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Education
The Inclusive and Accessible Workplace

Maximizing the performance of neurodiverse talent.

AS COMPUTER SCIENCE (CS) learning opportunities expand across the U.S., related diversification efforts to make "CS for All" must include brain diversity. Neurologically different individuals, like those with *attention and learning disorders*, are often lost in conversations about broadening participation in computing. Yet their diverse experiences and perspectives are an asset to fields that require innovative thinking, like computing. Most CS learning and work settings have a long way to go to make the field more inclusive for people with these differences, and work practices accessible to them. If we are successful in growing CS educational opportunities to include diverse learners, the workplace must be ready to welcome and retain a neurodiverse talent pool. Employers need concrete management strategies that will maximize the performance of these current and future employees. Education research exploring ways to adjust teaching practices for CS students with varied attention and learning disorders can serve as a starting point. We refer to this diverse group of individuals as *neurodiverse talent*. Good teachers use inclusive classroom practices, adjust strategies as needed, and provide additional supports to help all students succeed. Managers looking to benefit from neurodiversity must similarly employ inclusive practices and adjust techniques to provide individual supports where needed.
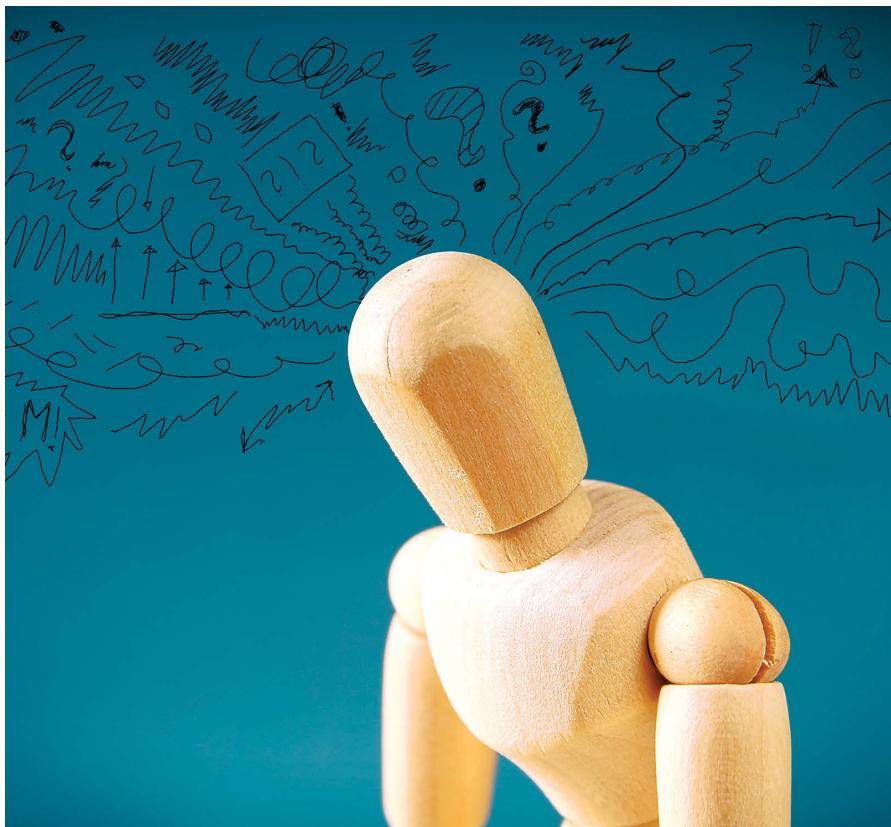
Neurodiversity Is Often Misunderstood

The term *neurodiversity* is used to describe a spectrum of neurological differences, which result from a normal, expected range of variation in the human genome. Individuals with an "atypical" neurological configuration, such as with ADHD or autism spectrum, are referred to as *neurodivergent*. People with a "typical" neurological configuration (that is, con-forming to what some would interpret as "normal") are considered *neurotypical*. The term *neurodiverse* is used to describe a group of people with varied neurocognitive functioning. These terms are often confused.

Atypical individuals with attention and learning disorders experience "neurologically-based difficulties in reading, writing, math, organization, focus, listening comprehension, social skills, motor skills or a combination of

these."[3] They often demonstrate average to superior intelligence and possess varying strengths, yet experience unexpected underachievement in basic academic skills. While their ability to receive, store, process, retrieve, or communicate information may be affected, they can be successful when provided with accessible instruction and support. Neurodivergent individuals face a range of bias and misperceptions. In 2012, the National Center for Learning Disabilities conducted a survey, randomly sampling U.S. adults and found that 43% of respondents mistakenly think that learning disorders "are correlated with IQ."[1]

Researchers estimate that one in five children in the U.S. have attention and learning issues.[3] At the postsecondary level, the largest group of students who report a disability are those with these less-visible disorders. In the workplace, 46% of working-age people with learning disorders (defined as 18–64 years) are employed, yet only 19% of them report disclosing their disorder to an employer.[1] This similarly occurs in postsecondary education, suggesting the current computing workplace is likely far more neurodiverse than we realize, and includes employees who would benefit from more inclusive and accessible operations and management techniques.

Neurodiversity Benefits Computing
The computing field has a lot to gain from the one in five youth in the U.S. with attention and learning disorders. For example, some suggest the best and brightest programmers are dyslexic (a reading disorder) because of their strengths in visualization, analytical and strategies reasoning, and hands-on problem solving.[2] As one CS student told us, "a lot of us have always been on the outside … we can think on the outside … that type of thing puts me and other kids with learning differences at an advantage … we think in a more creative way." But for those gains to be realized, the workplace must be inclusive of, and accessible to them.

The Americans with Disabilities Act (ADA), a federal civil rights law provides legal protections and requires employers to provide "reasonable accommodations" for employees with disabilities. Accommodating neurodi-

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verse talent (and others with a range of disabilities) is not just about "doing the right thing"—people with attention and learning disorders are legally protected under ADA. In this period of increased CS learning opportunities for all students, employers carry a responsibility to know about appropriate accommodations and small shifts in current management practices to support the diverse range of new talent entering the workforce. Luckily, many resources that provide workplace guidance already exist.[a] We can also look to large tech companies who have already started to adjust hiring and operational practices to accommodate neurodiverse talent (particularly those on the autism spectrum), like Microsoft and SAP. Employers will find the monetary investment of accommodations is generally small, if anything. Approximately half of accommodations have no cost,[b] like shifts in management techniques to leverage talent.

Education Research to Inform Workplace Adjustments
Attention and learning disorders are life-long conditions (that is, students do not outgrow them). Thus, strategies to include and support these individuals are needed in both educational and workplace settings. Insights from education research in this area can inform approaches to maximize contributions from neurodiverse talent.

In our National Science Foundation supported research exploring strategies to make high school AP Computer Science Principles (CSP) more accessible to students with at-

tention and learning disorders (a partnership between Outlier Research & Evaluation at the University of Chicago, and Wolcott School), we identify general instructional practice adjustments, and lesson-specific adjustments that improve accessibility of, and student engagement in CS learning.[c] Over the 2016–2017 school year, we regularly interviewed 12 students to understand how their attention and learning disorders related to their experience with various aspects of the class. Their responses directly informed our recommendations. Some of the challenges we heard students express included those related to **presentation** ("It was hard to read through the instructions handout [so] I had some of my classmates read [them] to me"), **response** ("If I have something in my brain, it's hard for me to put it in the right order and get it out of my brain [to] communicate"), **timing** ("It was kind of rushed … I would have been able to do better and think it through more if I had more time, especially … the first time"), **physical settings** ("It's a pretty large group … It's pretty distracting … If I put in my headphones … I can focus on my work"), and **social interactions** ("I got extremely frustrated cause they didn't know what they were doing … they thought they did everything right even though I blatantly told them 'you messed up'"). All of our adjustment recommendations address at least one of five general categories:

▸ **Presentation:** Providing access to materials in multiple ways.

▸ **Response:** Providing options for solving or organizing work in alternate ways, and for demonstrating understanding.

▸ **Timing:** Offering additional time for tasks, projects, and assessments.

▸ **Settings:** Offering physical setting adjustments.

▸ **Social interactions:** Providing supports to help maintain focus and engagement in collaborative work and share concrete examples of collaboration.

These are the key areas where managers may also need to adjust current practices. Research suggests that teaching adjustments made to accommodate those with attention and

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c   http://bit.ly/2BGTKIp

learning disorders often result in better academic success for *all individuals*.

Strategies for Increasing Contributions from Neurodiverse Talent

While there are many resources that provide specific strategy suggestions to improve accessibility of work environments, we offer a synthesis of these recommendations[d,4] and our own from experiences supporting neurologically different youth and adults. While particularly well-suited for neurodivergent employees, these strategies are also beneficial for the range of neurotypical employees in a computing-related setting.

We realize there is considerable challenge for managers in recognizing which employees might need accommodations when so few disclose their differences. One great approach in this situation is to incorporate suggested strategies into all regular team operations, to create a workplace more inclusive of a range of workers. Shifting management approaches requires effort and flexibility, but the benefits to both employees and employers are considerable. Inclusive practices create an environment that allows employers to tap into, and acknowledge a range of perspectives and experiences, which are at the heart of innovation. As managers shift, neurodiverse talent must also take responsibility for establishing and sustaining their own practices to ensure success, to self-advocate when supports are needed, and to implement additional strategies to increase their focus and productivity.

Here, we share management strategy recommendations to maximize the strengths and performance of a neurodiverse workforce:

Present instructions and expectations both verbally and in writing to avoid ambiguity, support employees with memory deficits, and explicitly outline expectations.

▸ Provide project details and work tasks in both verbal and written communications.

▸ Clearly describe key expectations and instructions in writing for employees to revisit as needed.

Break down tasks and identify spe-

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cific goals to support organization, prioritization, and time management of work assignments.**

▸ Provide task checklists; Promote use of collaborative project management and time management systems to separate tasks for completion, and to keep track of time on tasks.

▸ Share flowcharts to describe steps of complicated processes and appropriate completion time.

Schedule frequent check-in meetings between employee and supervisor to provide time for direct communication and specific feedback.

▸ Establish a structure for weekly check-in meetings to keep work on track and clarify any misunderstandings.

▸ Provide personalized training and job mentors to support targeted areas of improvement.

Recognize the hurdles email writing presents for some employees.

▸ Grant sufficient time for writing and editing email communications.

▸ Offer editing options, like the use of text-to-speech software (to listen to their own writing), or support from co-workers to proofread email content *and* subject lines.

Permit employees to "pass" on note taking and on-the-spot idea generation to minimize anxiety from spelling and writing, and social or communication-related challenges.

▸ Be flexible with group note-taking duties in meetings (whiteboards; shared electronic documents).

▸ Provide advance notice of meeting topics, and allow employees to submit ideas and feedback in writing, pre-, or post-meeting.

Offer flexible workspace arrangements to support organizational and concentration in open work environments.

▸ Enable employees to organize their personal workspaces and approaches to best fit their strengths and their own organizational needs.

▸ Designate quiet/private spaces that employees can use throughout the day to minimize distractions and focus.

Organizational commitment to utilizing management techniques like these requires dedication, person power, and time, yet these simple strategies are a low, or no-cost starting point to support workers with attention and learning disorders. In fact, some of these approaches are likely already used by effective managers. Employers, like classroom teachers, are responsible for adjusting practices to meet the needs of neurodiverse talent and providing workers with appropriate tools for success. Using strategies to support these workers (and make work less stressful for them) will ultimately maximize the contributions of *all* employees, improve team efficiency and productivity, and increase retention of great workers. **ⓒ**

References
1. Cortiella, C. and Horowitz, S. *The State of Learning Disabilities: Facts, Trends and Emerging Issues.* National Center for Learning Disabilities, NY, 2014; http://bit.ly/2kfoDtA
2. Dyslexic Advantage Team. Dyslexia and computer programmers. (Sept. 2016); http://bit.ly/2kGYiEh
3. Horowitz, S, Rawe, J., and Whittaker, M. *The State of Learning Disabilities: Understanding the 1 in 5.* National Center for Learning Disabilities, NY, 2017; http://bit.ly/2oIjuPe
4. Morris, M.R., Begel, A., and Wiedermann, B. Understanding the challenges faced by neurodiverse software engineering employees: Towards a more inclusive and productive technical workforce. In *ASSETS '15* (Oct. 26–28, 2015, Lisbon, Portugal), 173–184; DOI: http://dx.doi.org/10.1145/2700648.2809841

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