universal design for learning. UDL is predicated on three principles: multiple means of engagement, representation, and action and expression. Within each one of those we've recorded some videos, and we've also put in some strategies.

We have identified four areas with our practice partners: an introduction to inclusive computer science, advocacy, frameworks, and instructional practices. We have it by grade level, resource type, and the CSTA teacher standard. For example, you could go into "Introduction," and filter through a curated list of resources.

That's UDL4CS. The idea is to provide professional development that also includes students with disabilities. It's an important piece of the work.

Now I'm going to describe another project. Whereas UDL4CS is very much focused on professional development and building professional development resources, Time4CSforAll is focused on how we design curriculum for teachers to implement that takes project-based learning — in this particular case, it's science and computer science at the elementary level focused on project-based learning — and embed universal design for learning and culturally responsive pedagogy right into that.

We're looking into the extent to which these are usable by teachers. This is also a research practice partnership involving Broward County Public Schools, the University of Chicago, and the Outlier Center. The first thing we did was take the eight elements of project-based learning and align them with different components of universal design for learning and culturally responsive pedagogy. We are developing an interactive crosswalk that will include each one of the project-based learning components, along with checkpoints to consider how to embed universal design for learning and culturally responsive pedagogy.

Next, we created our unit with lesson plans. We took these elements, and we embedded them right into the lesson plans. So, every single lesson plan we have has something called an "equity spotlight." In that spotlight is the range of UDL and CRP approaches that we want to call out to the teachers.

It's important to note we are not asking the teachers to do the crosswalk themselves. It's a pretty heavy lift to be able to look at frameworks and embed those in lesson plans, and then teach those lesson plans. We have done a lot of this work for the teachers.

The lesson plans are being tested right now. But in addition to the crosswalk, we have created some videos that have a lot to do with our invasive species unit but can be generalized.

Our first video is just an introduction to the curriculum. The second video is about inclusive frameworks — universal design for learning and culturally responsive pedagogy, and how we see that in this integrated approach.

The others are specifically tied to the different project-based learning steps. For those doing work in project-based learning and thinking about how to design proactively in a way that is more inclusive, hopefully these videos will be helpful. The lessons should be up after our treatment control study ends. Look for the website to grow.

I have talked about research, and I have talked about implementation. I want to actually get to some of the advocacy work that comes out of this. Essentially, we are trying to inform our advocacy work based on both what we know from our research and from our practice.

WE HAVE TO ACKNOWLEDGE IT IS NOT ONE-SIZE-FITS-ALL. WITHIN MY LAB, THERE ARE A LOT OF AREAS OF ADVOCACY. WE LOOK AT FOUR AREAS, BECAUSE WE CAN'T DO IT ALL.

1 FIRST, WE DO WORK ON TECHNOLOGY ACCESSIBILITY.
This involves demanding that technology companies that design technology for children in K-12 design with accessibility in mind. Because, as I said earlier, all these amazing instructional practices that our fabulous teachers are doing don't matter if the tech is not accessible.

2 TEACHER PROFESSIONAL DEVELOPMENT (PD) AND TEACHER PREPARATION.
Within the PD that is being developed in computer science education, within all the new computer science teacher preparation programs, to what extent are those programs actually thinking about CSforAll that includes students with disabilities? We have some advocacy work there, and some education work — insisting that, when we look at our PD that is provided to teachers in our teacher preparation, we really are thinking about all kids.

3 OUR CURRICULAR RESOURCES.
Many of the teachers we work with are not designing their own lessons. They are using curriculum that is adopted by their school district or that they're finding on websites. So, working with these curriculum developers to focus on inclusive practices within their curriculum as well is another area of advocacy we are involved with.

4 THINKING ABOUT THE STUDENTS THEMSELVES, AND THEIR FAMILY, AND MAKING SURE THAT THEY HAVE A VOICE AND A PLACE AT THE TABLE IN THIS WORK.
There is a saying, "Nothing about us without us," that comes out of the disability advocacy community. It's really important that, if we're doing work related to learners with disabilities and their families, they be at the table. So, we want to make sure that folks who need to be at the table are at the table at the decision-making stages — at all decision-making stages.

I'm going to just share, for closing, what we are doing within our teacher preparation program here at the University of Florida. We've been working on computer science education for the past three or four years. We focus on equity within these teacher preparation pathways, across all of them. We are also advocating for that to happen, not just with me in my classes, but everybody who is teaching within our program, just to make sure that we are all on the same page.

FOR EXAMPLE, WE HAVE AN ONRAMP THAT INCLUDES A MICROCREDENTIAL FOR FOLKS WHO ARE NOT NECESSARILY GOING TO BE COMPUTER SCIENCE TEACHERS, BUT THEY WANT TO LEARN ABOUT COMPUTER SCIENCE.

We have microcredential programs for pre-service teachers. We also are developing some for in-service teachers. One of the ones we are starting to work on now, that hopefully will be ready by summer of 2023, is a microcredential related to access and inclusion in computer science education. It will be fully online, and anybody who is interested in it can take it and earn a badge in inclusive and accessible computer science education.

We teach two CS pedagogy courses for K-12 teachers. We embed inclusive practices within that: universal design for learning, high leverage practices, culturally responsive pedagogy, and translanguaging. Then, finally, we want to build a pipeline of teachers who are prepared to work with all students — students with disabilities — as part of that.

Not only are we working on the microcredential and students who are in our computer science certificate program, but we are also integrating computer science into the content areas with the same approach of thinking about inclusion. We are also hoping to develop our mentors who work with our teachers so that they are also thinking about it from this particular mindset.

To summarize, we started off thinking about how to improve access, how to improve participation, and how to improve learning for all learners, and including students with disabilities within this work. We are just scratching the surface here. This is a community of folks across the country, not just in our lab, who are doing this work. It is a pretty small community, but it is growing. We need more people to do the research, to do the implementation, and to do the advocacy for this together. ■

Maya Israel, PhD *is an associate professor of Educational Technology and Computer Science Education at the University of Florida. She is also the Director of CSEveryone: The Kenneth C. Griffin CS Education for All Initiative as well as the Creative Technology Research Lab at the UF. Prior to entering higher education, Dr. Israel was a special education teacher. Her research focuses on strategies for supporting students with disabilities and other academically diverse learners' meaningful engagement in computer science education through Universal Design for Learning (UDL).*

THE COLORS WE SEE

THERE ARE MANY COLOR “BLINDNESS” VARIATIONS. BELOW ARE THREE OF THE MOST PREVALENT.

“NORMAL”

MONOCHROMACY AND ACHROMATOPSIA
Monochromacy is the most severe form of color blindness, where an individual has a complete inability to see color. They see everything in shades of gray. Achromatopsia, also known as total color blindness, is a rare inherited condition where an individual has a complete absence of color vision. They are unable to see any hue or saturation in color and see everything in shades of gray or black and white.

DEUTAN COLOR BLINDNESS (“do-tan”) is a type of red-green color blindness caused by a genetic mutation that affects the function of the medium-wavelength sensitive cone cells in the retina. Individuals with deutan color blindness have difficulty distinguishing between red and green hues, often confusing them and perceiving them as the same color or a similar shade of yellow. Deutan color blindness is relatively common, affecting approximately 2% of the male population and 0.5% of the female population.

TRITAN COLOR BLINDNESS (“try-tan”) is a rare type of color blindness caused by a genetic mutation that affects the function of the short-wavelength sensitive cone cells in the retina. This type of color blindness affects the perception of blue and yellow hues, causing individuals to confuse these colors and perceive them as green or gray. Tritan color blindness is considered a very rare form of color blindness, affecting only a small percentage of the population.

re: sources

Whether you are an educator, an employer, or a producer of technology, think about what you can do to increase accessibility in your daily life. If you're interested in learning more, there's a small but dedicated group of organizations that focus on accessibility in computing education and careers.

NCWIT RESOURCES RELATED TO DISABILITY

Advising for Future-Ready Careers Episode 4: CS + Accessibility >

2020 NCWIT Summit - "Different Kinds Of Minds" By Temple Grandin >

2016 NCWIT Summit Presentation — "Including Students with Disabilities in the Computing Education Pipeline"
Workshop by Richard Ladner >

PRE K-12 RESOURCES

AccessCSforAll is a related NSF-funded project that works to develop accessible tools and curricula for K12 CS education. >

The Quorum programming language is an evidenced-based programming language that is accessible to screen-reader users. >

Other accessible tools include Swift Playgrounds (for Mac or iPad) and Blocks4All (for iPad). >

The National Center for Computer Science Education maintains an Accessibility page that includes strategies and resources related to accessibility in K-12 CS education. >

National Center for Accessible Educational Materials >

The Creative Technology Research Lab (CTRL) aims to investigate how to meaningfully engage all learners in technology-mediated learning with a focus on K-12. >

POSTSECONDARY RESOURCES

AccessComputing is an NSF-funded Broadening Participation in Computing Alliance that works to increase the participation of people with disabilities in computing education and careers. >

CMD-IT (the Center for Minorities and People with Disabilities in IT) aims "to contribute to the national need for an effective workforce in computing and IT through synergistic activities related to minorities and people with disabilities." It hosts the Tapia Celebration of Diversity in Computing conference. >

Code the Spectrum provides computer technology training to individuals with autism spectrum disorders and other neurodevelopmental disorders. >

WORKFORCE RESOURCES

Teach Access works to ensure that accessibility is included in the postsecondary curriculum, with the goal of increasing the ability of the workforce to design and develop accessible products. >

Disability:IN is the leading non-profit resource for business disability inclusion worldwide. >

The Job Accommodation Network has resources for employees and employers about workplace accommodations. The resources in A to Z of Disabilities and Accommodations are particularly useful. >

AccessComputing's Employment Resources list includes many organizations that seek to match job seekers with disabilities with employer. >

All links and resources For this issue are available in a digital format here:

QUIET QUITTING, ENGAGEMENT, AND REMOTE WORK – WHY INCLUSIVE CULTURES ARE CRITICAL

JOANNE ESCH
AND
ANDREA BOWENS-JONES

shhh

IT'S HARD TO IGNORE THE TRENDY HEADLINES AND WIDE RANGE OF REACTIONS AND EMOTIONS RELATED TO THE TOPIC OF "QUIET QUITTING." THE CONVERSATION POINTS TO TWO PRESSING CONCERNS: WORKER (DIS)ENGAGEMENT IN CORPORATE CULTURES, AND EMPLOYER ANXIETY ABOUT REMOTE WORK AND PERCEIVED LOW PRODUCTIVITY THAT SOME HAVE TERMED "PRODUCTIVITY PARANOIA."

When unenthusiastic workers began sharing stories about separating their identities from their work, prioritizing "work-life balance" over career ambition, and choosing to do the bare minimum, it provoked a strong reaction from bosses who feared an epidemic of remote workers doing less than the bare minimum.

Although this notion of "quiet quitting" is nothing new, in the context of a changing workforce it does point to a much-needed conversation about workplace culture, identity, inclusivity, and a reconfiguring of what work productivity can look like and how it can be assessed.

What can be learned from research? Let's start with some recent indicators of productivity and engagement among remote and hybrid workers.

87%

Microsoft reported that 87% of the rank and file say they're just as productive at home, but 85% of leaders say the shift to hybrid work has made it challenging to have confidence their employees are being productive (Work Trend Index Pulse survey of 20,000 knowledge workers).

MEANWHILE, MICROSOFT SAYS, OFFICE 365 DATA SUGGESTS GREATER PRODUCTIVITY – MORE HOURS WORKED, MORE MEETINGS, MORE MULTITASKING.

55%

In another large survey, 55% of respondents reported working more hours remotely than in the office (compared to only 12% who reported working fewer hours).

90%

90% said they were as – or more – productive at home (OwlLabs, 2021 survey of 2,050 full-time workers).

>

Gallup reported a small overall increase in the ratio of "actively disengaged" to "engaged" workers in its most recent survey but found hybrid and remote workers to be more engaged than on-site workers.

GOVERNMENT DATA SHOWS A SLUMP IN WORKFORCE-WIDE PRODUCTIVITY IN 2022, FOLLOWING DECADES OF GROWTH, AND IN THE CONTEXT OF CONTINUED SUPPLY-CHAIN DISRUPTIONS AND OTHER UNIQUE ECONOMIC CIRCUMSTANCES.

In short, there is no evidence of reduced productivity or engagement among remote workers — if anything, the reverse is true. So we ought to dispense with the idea that remote work is a panacea for quiet quitters. There are some indications of a modest decrease in productivity and engagement workforce-wide, though this is not necessarily attributable to "quiet quitting."

PRODUCTIVITY PARANOIA

The missing focus in this conversation is attention to building inclusive cultures in technology organizations. In our research at NCWIT, we define culture as a "shared set of norms and values within an organization." Unfortunately, we don't all experience the same workplace culture. For example, women of color are denied access to opportunities, fight feelings of exclusion, fall victim to prove-it-again bias, and are left with more office housework tasks (see, e.g., Williams, Korn, & Ghani, 2022). As a result, they must work harder to be perceived as competent and receive the same level of respect as their peers. Thus, non-majority groups stand a far greater chance of being negatively impacted by "productivity paranoia" and other aspects of perceived "quiet quitting" in the workplace than majority groups.

Reacting to suspected disengagement or low productivity by doing things that we know diminish employee engagement can further erode an inclusive culture. Despite sensational headlines and social media posts about "quiet quitting," we need to continue to create and nurture inclusive cultures in technology organizations that:

SUPPORT PEOPLE IN DOING THE BEST WORK OF THEIR LIVES.

SUPPORT PEOPLE IN FINDING SATISFACTION, MEANING, AND CONNECTION THROUGH WORK.

SUPPORT PEOPLE IN FINDING WORK/LIFE INTEGRATION/BALANCE THAT WORKS FOR THEM.

CONTINUE WORKING TO ENSURE EQUITABLE ACCESS TO RESOURCES THAT HELP PEOPLE DO THEIR BEST WORK.

These include, for example, meaningful project assignments, opportunities to contribute their ideas and influence decisions, valued roles on teams, and quality coaching, mentoring, sponsorship, and development opportunities.

However, some employees actually do "quiet quit" as it's defined, and can do so either while working remotely or in the office; the techniques may just be different but the intention is the same. When employees intentionally don't fulfill work obligations, they can have a negative impact on the company and their colleagues, who often must pick up the slack.

For more research-based tips and how-to guides related to workplace inclusion visit ncwit.org/resources.

HERE ARE A FEW TIPS FOR MANAGERS WHO BELIEVE THEY ARE DEALING WITH "QUIET QUITTERS:"

1. Use a spirit of inquiry in employee conversations– don't assume people are "quiet quitters" without an in-depth dialogue, and consider how bias and exclusion might affect access to resources that support employees in doing their best work.

2. Consider increasing one-on-one time with employees until a mutually agreeable work cadence and output are established.

3. Scrutinize your assumptions about who is and is not productive – be mindful of proximity and other types of biases experienced by members of non-majority groups.

4. Offer options as to when and where people work as appropriate to the needs of the business – recognize people experience workplaces differently, and a "one size fits all" approach may not be beneficial.

5. Practice collaborative goal setting and accountability (e.g., as part of the performance evaluation process) to ensure clear goals and outcomes have been set.

6. When you think about productivity or engagement, also ask about resources and opportunities; pay attention to task assignment and work distribution patterns. ■

WHEN WE ANALYZED DATA FROM MORE THAN 113,000

leaders to find the top behavior that helps effective leaders balance results with their concern for team members, the number one behavior that helped was trust. When direct reports trusted their leader, they also assumed that the manager cared about them and was concerned about their wellbeing.

3% Managers who were rated highest on balancing relationships saw only 3% of their employees quietly quitting.

TRUST

TRUST WAS LINKED TO THREE BEHAVIORS:

1. POSITIVE RELATIONSHIPS WITH ALL DIRECT REPORTS
2. CONSISTENCY AND HONESTY
3. EXPERTISE – PROVIDING CLARITY AND A PATH FORWARD FOR DIRECT REPORTS

hbr.org/2022/08/quiet-quitting-is-about-bad-bosses-not-bad-employees

PIONEER

IN TECH

2022
NCWIT PIONEER IN TECH
AWARD RECIPIENT

FRANCES POPPY NORTHCUTT

Frances "Poppy" Northcutt's career includes groundbreaking achievements as an engineer, as a women's rights advocate, and as an attorney. Born in Many, Louisiana, and raised in Luling and Dayton, Texas, Poppy earned a degree in mathematics at the University of Texas. In 1965, she began working for the Apollo program at NASA, initially as a computress and then as a return-to-earth specialist. During the Apollo 8 mission, she became the first woman to work in NASA's Mission Control Center. She also participated in the Apollo 11 and Apollo 13 missions and was a member of the mission operations team that received the Presidential Medal of Freedom for rescuing Apollo 13.

As one of few women in engineering, Poppy became increasingly involved in the women's liberation movement. She helped plan events with the National Organization for Women, a grassroots women's rights group. Poppy is currently President of Houston Area NOW and Texas NOW. In the 1970s, she served on NOW's national board of directors and was founding chair of the Harris County Women's Political Caucus, the first Women's Advocate for the City of Houston, and a special conference consultant for the National Women's Conference.

In 1984, Poppy earned a law degree and clerked for a federal appellate judge. She then prosecuted and later defended criminal cases. She was the first felony prosecutor in the Domestic Violence Unit at the Harris County DA's Office. In her private practice, she focused on criminal trial and appellate work. Now semi-retired, she is a referral lawyer for Jane's Due Process, a non-profit providing legal assistance to pregnant teenagers.

THE IDEA YOU DON'T HAVE IS THE VOICE YOU HAVEN'T HEARD.

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