



# CAREER AND TECHNICAL EDUCATION IN MICHIGAN: STUDENTS WITH DISABILITIES

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## KEY FINDINGS:

1. Students with disabilities (SWD) participate in Career and Technical Education (CTE) at roughly the same rate as other students. Students with specific learning disabilities and speech or language impairments are most likely to enroll among all SWD. Girls with disabilities are less likely to participate compared to observably similar girls without disabilities.
2. Both boys and girls with disabilities are more likely to participate in agriculture and skilled trades programs and less likely to enroll in business and communications programs. That said, the skilled trades offer promising labor market prospects in Michigan.
3. SWD are less likely to complete CTE programs compared to students without disabilities. Approximately half of this gap can be explained by other characteristics like socioeconomic status and prior academic achievement.
4. SWD who complete a CTE program are 48% more likely to graduate high school relative to observably similar SWD who never enroll in a CTE program. This trend holds across sexes and most disability types. These benefits appear greater for SWD than students without disabilities.

# INTRODUCTION

Supporting students with disabilities (SWD) throughout their educational pathways is a critical policy imperative. Approximately one out of every seven students aged three to 21 qualifies for service under the Individuals with Disabilities Education Act (IDEA).<sup>1</sup> While 85% of all students nationwide graduate high school, just 69% of SWD do so.<sup>2</sup> Similarly, SWD are less likely to enroll in college.<sup>3</sup>

Individuals with disabilities face challenges in the labor market as well. Seventy-three percent of working-age adults with disabilities are either not in the labor force – meaning they do not have a job and are not looking for work – or are unemployed. The same is true for just 23% of individuals without disabilities.<sup>4</sup> Some of these differences in employment levels are surely attributable to the nature of individuals' disabilities. Indeed, Supplemental Security Income provides cash transfers to eligible individuals with disabilities who are unable to work. This is a crucial social safety net and we would not expect every individual with a disability to have a job. That said, employment levels rise with educational attainment among individuals with disabilities. This suggests that increased educational attainment may provide a buffer against economic insecurity for this population. Considering poverty rates among individuals with disabilities are more than double the rates for individuals without disabilities, this is an important policy objective.<sup>5</sup>

Career and Technical Education (CTE) could offer one way of bolstering educational attainment among and providing valuable job skills to SWD. These programs cultivate work readiness and can help students prepare to transition to life after high school. This brief provides a summary of CTE participation among SWD in Michigan. We also present descriptive findings showing that SWD who enroll in CTE graduate high school at higher rates compared to observably similar students who do not.

**“ 85% OF ALL STUDENTS  
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### What share of Michigan students have a disability?

Approximately 12% of students from each 11th-grade cohort (i.e., each group of students who entered 11th grade for the first time in the same year) have an Individualized Education Program (IEP). An IEP is a written plan for SWD that outlines their learning needs and goals along with any services they require to meet them. The presence of an IEP is how we identify SWD in our data.

Note that we limit our analyses in this report to students who reached at least 11th grade because this is when most students begin taking CTE courses. This is important for two main reasons. First, we want to focus on students who can actually enroll in CTE programs when examining CTE participation and completion rates. Second, we eventually analyze the relationship between CTE and graduation rates. We do not want to include students who drop out of school before they are eligible for our “treatment condition” of interest (i.e., CTE) and potentially skew our results.

Table 1 shows the share of all students with a disability among 11th-grade students from the 2016-17 school year as well as the rate among selected demographic groups. We see that male, Black, and economically disadvantaged students are more likely to have IEPs compared to other students. In fact, students who qualify for free or reduced price lunch (FRL; our marker for economic disadvantage) are more than twice as likely to have a disability compared to their more affluent peers.

**TABLE 1: Share of students with an IEP among 2016-17 11th graders**

Student group	% of all students in 11th grade with IEPs
<i>All students</i>	11.3
<i>Male</i>	14.3
<i>Female</i>	8.2
<i>Black</i>	15.5
<i>Hispanic</i>	11.4
<i>White</i>	10.6
<i>Other</i>	6.1
<i>FRL-eligible</i>	16.5
<i>FRL-ineligible</i>	8.1

### A Note on Demographic Disparities

There are clear disparities within each demographic category. Boys are more likely than girls to have IEPs, a greater share of Black and Hispanic students have IEPs than do their White peers, and the same is true of socioeconomically disadvantaged students compared to more affluent students. An essential question is why these inequities exist, and whether they are further disadvantaging already vulnerable young people. For example, are Black students more likely to receive an IEP than White or Hispanic students because they actually are more likely to have specific disabilities, or is the gap we see a function of implicit or explicit prejudice on the part of school staff? Could economically disadvantaged students be assigned to subjective disability categories because they exhibit disruptive behavioral patterns that stem from adverse experiences at home?<sup>6</sup> Are disabilities more prevalent among boys or do educators respond differently when boys experience academic difficulties compared to girls? While exploring any and all of these questions would benefit policy discussions, we will briefly examine them as they relate to race in particular. The magnitude and direction of racial gaps change as we dive deeper in our analysis, and this example illustrates the various complexities with which policymakers must grapple.

Perhaps counterintuitively, the fact that Black students are 1.5 times as likely as White students to have an IEP might indicate that schools are countering other inequities that fall along racial lines. For example, children of color are more likely to live in poverty.<sup>7</sup> As a result, these students might grow up with less access to health care and/or in communities with more environmental health hazards. Both of these factors could increase their probability of having a disability. In this case, IEPs would be evidence of schools attending to students’ needs.

However, once we compare students with the same socioeconomic background, similar levels of academic achievement, and other observable characteristics, Black students are actually 32% less likely than White students to have an IEP.<sup>8</sup> Importantly, the shift occurs once we account for prior attendance and standardized test scores in particular. Moreover, this finding persists even after we compare students who attended the same school. This means the differences between racial groups cannot result from local resource disparities. Recent research in other states has reached a similar conclusion.<sup>9</sup>

Of course, it is possible there are factors we cannot see in the administrative data that account for these differences. But taking these differences at face value, one potential explanation of these results is that schools view low-achieving White students as having disabilities that merit accommodations while they expect poor performance out of students of color. Alternatively, parents of Black children might resist having their children classified as learning disabled because of the stigma or because they believe the services that would be provided would not help their children.

Ultimately, how we assess the disparities in SWD identification across groups depends in large part on how beneficial one believes this classification to be – both in terms of the services themselves as well as the label. Unfortunately, there is little compelling evidence on either of these issues. A more detailed exploration of these issues is beyond the scope of the current brief. However, these disparities in disability classification is an important topic for policymakers and practitioners to address.

**What is the distribution of disability types?**

Although we use the umbrella term “SWD” to refer to all students with an IEP, this group is not monolithic. There are 13 distinct disability classification markers in our data and students may qualify for more than one. Table 2 shows the share of students among all 11th-grade SWD during the 2016-17 school year with with each classification as the primary disability on their IEP.

More than half of all SWD are designated as having a “specific learning disability.” This classification involves the disruption of one or more “basic psychological processes involved in understanding or using language” and includes perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia.<sup>9</sup> A student can be designated to have a specific learning disability if, after being provided age-appropriate instruction and learning opportunities, they do not meet State-approved standards in oral and written expression, listening comprehension, and other skills. “Other health impairment,” the second most common classification, covers conditions such as asthma, diabetes, and attention deficit disorder that result in “limited strength, vitality, or alertness.”<sup>10</sup> See Technical Appendix for definitions of every disability classification.

TABLE 2: Share of students with IEPs by primary disability classification among 2016-17 11th graders

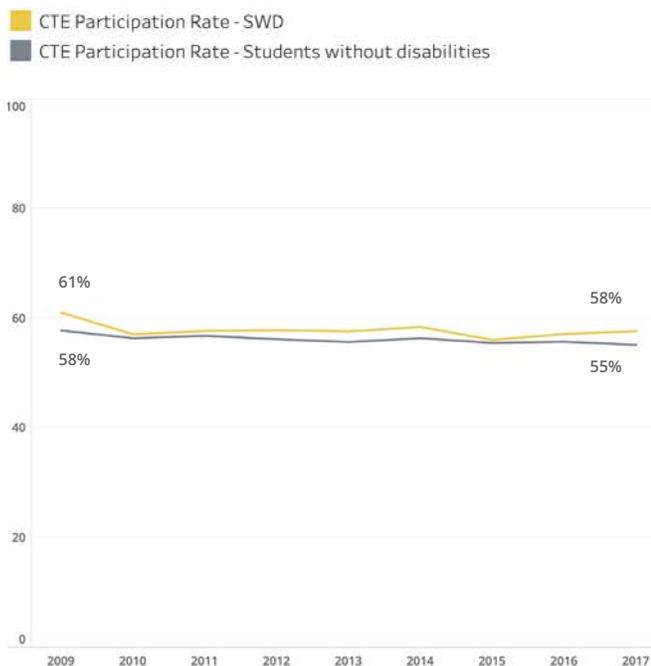
Specific disability group	% with disability among all SWD
Specific learning disability	51.8
Other health impairment	16.4
Cognitive impairment/ educable mentally impaired	9.9
Autism Spectrum Disorder	9.1
Emotionally impaired	6.7
Speech and language impaired	2.6
Hearing impaired	1.2
Physical (and otherwise) impairment	0.8
Disability category not listed	0.7
Traumatic brain injury	0.4
Visual impairment	0.4
Severe multiple impairment	0.2
Deaf-blindness	0.0

**Why might CTE benefit SWD?**

Taught by former industry professionals, CTE programs teach students to work in specific occupations. CTE classes feature project-based or “hands-on” learning to a degree typically not found in traditional classrooms. For example, students in a construction course may spend the year building a home. This unique environment may prove more pedagogically accessible to some SWD and serve to increase their engagement with school.<sup>11</sup> Such a result might increase attendance and, ultimately, graduation rates as school engagement is an important determinant of whether some SWD obtain a diploma.<sup>12</sup>

Additionally, CTE presents an opportunity for SWD to learn alongside peers without disabilities. Federal mandates from the IDEA and Americans with Disabilities Act (ADA) require schools to make general education programs like CTE available to SWD.

**FIGURE 1: SWD participate in CTE at similar rates as students without disabilities**



Note: Year corresponds to spring of 11th grade

The Carl D. Perkins Act, which administers federal funding for CTE, similarly requires that SWD have equal access to programs and stipulates that programs meet specific industry standards. As a result, CTE classrooms include students with diverse abilities and hold everyone to the same expectations regardless of disability status. This is another factor that has been shown to improve attendance, academic performance, grade progression, and on-time graduation among SWD.<sup>13,14</sup>

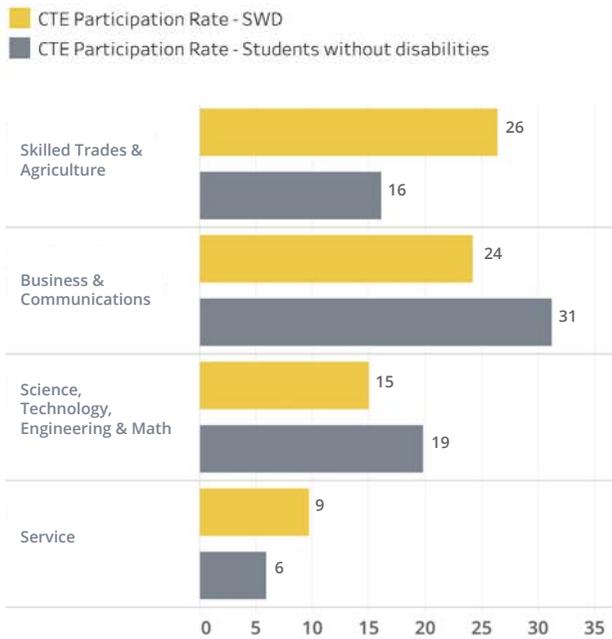
**SWD enroll in CTE at similar rates as the overall student population**

Among students who reach 11th grade, SWD participate in CTE at roughly the same rate as the overall student population. Figure 1 shows enrollment rates across nine recent cohorts. Rates have remained stable with nearly three out of every five students participating in at least one program during high school.

However, students with disabilities are approximately 5% less likely to participate in CTE once we compare observably similar students who differ with respect to disability status. In other words, this is the effect of having a disability on CTE participation independent of other factors like race, socioeconomic status, prior attendance, and academic achievement.

The difference between groups is small in either case, indicating enrollment rates are more or less similar. This would seem to challenge the opinion that guidance counselors and other administrators steer SWD into vocationally oriented programs because of these students’ perceived lack of academic potential. At a macroscopic level, this is clearly not happening in Michigan. That said, we find that SWD enroll in different types of programs than students without disabilities on average and that participation rates vary between boys, girls, and students with different disability classifications.

FIGURE 2: SWD are more likely to enroll in agriculture and skilled trades programs



Notes: Sample is 11th-grade students from the 2016-2017 school year. Figure shows raw enrollment rates that do not account for demographic or other characteristics.

Boys and girls with disabilities exhibit raw participation rates that are indistinguishable from their same-sex peers without disabilities. However, girls with disabilities are 8.4% less likely to participate compared to girls without disabilities once we account for other characteristics (e.g., socioeconomic status, attendance, etc.).

Boys with and without disabilities participate in CTE at similar rates even after accounting for these other traits.

Enrollment varies substantially across disability types. For example, three out of every five students with Specific Learning Disability, Traumatic Brain Injury, Speech and Language Impairment, Other Health Impairment, or Hearing Impaired as their primary IEP classification participate in CTE. Conversely, less than half of all remaining SWD participate.

CTE encompasses more than 50 individual programs organized within 17 career clusters spanning hospitality services to information technology. Figure 2 groups career clusters into four major categories and shows the share of students with and without disabilities from the most recent 11th-grade cohort who enrolled in affiliated programs.<sup>11</sup> (See appendix for a full breakdown of every career cluster included in each of these categories.) Whereas SWD are most likely to enroll in programs like construction, manufacturing, and agriculture (“Skilled Trades & Agriculture”), students without disabilities are most likely to enroll in business management and communications programs.

<sup>1</sup> See Appendix table A1 for a full list of career clusters each of these four groups contains.

**“ SWD are most likely to enroll in programs like construction, manufacturing, and agriculture (“Skilled Trades & Agriculture”), while students without disabilities are most likely to enroll in business management and communications programs. ”**

Both boys and girls with disabilities are approximately 17% more likely to enroll in agriculture and skilled trades programs than their same-sex peers without disabilities, even after we account for other characteristics. That said, student characteristics absorb half of the original participation gap. Both boys and girls with disabilities remain less likely to enroll in business and communications programs after controlling for other characteristics.

These results suggest that SWD possess fundamentally different preferences compared to students without disabilities (i.e., a stronger desire to “work with their hands”) and/or they are tracked into skilled trades programs based on their disability status. We saw earlier that students of lower socioeconomic status are more likely to have an IEP. One might therefore assume that SWD are less likely to enroll in programs associated with high-paying fields like business and finance because they are less likely to come from communities where people work in those fields. However, our analyses compare students who have the same FRL eligibility status and who live among similar shares of college-educated neighbors. This means that SWD are more likely to enroll in skilled trades programs and those without disabilities are more likely to participate in business programs *regardless of their socioeconomic background*.

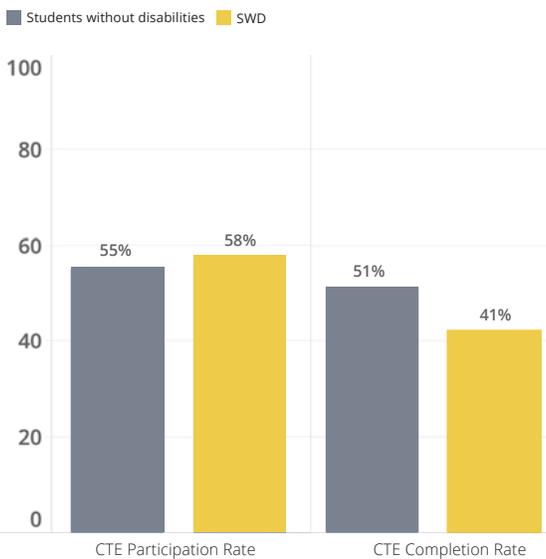
If one considers skilled trades careers inherently less desirable than other occupations, then the differences we find between students with and without disabilities may seem like evidence in favor of CTE as a “dumping ground” for SWD. However, CTE programs in construction, transportation, and other skilled trades can offer *highly valuable* pathways to economic security for SWD. The manufacturing industry continues to employ a greater share of the population in Michigan compared to the rest of the nation despite faltering after the Great Recession.<sup>15</sup> Similarly, the Michigan Department of Technology, Management, and Budget (DTMB) forecasts thousands of new jobs in construction and transportation over the coming decade.<sup>16</sup> DTMB has produced lists of high-wage occupations that project to exhibit strong job growth throughout [the state](#) and each [Prosperity Region](#). Construction and transportation jobs appear regularly throughout these lists, and there are CTE programs that train students to work in many of them.

### SWD are less likely to complete CTE programs

Despite the fact that they participate in CTE at the same rate as the overall student population, SWD are less likely to complete programs once enrolled. Consider 11th-grade students from the 2016-2017 academic year as an example. Approximately 58% of SWD enrolled in a CTE program compared to 55% of students without disabilities. However, just 42% of SWD CTE enrollees ultimately completed a program while 51% of CTE participants without disabilities did. This disparity has held constant over recent years. SWD completion rates are roughly 18% lower than those of students without disabilities among each 11th-grade cohort dating back to the 2010-2011 school year.<sup>17</sup>

The completion gap shrinks to 7% once we control for other factors like demographics, previous academic achievement, and prior school attendance. In other words, we estimate that the effect of having a disability in itself is roughly half as large as the raw difference in completion rates would suggest. We find this result for both boys and girls.

FIGURE 3: SWD are less likely to complete CTE programs



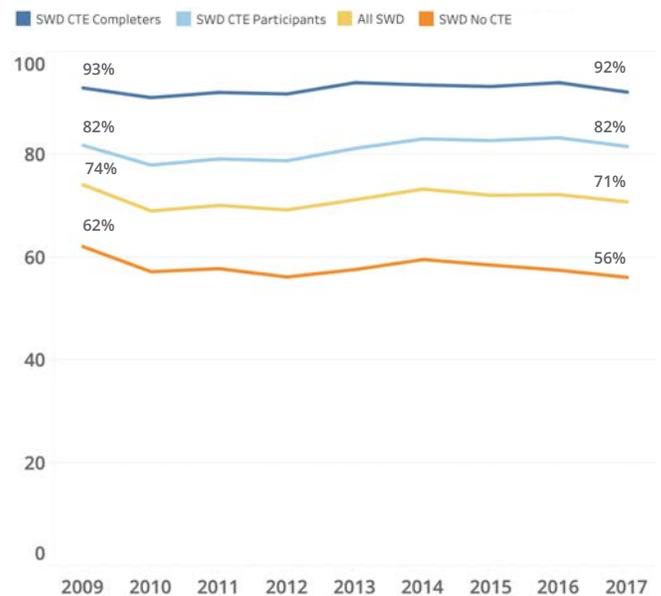
Notes: Sample is 11th-grade students from the 2016-2017 school year. Figure shows raw completion rates that do not account for demographic or other characteristics.

As with participation, completion rates vary by disability type. Students whose primary IEP classification was Hearing Impaired, Specific Learning Disability, and Physical Impairment completed programs at higher rates than the SWD average. Conversely, students with emotional or cognitive impairment diagnoses or traumatic brain injuries were least likely to complete.

**CTE is associated with a higher probability of graduating high school**

SWD in Michigan graduate high school at rates consistent with the national figures we discussed previously. Across nine recent 11th-grade cohorts, approximately 71% of all SWD ultimately graduated. Graduation rates are higher among students who participate in a CTE program (80%) and higher still among those who complete one (92%).<sup>18</sup>

FIGURE 4: SWD who enroll in CTE graduate high school at higher rates



Note that these differences do not reflect the causal effect of enrolling in CTE. Indeed, one might assume that students whose disabilities are less severe are more likely to take a CTE course and are also more likely to graduate high school independent of CTE. The same could be true for students with different disability types. We already know, for example, that students with different types of disabilities participate in CTE at disparate rates. Those disability classifications might themselves predict students' probability of graduating high school. For these reasons, it is important to make focused comparisons between students with similar disabilities, levels of academic achievement, school attendance, and other key factors.

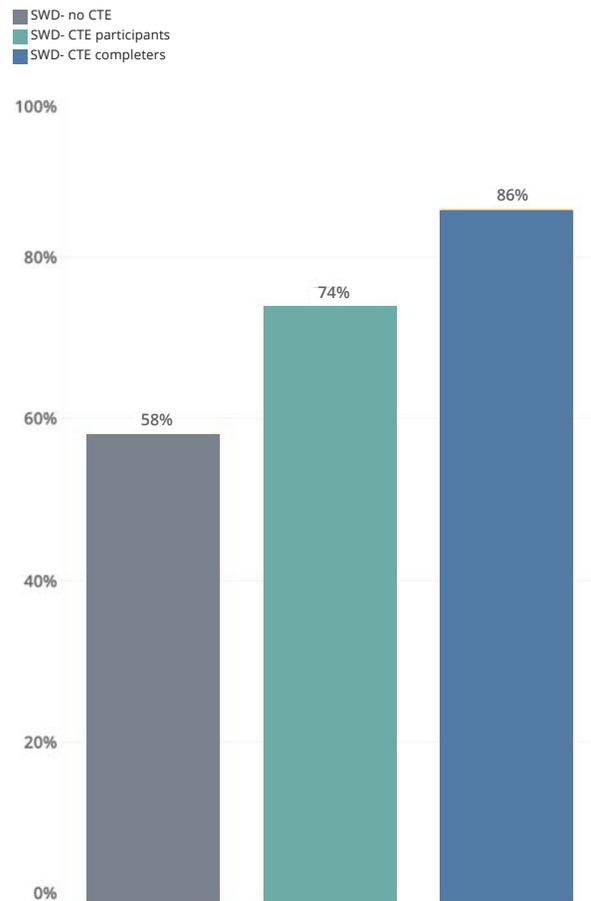
We therefore estimate the effect of enrolling in CTE on the probability of graduating high school using statistical models that control for the aforementioned characteristics and compare students who attended the same school, first appeared in 11th grade during the same academic year, and share the same primary IEP classification. As before, we limit our sample to students who reached at least 11th grade as this is typically the first year students begin taking CTE courses.

Compared to their peers who do not enroll in CTE, SWD who participate in but do not complete a program are 16 percentage points (or 27% :  $74/58 = 1.27$ ) more likely to graduate even after accounting for other characteristics. SWD who complete a CTE program are 28 percentage points (or 48%) more likely to graduate.<sup>19</sup> In other words, the raw differences we observed earlier shrink, but only slightly. The differences between groups remain sizable. Students without disabilities also graduate at higher rates if they participate in or complete a CTE program, but the differences are much smaller compared to SWD. Participants in this group are just 3% more likely to graduate and completers are 10% more likely to graduate, all else equal.

As with our previous analyses, outcomes here vary by disability type. Among disability classifications for which we have at least 1,000 student observations across all cohorts (a criterion which excludes traumatic brain injury and visual impairment), students with cognitive and emotional impairments appear to benefit the most from CTE.

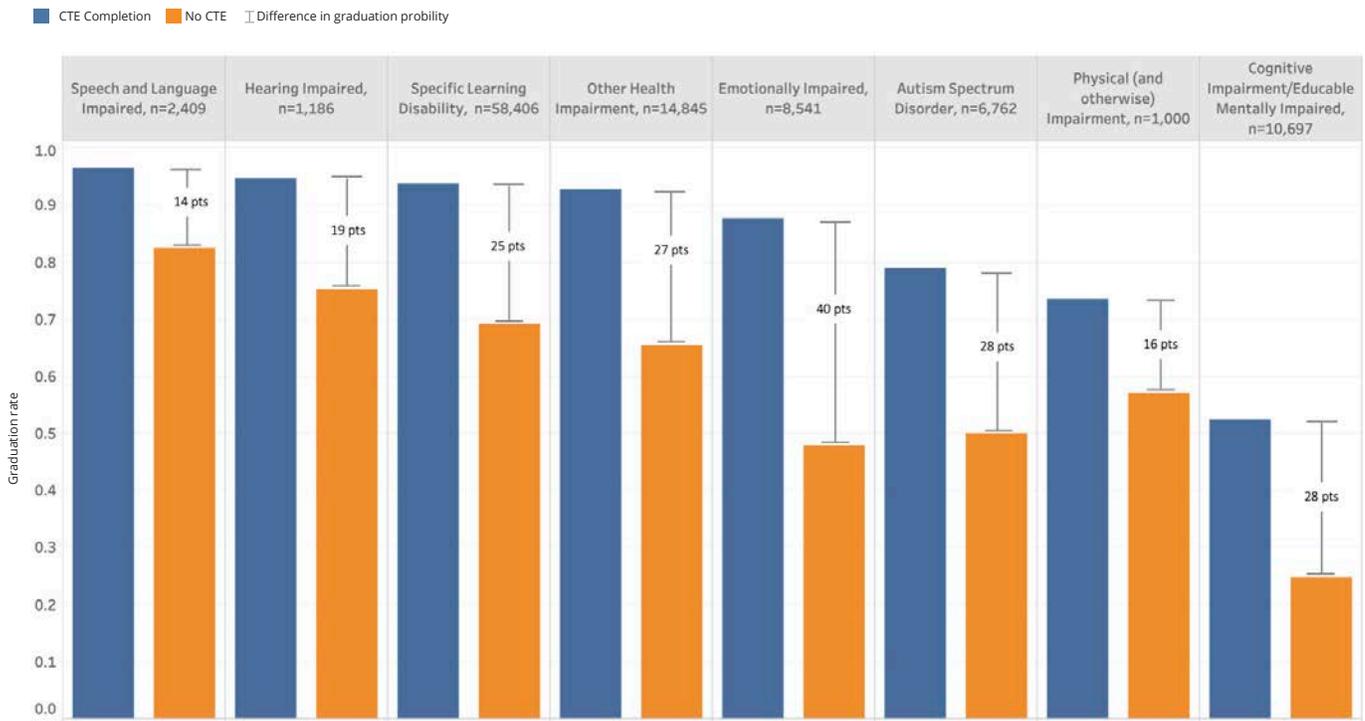
Emotionally impaired students who complete a CTE program are 83% more likely to graduate relative to non-participants. Cognitively impaired students who complete a program are more than twice as likely to graduate. Other groups exhibit smaller differences between CTE completers and non-participants. Students with speech, language, and hearing impairments show the most modest returns to completion.

FIGURE 5: CTE is positively associated with probability of graduating high school among SWD



Note: Figure shows graduation rates after accounting for other student characteristics.

FIGURE 6: The effect of CTE completion on the likelihood of graduating varies by disability type



Although we do not know why CTE completion is associated with such large increases in the probability of graduating for students with cognitive and emotional impairments, our data offer some potential clues. In analyses not shown here, we find that nearly 95% of cognitively impaired students did not take standardized state tests. The remaining students who did sit for these assessments scored very low on average. So, it is possible that CTE provides a learning environment where these students are more likely to succeed compared to traditional academic settings.

CTE might also increase students' sense of attachment to school, thus improving overall engagement. For example, CTE programs could provide extra motivation for students who encounter difficulties in core academic courses. Similarly, students might form close relationships with peers and instructors through group projects and individualized instruction – two features that are common in CTE courses.

Both of these factors could increase attendance. In fact, emotionally impaired students are most likely to be chronically absent (i.e., miss at least 10% of school days) out of all disability groups. It may therefore be no coincidence that this group exhibits one of the largest returns to CTE completion.

When we probe this question further, we find that participating in and completing a CTE program are indeed associated with improved 11th-grade attendance. SWD CTE participants exhibit attendance rates that are 3% higher and completers' attendance is 8% higher on average. Importantly, we do not observe the same results for students without disabilities. This group shows no improvements from merely participating in a program, and the returns to program completion are one-quarter the size compared to SWD (roughly 2%).

# CONCLUSIONS AND IMPLICATIONS

Our results indicate that SWD in Michigan enroll in CTE programs at rates that are comparable to other students. They are neither disproportionately tracked into these courses as some might fear, nor are they denied access. Although we find that SWD are more likely to enroll in skilled trades programs like construction, manufacturing, and transportation, this may be a desirable outcome. SWD may possess a genuine preference for such programs and these courses may offer an especially good fit for the interests and learning styles of many SWD. Furthermore, the construction and transportation fields appear to have bright futures in Michigan. Developing the skills to work in these industries may help set SWD on a path to greater economic security.

One area of concern, however, is that SWD are less likely to complete CTE programs once enrolled. Our results suggest there may be meaningful academic benefits to completing a CTE program. Students who do so attend school at higher rates and are more likely to graduate. There are also potentially important long-term consequences. Recent research suggests that upper-level CTE courses lead to improved wages later in life while entry-level courses produce no such returns.<sup>20</sup> Other work finds that progressing further in a CTE program is positively associated with full-time employment.<sup>21</sup> Given that people with disabilities are more than twice as likely to live in poverty compared to those without disabilities, this is an area where policymakers and practitioners should seek to develop supports.<sup>22</sup>

Unfortunately, our data do not tell us *why* SWD complete CTE programs at lower rates. It is therefore difficult to offer specific policy recommendations. That said, there are a couple of practices schools and districts should consider pursuing if they are not already.

First is making sure CTE instructors participate in IEP team meetings. These are important conversations where school personnel identify the specialized instruction and support services SWD need to achieve their annual goals. When they collaborate in the IEP development process, CTE instructors can share critical insights about their courses, whether a specific program is a good fit with a student's learning needs, and any accommodations that might benefit the student. Failing to include these perspectives can result in student-program mismatches. Moving forward, schools and districts could adopt policies to ensure CTE instructors help develop IEPs when a student expresses interest in their program(s).

Another more resource intensive strategy would be to provide CTE instructors with additional training for teaching SWD. Researchers studying this topic have found that many CTE instructors report having received no special needs in-service training at all or had not received any within the previous two years.<sup>23</sup> These same researchers suggest providing ongoing professional development at the local level and working with regional postsecondary institutions to offer special education coursework opportunities.

While high school graduation is a worthy goal in its own right, we also look forward to investigating whether completing a CTE program ultimately leads to improved economic security for SWD. YPL is working to acquire wage and employment records for every student included in this analysis. In future work, we will explore whether CTE completers fare better in the labor market and whether this varies by disability type or CTE program.

# APPENDIX

## Data

The datasets used in preparing this report are from the Michigan Education Data Center housed at the University of Michigan's Education Policy Initiative research center in the Ford School of Public Policy. The underlying data come from the Michigan Department of Education's Michigan Student Data System (MSDS), the Graduation and Dropout Application (GAD), the state Office of Career and Technical Education (OCTE), and the Department of Education's Common Core of Data (CCD).

Observations in the primary analysis dataset are at the student-level. Each observation corresponds to a student's first-time 11th grade year, however variables from other years, such as 8th grade attendance and test scores or post-secondary enrollment, have been added. The data include standard demographic, enrollment, graduation, and disciplinary information. The data also include information on students' participation in Career and Technical Education programs; and, for students with disabilities, their individualized education plan (IEP), which includes their primary disabilities code as defined by the Michigan Administrative Rules for Special Education (MARSE). Additionally, we have information on students' school size, location, and type, and on their neighborhood (census block group) educational attainment.

The 11th graders included in our sample attended public schools in the state of Michigan during the school years from 2008-09 to 2017-18. Cohorts and expected graduation years are calculated from the 9th grade year, so our sample includes cohorts beyond those from 2010 to 2019 due to irregular grade progression. As such, we generally refer to students' 11th grade year in figures with a time dimension. Furthermore, in many tables and figures, we either omit the 2017-2018 year or focus on the 2016-2017 year because the most recent year of data is still in the process of being released at the time of publication. The students included in our sample make up a large proportion of the universe of Michigan public school 11th graders. However, we do make a few small restrictions: students with missing values for key variables, those not attending traditional or vocational schools, or those attending schools with fewer than 50 students are dropped. Our final sample is comprised of 1,027,455 students.

## Analysis and Methodology

**Table 1** Share of students with an IEP among 2016-17 11th graders: This table reports the fraction of students with an IEP in 11th grade during the 2016-17 school year by specific student characteristics. Each cell is equal to the fraction with the total number of students in this group in the denominator, and the number of students with an IEP in this group in the numerator.

**Table 2** Share of students with IEPs by primary disability classification among 2016-17 11th graders: This table reports the share of students with an IEP with each of the primary disability classifications defined by MARSE. Each cell is equal to the fraction with the total number of students with a disability in the denominator, and the number of students with the primary disability in the numerator. Note: not all primary disabilities are included here because some are age dependent.

**Figure 1** SWD participate in CTE at similar rates as students without disabilities: This figure gives the rate at which students with and without disabilities participated in career and technical education programs for their 11th grade years 2008-09 to 2016-17. Note that students generally participate in CTE during the junior and senior years. The rate for each year is calculated by dividing the number of participants in each sub group by the total number of students in each sub group.

**Figure 2** SWD are more likely to enroll in agriculture and skilled trades programs: Figure 2 is a refinement of Figure 1 wherein we focus only on the 2016-17 year and construct CTE participation rates for students with and without disabilities by groupings of CTE clusters. The 17 CTE clusters are assigned to 4 groups (Skilled Trades and Agriculture, Business and Communications, Science and Education, and Service) according to the table below. Students can participate in multiple clusters, so these participation rates do not necessarily sum to overall CTE participation rates.

**Figure 3** SWD are less likely to complete CTE programs: This figure compares the CTE completion rate of CTE participators with and without disabilities. The sample is restricted to students that were in 11th grade for the first time during the 2016-2017 school year.

**Figure 4** SWD who enroll in CTE graduate high school at higher rates: This figure compares over time the graduation rate of students with disabilities as a whole, with those who did not participate in CTE, those who participated but did not complete, and those who completed. The graduation rate is calculated by dividing the number of students in each 11th-grade cohort who ever graduated by the total number of students in the cohort. The overall graduation rate would be a weighted average of its constituent groups' graduation rates.

**Figure 5** CTE is positively associated with probability of graduating high school among SWD: This figure presents regression adjusted graduation grades for students with disabilities who either did not participate in CTE, participated but did not complete, or completed. We estimate these rates using a linear probability model, so these estimates also have the interpretation of conditional graduation probabilities for each sub-group. We control for student demographic and scholastic characteristics (gender, race, reduced price lunch, neighborhood education, limited English proficiency, and eighth grade attendance and test scores). We also control for school-year and primary learning disability fixed-effects.

**Figure 6** The effect of CTE completion on the likelihood of graduating varies by disability type: This figure presents a further refinement of Figure 5. Here we re-estimate the above model using 8 separate samples corresponding to the 8 largest primary disability groups. We necessarily omit primary learning disability fixed-effects, but the specification otherwise remains unchanged from Figure 5.

**Table A1: Career Cluster Groups**

<b>Skilled Trades and Agriculture</b>
Agriculture, Food & Natural Resources
Architecture & Construction
Energy
Human Services
Manufacturing
<b>Business and Communications</b>
Arts, A/V Technology & Communications
Business, Management & Administration
Education & Training
Finance
Marketing
<b>Science</b>
Health Science
Information Technology
Science, Technology, Engineering and Mathematics
<b>Service</b>
Government & Public Administration
Hospitality & Tourism
Human Services
Law, Public Safety, Corrections & Security

**Michigan Administrative Rules for Special Education (MARSE) Disability Definitions<sup>24</sup>**

See the following links for full Michigan Department of Education definitions and determination criteria for each disability classification:

1. [Autism Spectrum Disorder](#)
2. [Cognitive Impairment](#)
3. [Deaf-Blindness](#)
4. [Deaf or Hard of Hearing](#)
5. [Emotional Impairment](#)
6. [Other Health Impairment](#)
7. [Physical Impairment](#)
8. [Severe Multiple Impairment](#)
9. [Specific Learning Disability](#)
10. [Speech and Language Impairment](#)
11. [Traumatic Brain Injury](#)
12. [Visual Impairment](#)

## DISCLAIMER

This research result used data structured and maintained by the MERI-Michigan Education Data Center (MEDC). MEDC data is modified for analysis purposes using rules governed by MEDC and are not identical to those data collected and maintained by the Michigan Department of Education (MDE) and/or Michigan's Center for Educational Performance and Information (CEPI). Results, information and opinions solely represent the analysis, information and opinions of the author and are not endorsed by, or reflect the views or positions of, grantors, MDE and CEPI or any employee thereof.

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- 17 If one examines these completion rates they will find the gap between students with and without disabilities has actually grown in terms of raw percentage points. This is because more students overall are completing programs. The share of SWD participants who complete programs relative to participants without disabilities has remained stable.
- 18 Students qualify as CTE completers if they complete a series of courses covering all of the program standards in a state-approved CTE program and complete any compulsory technical skills assessments. Participants are students who enroll in a CTE program but do not satisfy these criteria.

- 19 It is important to acknowledge the inherent challenges in using non-experimental methods to study the relationship between CTE completion and high school graduation. First, we are analyzing students who chose to enroll in CTE. Although we control for a number of key characteristics to ensure we are comparing observably similar students, we cannot rule out the possibility that there are other traits that both (a) distinguish students who did and did not take CTE and (b) influence students' likelihood of graduating high school. For example, some students likely have clearer visions of what they want to do with their lives after high school compared to their peers. Such students may be more likely to enroll in CTE to begin training for a specific occupation and be more motivated in school generally. We have no way of accounting for this type of factor. Second, the relationship between CTE completion and high school graduation is somewhat mechanical in nature. Most students who complete a CTE program do so in 12th grade. Of course, a majority of students who reach 12th grade also graduate. So by estimating the effect of completing a CTE program on the probability of graduating, one's results are likely biased upward. (The "CTE effect" is at least partially inflated by the influence of students simply making it to 12th grade.) With this thinking in mind, we ran two additional models not shown in this brief to probe the mechanical qualities of our main results. We find that while there is evidence of a mechanical relationship between completion and graduation, CTE still appears to exert a positive influence on student outcomes. In our first model, we retain our original sample, include all of our usual control variables, but estimate the effect of participating in CTE during 9th through 11th grade. That is, we remove any 12th-grade CTE activity. In this case, SWD who enrolled in, concentrated in, or completed a CTE program by the end of their 11th grade year are approximately 17% more likely to graduate. In the second model, we limit our sample to only those students who reached 12th grade. This produces "cleaner" estimates of the return to completing a CTE program because we eliminate the possibility that students who do so are more likely to reach their last year of school and therefore graduate. Here we find that SWD who complete a CTE program are 32% more likely to graduate than SWD who never enrolled in CTE, all else equal.
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The University of Michigan Youth Policy Lab helps community and government agencies make better decisions by measuring what really works. We're data experts who believe that government can and must do better for the people of Michigan. We're also parents and community members who dream of a brighter future for all of our children. At the Youth Policy Lab, we're working to make that dream a reality by strengthening programs that address some of our most pressing social challenges.

We recognize that the wellbeing of youth is intricately linked to the wellbeing of families and communities, so we engage in work that impacts all age ranges. Using rigorous evaluation design and data analysis, we're working closely with our partners to build a future where public investments are based on strong evidence, so all Michiganders have a pathway to prosperity.