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# A New Look at Apprenticeship: Linking School to 21st Century Skills

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# Introduction

“We are currently preparing students for jobs that don’t yet exist ... using technologies that haven’t yet been invented ... in order to solve problems we don’t even know are problems yet.”

This statement was made by former U.S. Secretary of Education [Richard Riley](#) in the 1990s. In the three decades since, we have witnessed a swift change in the job market that calls for new competencies. But we also hear employers express increasing frustration about a mismatch between the skills they want and the skills the labor market offers.

A skills gap challenges educators and policymakers alike. To help meet the economic and educational needs for the modern workplace, Congress recently reauthorized the Perkins Act. The bill, *Strengthening Career and Technical Education for the 21st Century Act*, emphasizes an important mission of education in the 21st century, that is, helping students to acquire “[academic knowledge and technical and employability skills](#).”

We believe that both college and career readiness play an essential role in every student’s K-12 education. Students are clearly getting the college message; about two-thirds of recent high school graduates enroll in two- and four-year colleges and universities. However, issues, such as low college completion rates, high student loans for college, and high unemployment rate among young adults, have driven us to ask whether we have also done enough to inform students about options in the world of work and help them get ready for the increasingly challenging and competitive job market.

According to TV host and self-described cheerleader for trade workers, Mike Rowe, “Not all knowledge comes from college, but not all skills come from degrees”. This popular piece of wisdom indeed rings true both when describing jobs available to students after high school as well as those graduates seek after college. How to better prepare our youth for the new workplace has recently taken on greater urgency among educators and policymakers. Across the country high schools are providing different program — such as career pathways and certifications — to acquaint teenagers with workplace demands. Yet we seem to be short on a potentially effective strategy — apprenticeships — and how students may benefit from such programs.

The purpose of our report is to provide an overview of apprenticeships in the United States, from the following four dimensions:

- I. What does the 21st century apprenticeship look like in the United States?
- II. What does data from the Program for the International Assessment of Adult Competencies (PIAAC) say about apprenticeships in the U.S.?
- III. What are the challenges that educators, both international and national, are facing to expand apprenticeship programs?
- IV. What perspectives should school districts consider when developing apprenticeship programs?



# I. What does the 21<sup>st</sup> century apprenticeship look like in the United States?

The concept of apprenticeship remains a practical and effective method of teaching a trade to young people, but technology in the 21<sup>st</sup> century has changed what apprentices learn and do during the apprenticeship program. In this section, we provide some contextual information pertaining to apprenticeships in the United States. Our reviews focus on apprenticeship-related policies, national trend of apprenticeships, youth apprenticeship, federal funding system that supports apprenticeships in K-12 education, and apprenticeship information management at federal and state level.

A brief review of apprenticeship-related policies

- Historically, the boom or decline of apprenticeship programs has been related to industry needs and economic change.
- The current national goal for expanding apprenticeship programs is not only to prepare workers to fill both existing and newly created jobs, but also to prepare workers for the jobs of the future.
- Both previous and current administrations have stressed the need to expand access, equity, and career awareness when promoting, funding and regulating apprenticeship programs.

**Figure 1: History of apprenticeship-related policies**

**First Apprenticeship Legislation**

- The first legislation in the U.S. to promote an organized system of apprenticeship was enacted in Wisconsin in 1911.
- The state legislation required all apprentices to attend classroom instruction five hours a week.

**“Earn-and-Learn” Model**

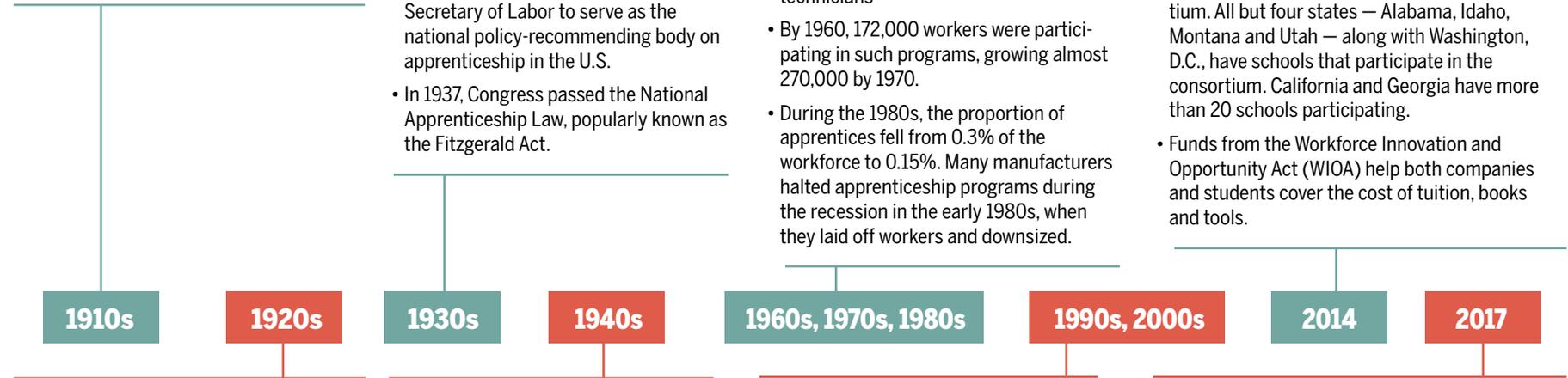
- In 1934, the Federal Committee on Apprenticeship was established to promote apprenticeship nationwide. The Committee, composed of representatives of Government agencies (later a representative of the U.S. Office of Education), was appointed by the Secretary of Labor to serve as the national policy-recommending body on apprenticeship in the U.S.
- In 1937, Congress passed the National Apprenticeship Law, popularly known as the Fitzgerald Act.

**Boom & Decline**

- After the Fitzgerald Act's passage, most of the apprenticeships were in construction, manufacturing and utilities.
- After WWII, apprenticeships expanded into such fields as law enforcement, firefighting and emergency medical technicians
- By 1960, 172,000 workers were participating in such programs, growing almost 270,000 by 1970.
- During the 1980s, the proportion of apprentices fell from 0.3% of the workforce to 0.15%. Many manufacturers halted apprenticeship programs during the recession in the early 1980s, when they laid off workers and downsized.

**President Obama's Push to Expand Federal Support for Apprenticeship Programs**

- To make it easier for apprentices to receive college credit for their training, which can be used toward an associate's or bachelor's degree, the departments of Labor and Education created the Registered Apprenticeship College Consortium. All but four states — Alabama, Idaho, Montana and Utah — along with Washington, D.C., have schools that participate in the consortium. California and Georgia have more than 20 schools participating.
- Funds from the Workforce Innovation and Opportunity Act (WIOA) help both companies and students cover the cost of tuition, books and tools.



**Need for Apprenticeship**

- National employer and labor organizations, educators, and government officials began a concerted effort to bring about a national, uniform apprenticeship system.
- In the boom days following World War I, the construction industry needed employees with comprehensive training like apprenticeship.
- Immigration was curtailed after the war, so fewer skilled workers were entering from other countries.

**Registered Apprenticeship Programs**

- By the mid-1940s there were approximately 6,233 Registered Apprenticeship programs nationwide, educating and training 4,000 apprentices

**Boom & Decline**

- Apprenticeships rebounded somewhat in the strong economy of the 1990s and early 2000s, reaching 442,000 by 2008.
- However, the 2008 recession and its aftermath sent the numbers down again to 358,000 by 2011.

**President Trump issued Executive Order “Expanding Apprenticeships in America”**

- The disconnect between the capabilities offered by American job seekers and the skills demanded by the 21st century workplace, known as the “skills gap,” contributes to the nation's 6.3 million open jobs.
- Led by the Secretary of Labor, a Task Force on Apprenticeship Expansion was established to identify strategies and proposals to promote apprenticeships, especially in sectors where apprenticeship programs are insufficient.
- The current administration emphasizes on creating Industry-Recognized Apprenticeships, amplifying and encouraging private sector initiatives to promote apprenticeships, and Expanding Access, Equity, and Career Awareness.

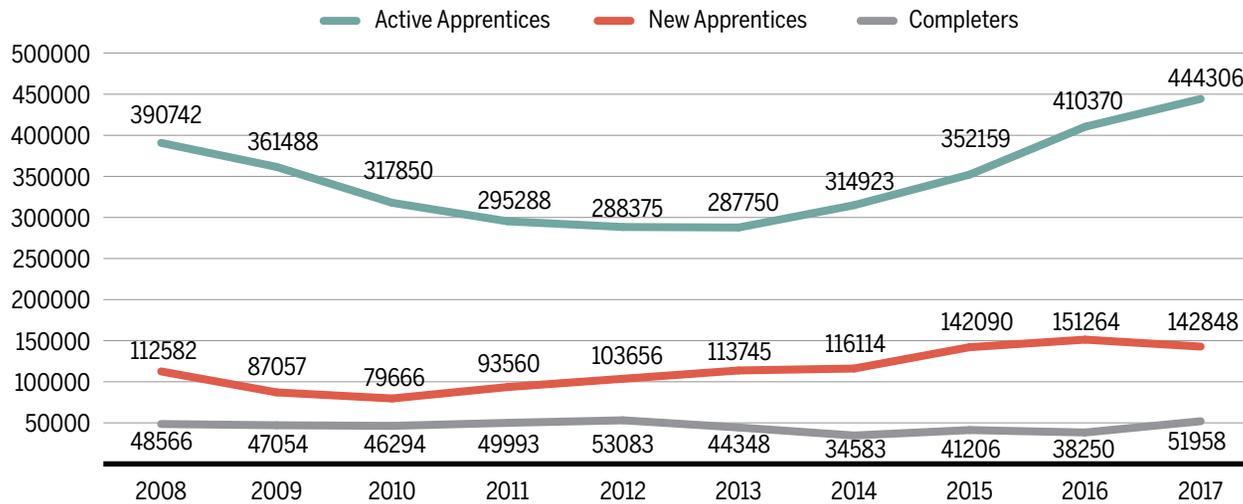
Note: The chart was compiled based on the following sources:  
<https://www.dol.gov/apprenticeship/docs/task-force-apprenticeship-expansion-report.pdf>  
<http://www.lni.wa.gov/TradesLicensing/Apprenticeship/About/History/>  
<https://doleta.gov/OA/history.cfm>  
<https://www.apprenticeship.gov/>  
<http://library.cqpress.com/cqresearcher/document.php?id=cqresrre2016101400>

## **NATIONAL TRENDS IN APPRENTICESHIPS**

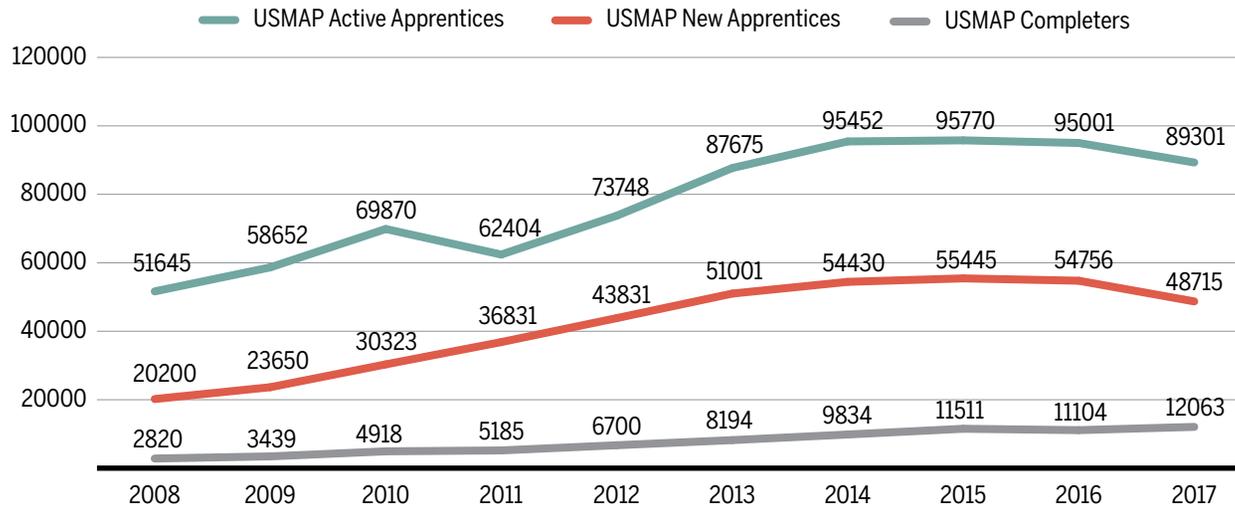
- Non-military apprenticeship programs experienced a decline from 2008 to 2012, but from 2013 to 2017, there was a large growth in the total number of active apprentices, namely individuals participating in the non-military apprenticeship programs and obtaining the skills necessary to succeed while earning the wages they need to build financial security.
- U.S. Military apprenticeship programs (USMAP) had been growing from 2008 to 2016 in both the total number of active apprentices and new apprentices (i.e., individuals entering the apprenticeship system).
- From 2008 to 2017, there was an increase in numbers of completers, i.e., participants who graduated from the apprenticeship system. However, among the individuals who participated in military apprenticeship programs, the number of completers increased four times or 428% (2,820 in 2008 to 12,063 in 2017).
- From 2009 to 2014, the total number of the existing national registered apprenticeship programs (including the U.S. military apprenticeship programs) decreased. However, from 2015 to 2017, this number increased slightly.
- The number of new apprenticeship programs in 2017 (N = 2,369), which included the military apprenticeship programs, increased 1.6 times, compared with 2008.
- Construction, Military, Public Administration, Manufacturing and Transportation are the top five industries that had active apprentices in FY2017.
- Electrician, Carpenter, Heavy Truck Driver, Plumber, Construction Craft Laborer are the top five occupations that had active apprentices in FY2017.
- Plumbers, Electrical Power-line Installers and Construction Laborers are occupations projected to grow faster in employment rate than the national average during 2016-26.
- The median annual wage of Electrical Power-line Installers, Electricians and Plumbers was above \$50K in 2016.

(Source: Department of Labor, 2018)

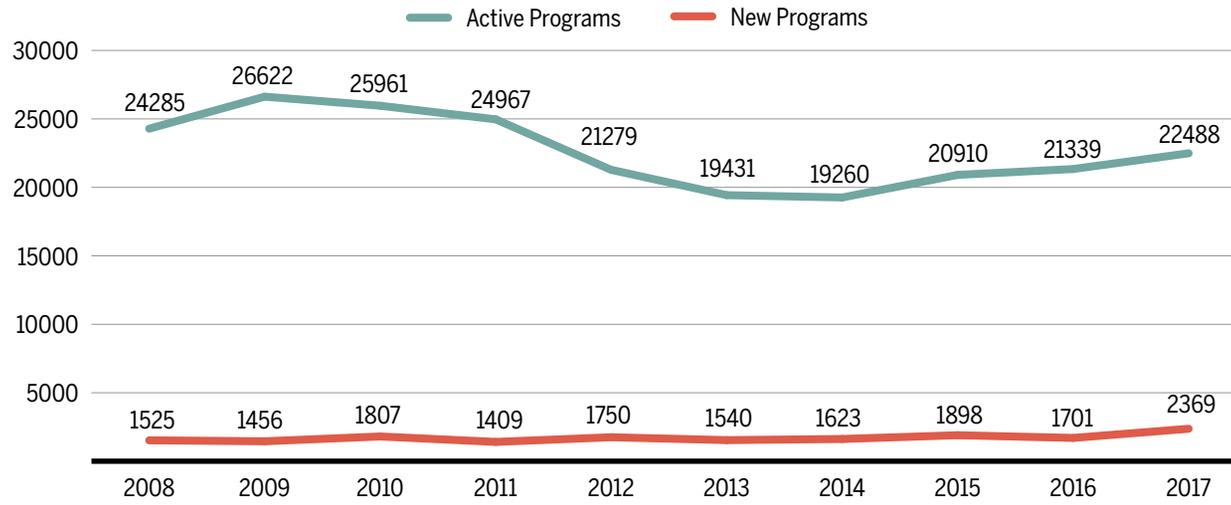
**Figure 2: 2008-2017 Number of Apprentices in Non-Military Apprenticeship Program**



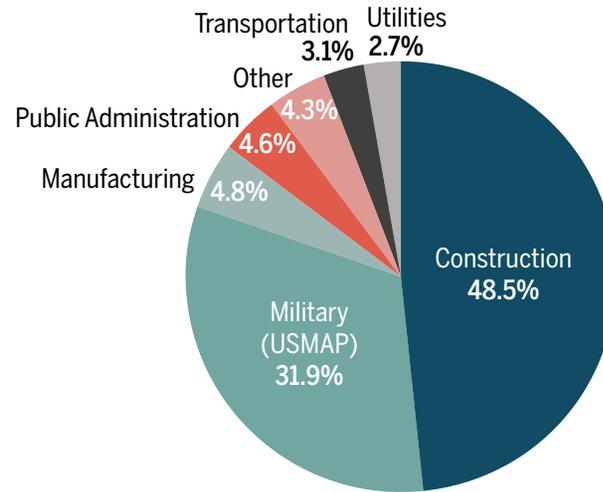
**Figure 3: 2008-2017 Number of National Registered Apprenticeship Programs**



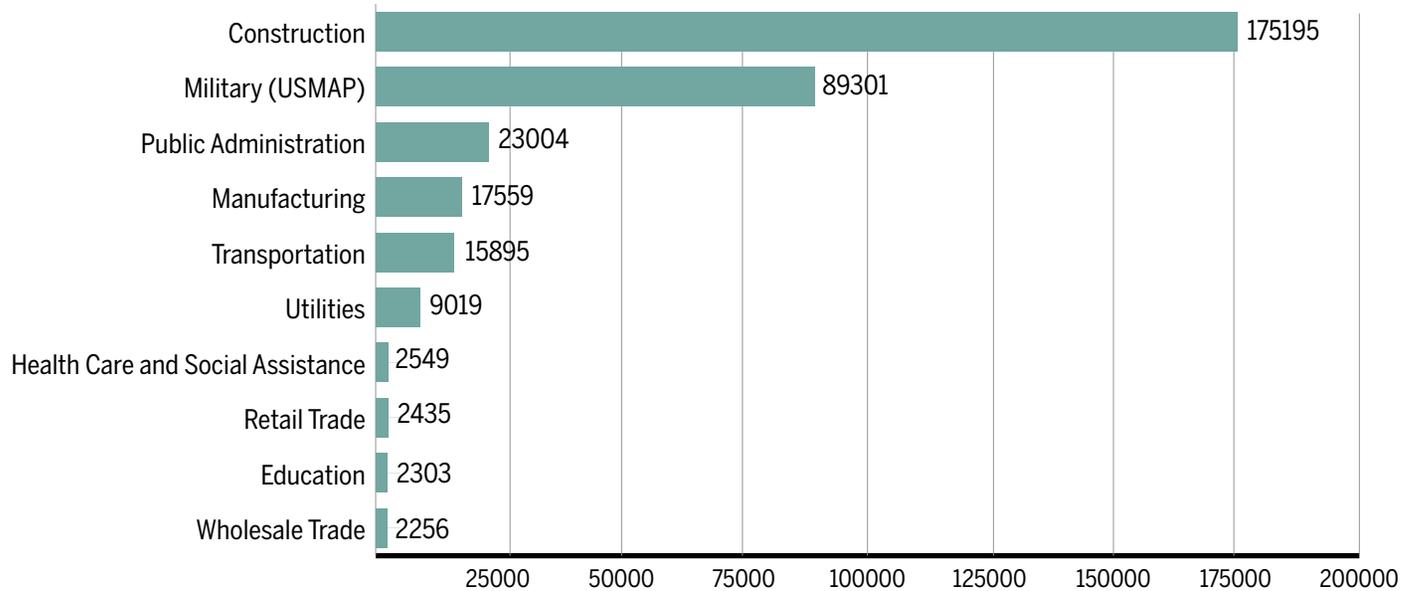
**Figure 4: 2008-2017 Number of National Registered Apprenticeship Programs**



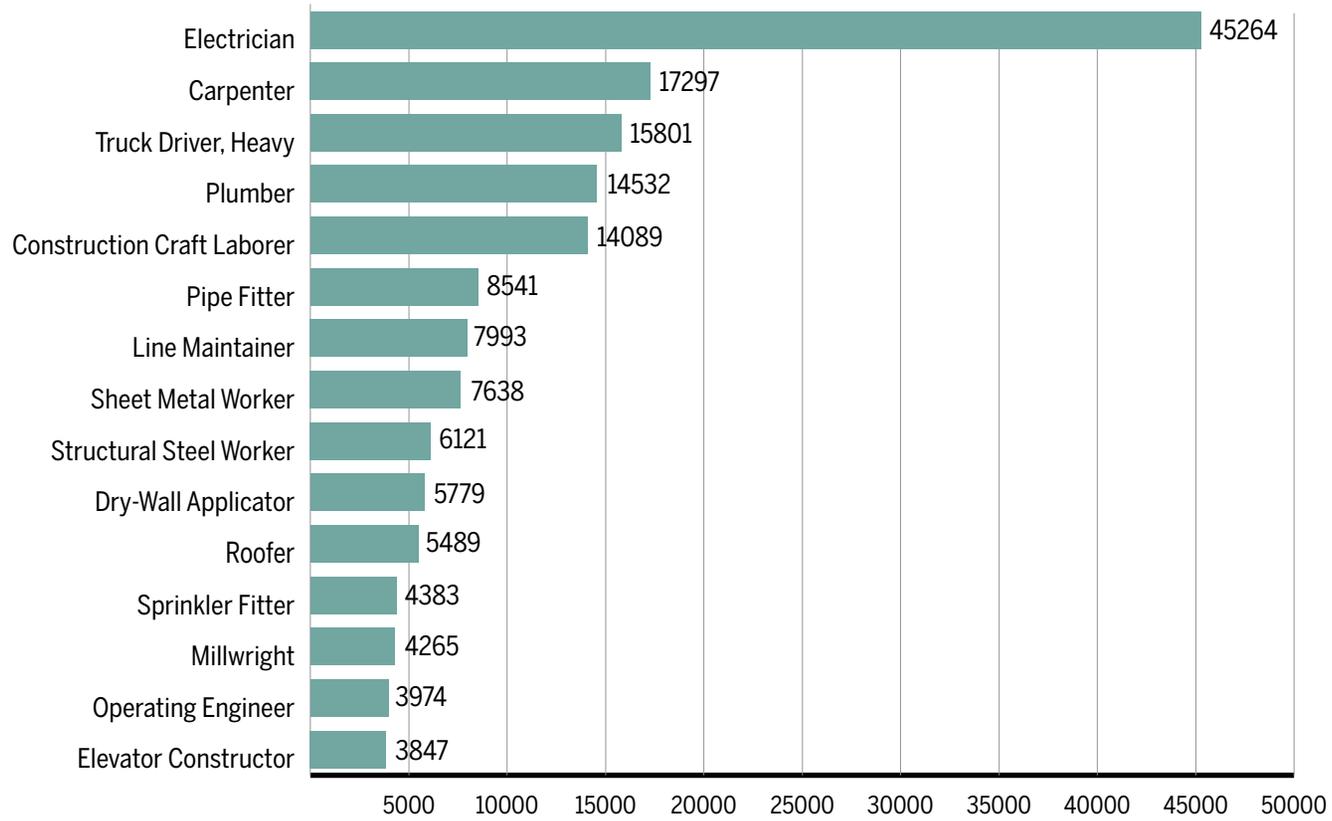
**Figure 5: Active Apprentices by Industry (FY2016)**



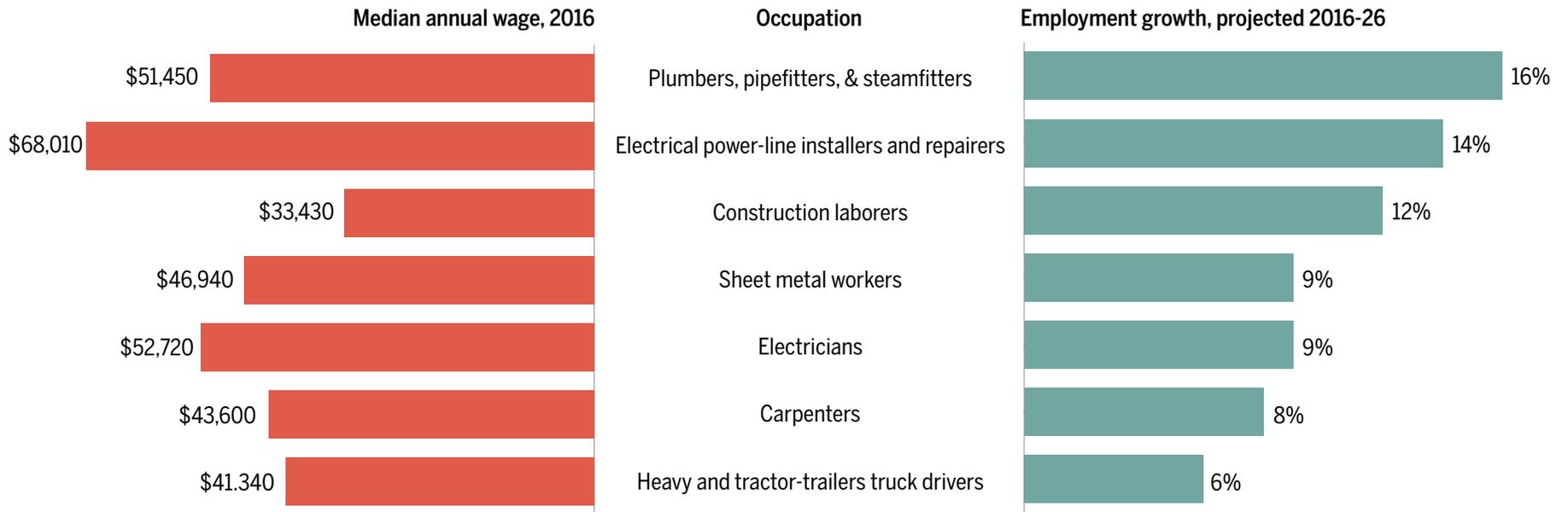
**Figure 6: Active Apprentices by Industry (FY2017)**



**Figure 7: Active Apprentices in Top 15 Occupations (FY2017)**



**Figure 8: Occupations with apprenticeships - Median annual wage and employment growth rate**



Note: The charts and graphs are compiled based on the data from the Department of Labor.  
[https://doleta.gov/oa/data\\_statistics.cfm](https://doleta.gov/oa/data_statistics.cfm)  
[https://www.bls.gov/careeroutlook/2017/article/apprenticeships\\_occupations-and-outlook.htm?view\\_full](https://www.bls.gov/careeroutlook/2017/article/apprenticeships_occupations-and-outlook.htm?view_full)

## **YOUTHBUILD PROGRAM**

- Since 2006, the U.S. Department of Labor (DOL) has administered the YouthBuild program. Approximately 210 actively-funded DOL YouthBuild programs, with different funding periods, serve over 6,000 youth nationally per year in more than 40 states. In May 2018, DOL announced \$85 million in grants to support and expand YouthBuild programs across the country.
- YouthBuild is a community-based pre-apprenticeship program that provides job training and educational opportunities for at-risk youth ages 16-24 who have previously dropped out of high school.
- Youth not only learn vocational skills in construction, as well as in other in-demand industries, including health care, information technology, and hospitality, but also provide community service through the required construction or rehabilitation of affordable housing for low-income or homeless families in their own neighborhoods.
- In YouthBuild program, youth earn their high school diploma or equivalency degree, learn to be community leaders, and prepare for postsecondary training opportunities, including college, apprenticeships, and employment.
- YouthBuild includes support systems, such as a mentoring, follow-up education, employment, and personal counseling services; and participation in community service and civic engagement.

## **FEDERAL SYSTEM OF FUNDING APPRENTICESHIP PROGRAMS**

- Registered Apprenticeship programs are operated by both the private and public sectors. Program sponsors (i.e., employers, employer associations and joint labor/management organizations) pay most of the training costs while simultaneously increasing the wages of the apprentices as their skill levels increase.
- Over \$1 billion for employment and training services is available through Workforce Innovation and Opportunity Act programs across the country. These programs can provide training funds to support on-the-job training and related instruction, as well as provide supportive services to help apprentices. (Source: [https://www.doleta.gov/oa/employers/apprenticeship\\_toolkit.pdf](https://www.doleta.gov/oa/employers/apprenticeship_toolkit.pdf))
- Apprentices may be eligible for Federal Financial Aid under certain circumstances. If the apprenticeship is connected to a school's program of study, then apprentices may be eligible for Pell Grants, \$3,000 on average per apprentice, and the school may choose to provide federal work-study grants, \$2,000 on average per apprentice. (Source: [https://www.doleta.gov/oa/employers/apprenticeship\\_toolkit.pdf](https://www.doleta.gov/oa/employers/apprenticeship_toolkit.pdf))

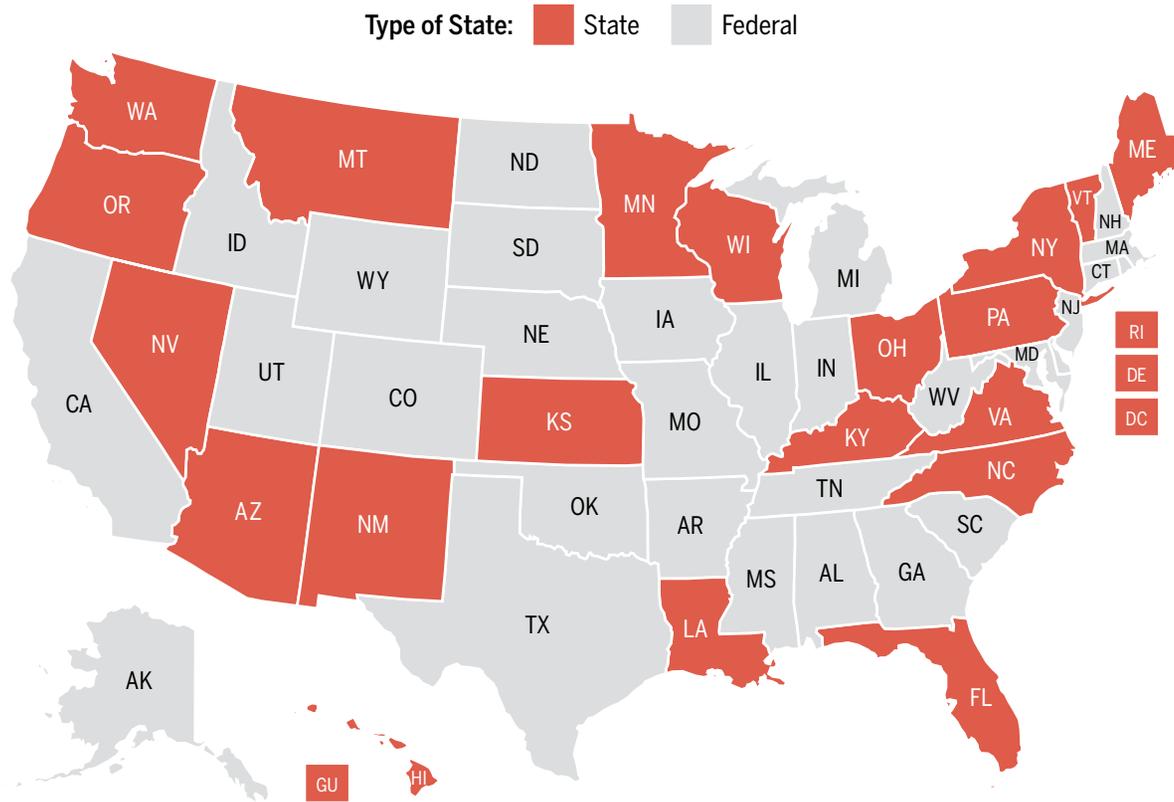
- In May 2018, a new \$3 million grant opportunity was announced by the U.S. Department of Education. The grants support State efforts to expand and improve the transition of high school CTE students to postsecondary education and employment through apprenticeships in science, technology, engineering, and mathematics (STEM), including computer science, that begin during high school. (Source: <https://cte.ed.gov/grants/funding-opportunities>)

### **DEMAND-AND-SUPPLY APPRENTICESHIP INFORMATION**

- In 25 states, the Office of Apprenticeship (OA) at the U.S. Department of Labor directly registers and oversees apprenticeship programs.
- In the other 25 states, and the District of Columbia, OA delegates administrative duties to select state agencies, referred to as State Apprenticeship Agencies (SAAs). These states independently run and evaluate their own apprenticeship programs.
- According to the Data Quality Campaign, the shortfalls of Registered Apprenticeship Data include (i) no comprehensive centralized database, (ii) lack of publicly accessible information, and (iii) non-uniformity of skills underlying certificates.

Technology advancement and a skills gap in the labor market present a challenge for educators and policy makers. Although currently we are witnessing more support in regards regulations and funding for 21<sup>st</sup> century apprenticeships, it is not totally clear how apprenticeships benefit individuals in general and in the long run. In the next section, we used a large-scale national data to look at what characteristics individuals with an apprenticeship background have developed in terms of the 21<sup>st</sup> century skills.

**Figure 9:** States can either belong to the broader Federal apprenticeship system, or they can run their own State Apprenticeship



(Image: 25 states independently run and manage their apprenticeship programs. Source: [The United States Department of Labor](#))



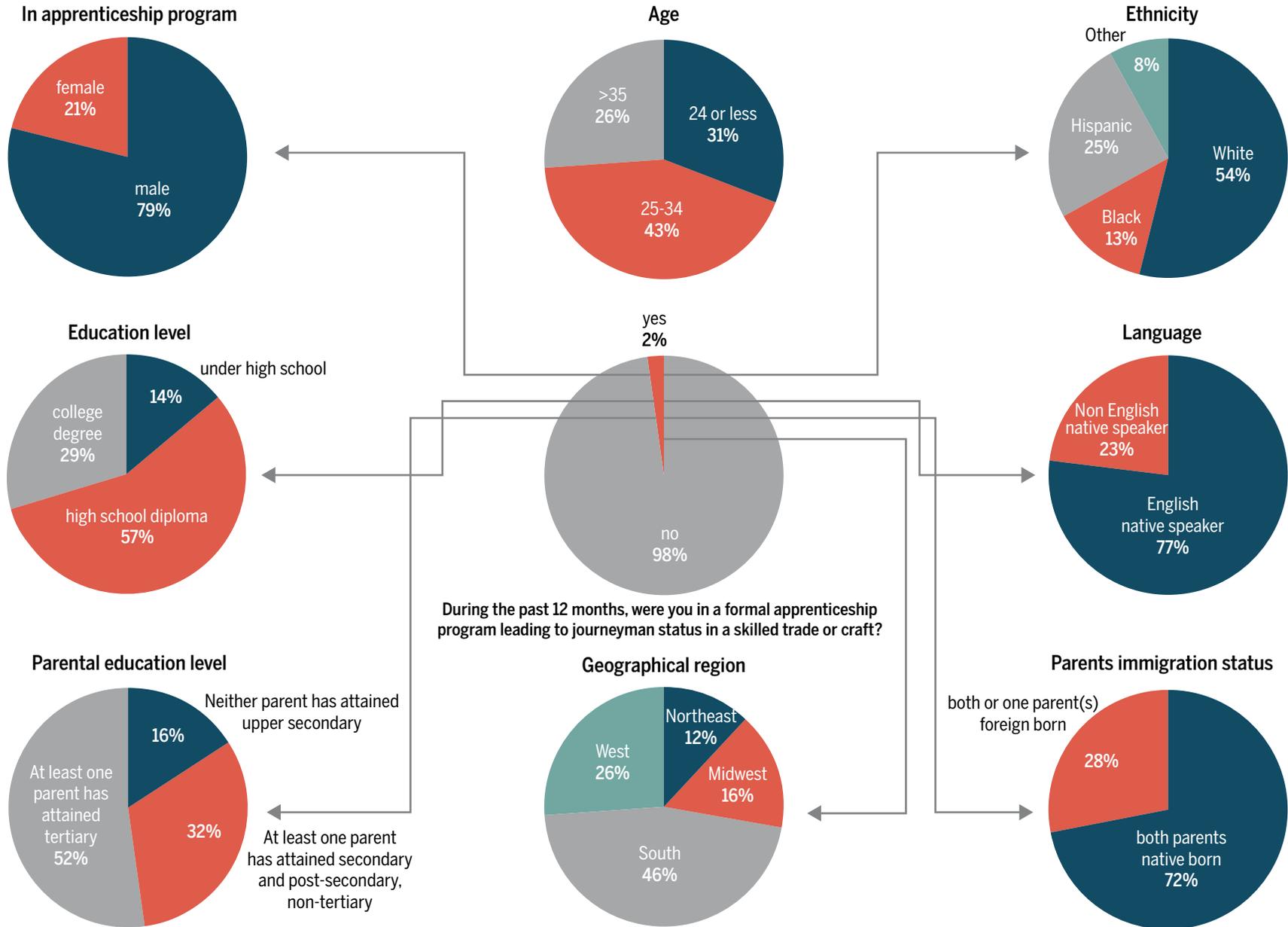
## II. What does PIAAC say about apprenticeship?

The Program for the International Assessment of Adult Competencies (PIAAC) is a cyclical, large-scale study that was developed under the auspices of the Organization for Economic Cooperation and Development (OECD). In 2012 and 2014, the U.S. Department of Education surveyed 8,660 individuals ages 16-74 in the United States. In the background questionnaire, individuals were asked, “During the past 12 months, were you in a formal apprenticeship program leading to journeyman status in a skilled trade or craft?” According to PIAAC, “A journeyman is a person who has fully served an apprenticeship in a trade or craft and is a qualified worker in that trade or craft.”

### **OUR FINDINGS (DEMOGRAPHICS)**

- Approximately 2 percent of the surveyed population (sample n = 144) were or had been in a formal apprenticeship program at the time the PIAAC survey was taken.
- About 74 percent were under age 35, and most were from the South (46%) and the West (26%).
- Approximately 57 percent had a high school diploma and 29 percent held a college degree
- Most of the participants in such programs were either working (50%) or working and studying in formal education simultaneously (33%), and 93 percent had a paid job during the 12 months preceding the PIAAC survey
- They were in skilled occupations (30%), semi-skilled blue-collar occupations (37%), semi-skilled white-collar occupations (20%), and elementary occupations (13%) (Note: According to [OECD](#), skill is defined as the ability to carry out the tasks and duties of a particular job, and elementary occupations can be regarded as unskilled occupations.)

**Figure 10:** Demographic distribution of population with apprenticeship experiences



- A large proportion of participants in apprenticeship programs were male (79%), White (54%), English native speakers (77%), non-first or second-generation immigrants (i.e., both parents were born in this country) (72%), and at least one parent who had high school or college education (84%).

**OUR FINDINGS (LITERACY, NUMERACY, PROBLEM SOLVING IN TECHNOLOGY-RICH ENVIRONMENTS)**

- Individuals with apprenticeships perform lower in literacy than their peers without but perform the same in numeracy and digital problem solving as their peers without apprenticeships (holding age and education level as constants). This situation could be related to the fact that “Apprenticeship in the United States focuses primarily on construction and manufacturing occupations, with large scale programs in electrical, pipe-fitting, carpentry, shipbuilding, maintenance, machining, and welding” (Lerman, 2010).

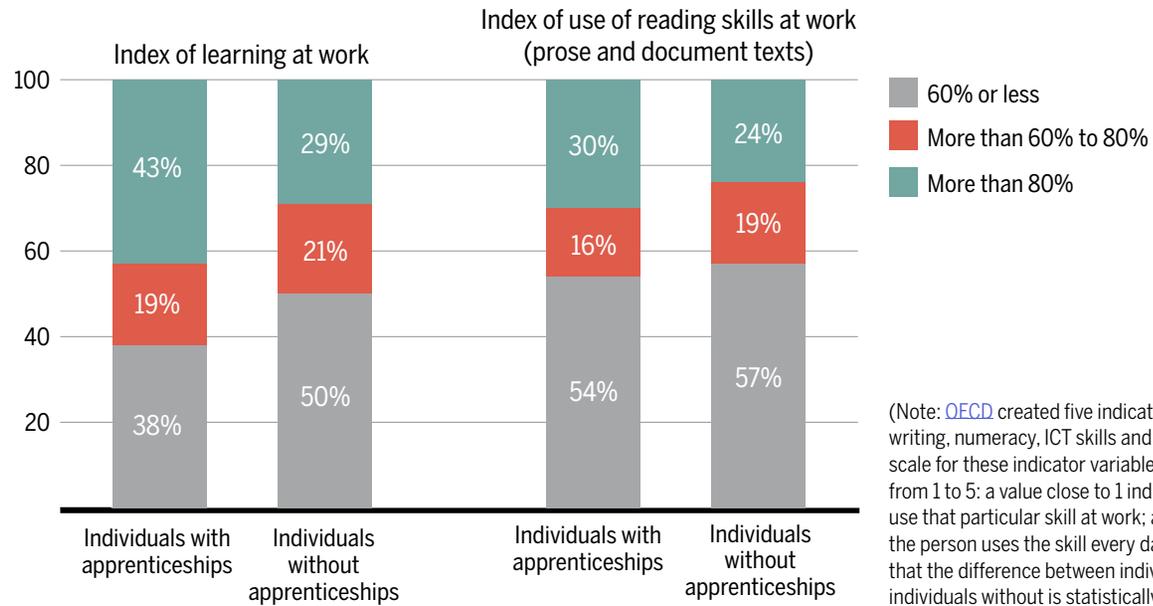
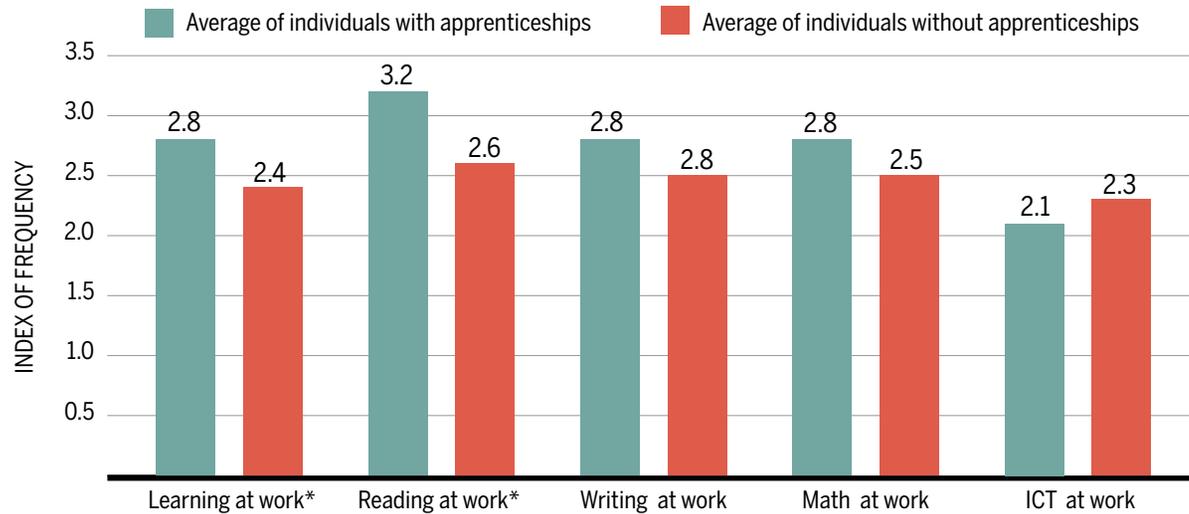
**Table: PIAAC Cognitive Skills Assessments: Average Scores for Individuals with Formal Apprenticeship**

	Sample <i>n</i> ( <i>weighted %</i> )	Literacy	Average scores Numeracy	Problem solving skills in technology rich environments
Apprenticeship	144 (1.5%)	261* (4.96)	274 (4.67)	253 (6.29)
Non-apprenticeship	8,335 (98.5%)	270 (0.99)	272 (1.05)	255 (1.05)
Total	8,479 (100%)			

Note: \*After controlling for age and education level, the average literacy score of individuals with formal apprenticeship experiences is significantly lower than the score of those without. (p = .003)

- U.S. workers with apprenticeships spend more time learning at work than their peers without. They also use more reading skills at work, such as frequently reading books, manuals and schematics. In addition, a relatively higher percentage of workers with apprenticeships use advanced math and statistics at work, compared with their peers without.
- Approximately 43 percent of individuals with apprenticeships spent more than 80% of their time at work learning; in contrast, only 29 percent of those without apprenticeships did so.
- Approximately 30 percent of individuals with apprenticeships reported using their reading skills more than 80 percent of their work time; 24 percent of those without apprenticeships reported the same.

**Figure 11:** Comparison between U.S. workers with and without apprenticeship experiences: Indicators of learning and skills use at work



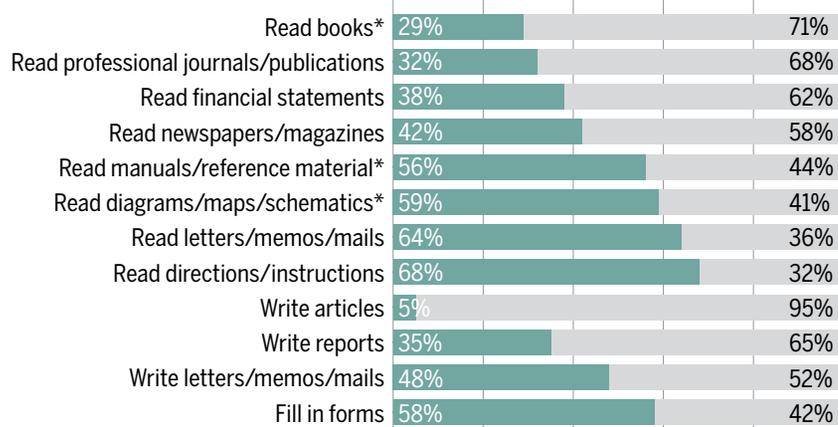
(Note: OECD created five indicators related to the use of reading, writing, numeracy, ICT skills and problem solving at work. The scale for these indicator variables is semi-continuous and ranges from 1 to 5: a value close to 1 indicates that the person does not use that particular skill at work; a value close to 5 suggests that the person uses the skill every day. In the chart, the sign \* means that the difference between individuals with apprenticeship and individuals without is statistically significant.)

- More than one half of the population with apprenticeship background reported that they used the following skills at work frequently:
  - **Literacy:** reading manuals and reference materials (56%), diagrams and schematics (59%), memos and mail (64%), directions and instructions (68%); filling in forms (58%)
  - **Numeracy:** using calculators (53%); calculating fraction and percentage (53%)
  - **ICT:** using Internet for work-related information (78%) and for mail (79%).
- Workers with apprenticeships are more likely to use the following skills at work much more than workers without apprenticeships.
  - often reading books at work (29% versus 17%)
  - often reading manuals and reference materials (56% versus 41%)
  - often reading diagrams, maps and schematics (59% versus 31%)
  - often using advanced math and statistics (17% versus 6%).

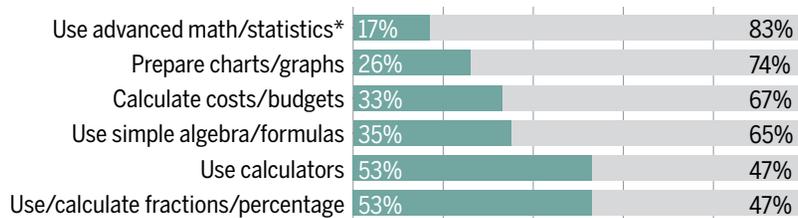
**Figure 12: Literacy, numeracy and ICT skills used at work among U.S. workers with apprenticeships**

Often (used everyday or at least once a week) Not often (used less than once a week/once a month/never)

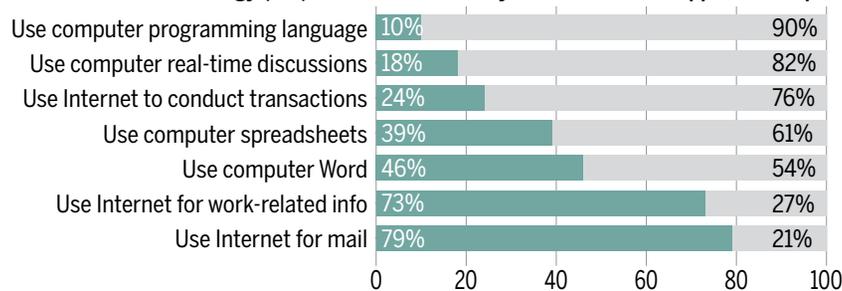
**Literacy skills used at work by U.S. workers with apprenticeships**



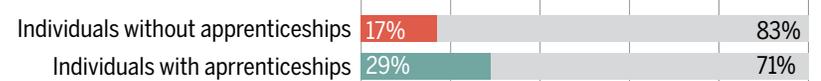
**Numeracy skills used at work by U.S. workers with apprenticeships**



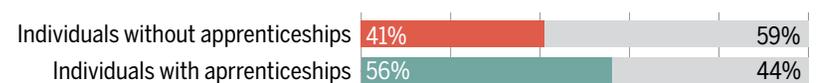
**Information communication technology (ICT) skills used at work by U.S. workers with apprenticeships**



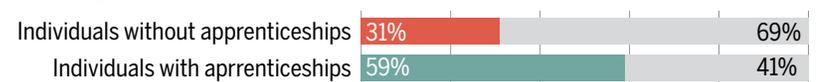
**Read books\***



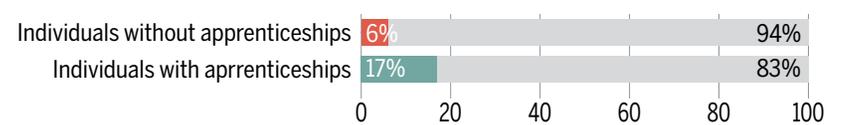
**Read manuals/reference materials\***



**Read diagrams/maps/schematics\***



**Use advanced math/statistics\***

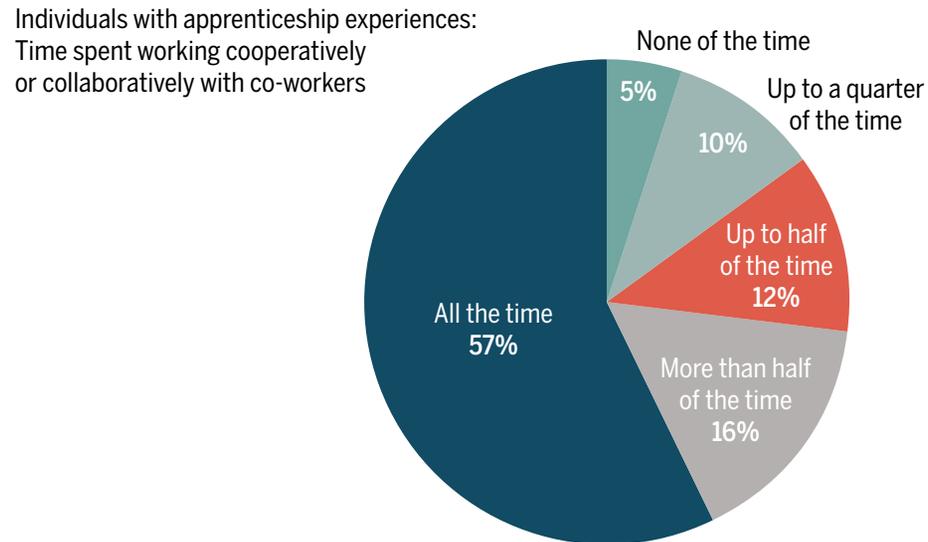


Note: \*The difference between individuals with apprenticeships and those without is statistically significant.

## OUR FINDINGS (SO-CALLED “SOFT SKILLS,” E.G., COMMUNICATION, COLLABORATION AND PROBLEM SOLVING)

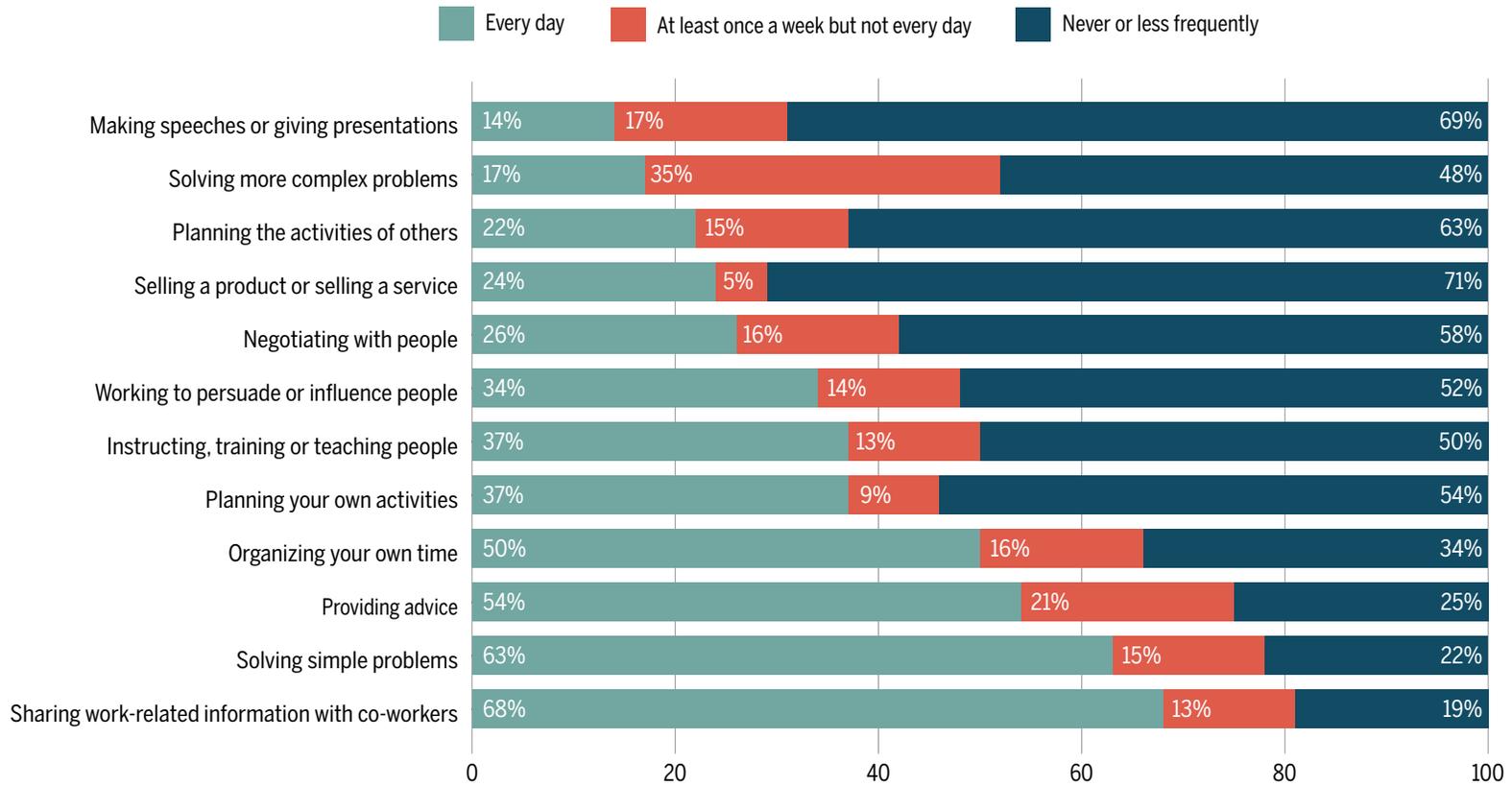
- Among individuals who participated in apprenticeships, 57 percent spent all the time working cooperatively or collaboratively with co-workers. This percentage is much higher than among individuals without apprenticeships (43%).

**Figure 13: Individuals with apprenticeship: Time spent working cooperatively/collaboratively**



- Among people who have apprenticeship experience, the most frequently used non-cognitive skills at work are sharing work-related information with co-workers, providing advice, and solving simple problems (i.e., a new or difficult situation which requires an individual to think for a while or no more than 5 minutes to find a good solution). Only 17 percent of the population with apprenticeships solve complex problems (i.e., at least 30 minutes to find a good solution or 30 minutes needed to think of a solution) daily, but 35 percent solve complex problems at least once a week.

**Figure 14: Percentage of individuals with apprenticeships: Frequency with which non-cognitive skills are used at work**



- After controlling for the scores in literacy, numeracy and digital problem solving, the logistic regression model shows that individuals with apprenticeships are more likely to use more soft skills—cooperating with coworkers ( $p = .002$ ), advising people ( $p = .028$ ), planning own activities ( $p = .010$ ), and organizing own time ( $p = .018$ )—than individuals without apprenticeships. These non-cognitive skills, which are developed through practice or apprenticeships, are key to achieving success in employment.

## **WHAT DO OUR FINDINGS SUGGEST?**

[Skills matter](#), but in terms of narrowing the skills gap, the continuous building of skills may matter more. Compared with their peers who have the same level of literacy/numeracy, individuals with apprenticeships are more likely to spend more time at work reading books, manuals, diagrams and using advanced math. This finding suggests that the apprenticeship model—career-building and life-long learning through the attainment of stackable credentials—seems to be effective.

For school leaders, partnership with local businesses may be a win-win strategy. Making school more relevant to the job market can help educators to identify literacy and numeracy skills that are mostly needed at the workplace and modify classroom instruction accordingly. By narrowing the skills gap, the school system would not only help broaden the scope of career choices of students; it would also establish a continuous pipeline of high-skilled workers to the job market.

Note that small sample size is a weakness in our analysis; we therefore suggest that caution be exercised when interpreting the reported results. However, this small sample size is meaningful in the sense that it suggests that apprenticeship is an underused, but potentially effective career pathway.



## III. Apprenticeships have been proven to work. Why don't we use them more?

Many factors affect the choices high school students make for their postsecondary education. Misperceptions about apprenticeship programs may be one (Parton, 2017). In this section, we look at specific cases, both nationally and internationally, in an attempt to identify some challenges to expanding apprenticeship programs.

### **BENEFITS OF APPRENTICESHIPS**

- Lower unemployment among youth
- High-skilled workers who meet industry needs
- Meaningful and lifelong learning

- ✓ In Finland, during a ten-year observation period, only 8 percent of students completing a vocational qualification in apprenticeship training had experienced unemployment; in contrast, 23 percent of students completing upper secondary VET (vocational education and training) had experienced unemployment ([Finnish National Board of Education](#), 2016).
- ✓ In Germany, about half a million young people enter the workforce through apprenticeship programs each year, and become a steady stream of highly qualified industrial workers that helps Germany maintain a reputation for producing top-quality products ([NPR](#), 2018).
- ✓ In Switzerland, approximately 70 percent of Swiss students choose to do an apprenticeship, and only 25 percent choose a traditional university pathway. Many students at age 15 or 16 spend one or two days at school and the rest of their week applying what they learn in the workplace. The apprenticeship system not only helps young people to enjoy quality education and become lifelong learners across society, but also helps the country maintain low unemployment rates ([Education Week](#), 2015).

## **GLOBAL CHALLENGES TO EXPANDING APPRENTICESHIP PROGRAMS**

- Low participation rates
- Low completion rates
- Inadequate information for both employers and students

- ✓ In Finland, the low participation rates of students under 20 years of age and students dropping out of apprenticeship training leading to higher-level qualifications is a problem and an area needing improvement ([Finnish National Board of Education](#), 2016).
- ✓ In Canada, apprenticeship is not a first educational choice of youth. Increasing the appeal of apprenticeships and skilled trades to youth and boosting the participation of employers are considered important to strengthening the apprenticeship system in Canada ([OECD](#), 2015).
- ✓ In Australia, the government targets incentives for employers and students to improve both the offering of apprenticeship programs and the participation in such programs in order to solve some issues related to skills gap in the labor market ([OECD](#), 2013).

**Map: Apprenticeship-related policies in Canada, Finland, Germany, Australia, and Japan**

**Canada**

- Provinces and territories are responsible for apprenticeship training and trade certification.
- The Government of Canada works with the provinces and territories to manage the Interprovincial Standards Red Seal Program to promote mobility of qualified tradespersons across the country.
- The government provides temporary financial assistance to apprentices attending in-class technical training through Employment Insurance (EI) benefits.
- Apprenticeship completion rates are relatively low, though information on apprenticeships is widely available.
- Increasing the appeal of apprenticeships and skilled trades to youth (in 2012, the median age of entry of new registrants was 25, which suggests that apprenticeship is not a first educational choice of youth) and boosting the participation of employers are considered important to strengthening the apprenticeship system in Canada.

**Finland**

- The government adopted the Preparatory Instruction and Guidance for VET program permanently in 2010 to reduce early school-leaving and prevent school dropout by providing instruction to help students become familiar with educational and vocational opportunities and find a place in upper secondary education and training.
- The Youth Guarantee (2013) is a policy that aims to help young people to complete post-basic qualifications and find employment. The guarantee provides everyone under 25 years old and recent graduates under 30 years old either a job, a traineeship, a study place, a workshop or a labor market placement within 3 months of becoming unemployed.

**Japan**

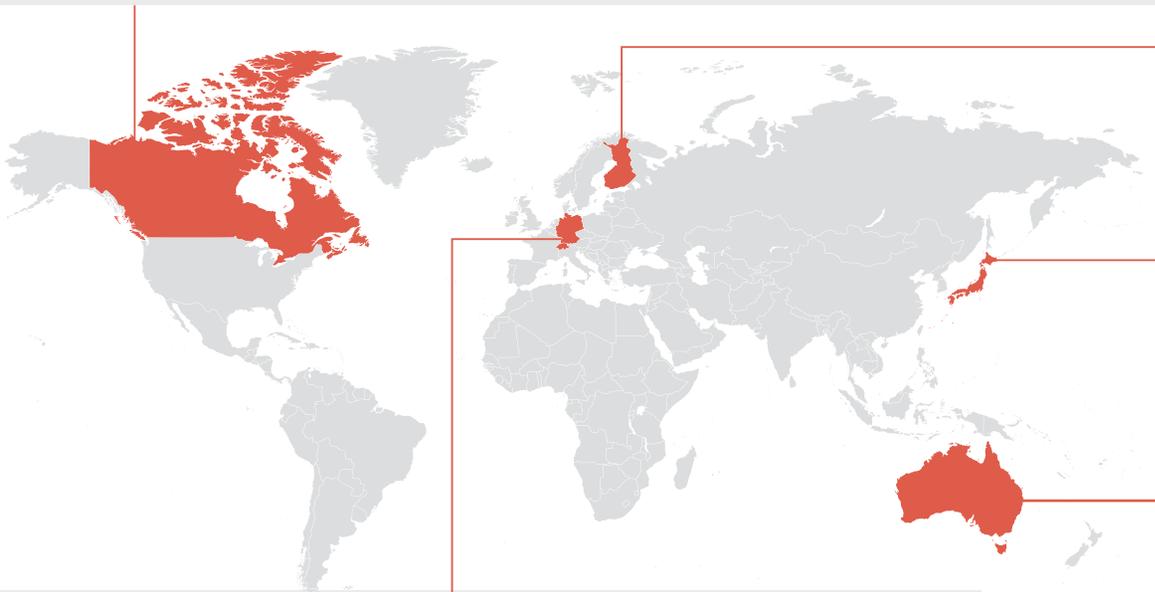
The government aims to improve the quality of VET education by introducing guidelines to enhance VET provision at different levels of the education system.

**Australia**

- The government targets incentives for employers and students to improve apprenticeships in response to skills gap.
- Australian Apprenticeship Centers provide a single source of information and support for employers, apprentices and training providers as well as for individuals searching for an apprenticeship.
- The Australian Apprenticeships Access Program provides pre-vocational training linked to an apprenticeship pathway for vulnerable job seekers.

**Germany**

- The dual system of upper secondary education combines school-based and work-based education.
- Strong co-operation has been developed between educational institutions, employers and other social partners who also work together on adjusting curricula.
- New regulations (2009) allow a) youth with advanced vocational qualifications (e.g. graduates from trade and technical schools) to access academic higher education and b) holders of other vocational qualifications to access subject-specific higher education.



Source: OECD Education Policy Outlook.

- [http://www.oecd.org/education/EDUCATION%20POLICY%20OUTLOOK%20AUSTRALIA\\_EN.pdf](http://www.oecd.org/education/EDUCATION%20POLICY%20OUTLOOK%20AUSTRALIA_EN.pdf)
- [http://www.oecd.org/education/EDUCATION%20POLICY%20OUTLOOK%20FINLAND\\_EN.pdf](http://www.oecd.org/education/EDUCATION%20POLICY%20OUTLOOK%20FINLAND_EN.pdf)
- [http://www.oecd.org/education/EDUCATION%20POLICY%20OUTLOOK%20GERMANY\\_EN.pdf](http://www.oecd.org/education/EDUCATION%20POLICY%20OUTLOOK%20GERMANY_EN.pdf)
- <http://www.oecd.org/education/EDUCATION%20POLICY%20OUTLOOK%20CANADA.pdf>
- <http://www.oecd.org/education/Japan-country-profile.pdf>

## **CHALLENGE IN THE U.S.—MEETING PARENTS' EXPECTATIONS**

A recent survey conducted by the U.S. Department of Education (2017) found that most parents (83%) expect their children to go to college. The percentage of those parents who expect their children to earn graduate or professional degree is much higher among minority parents—Black (43%), Hispanic (45%) and Asian (56%)—than among White parents (33%).

By contrast, only 8% of parents expect their children to attend vocational or technical school after high school. The percentage of parents who expect their children to go to vocational education after high school is higher

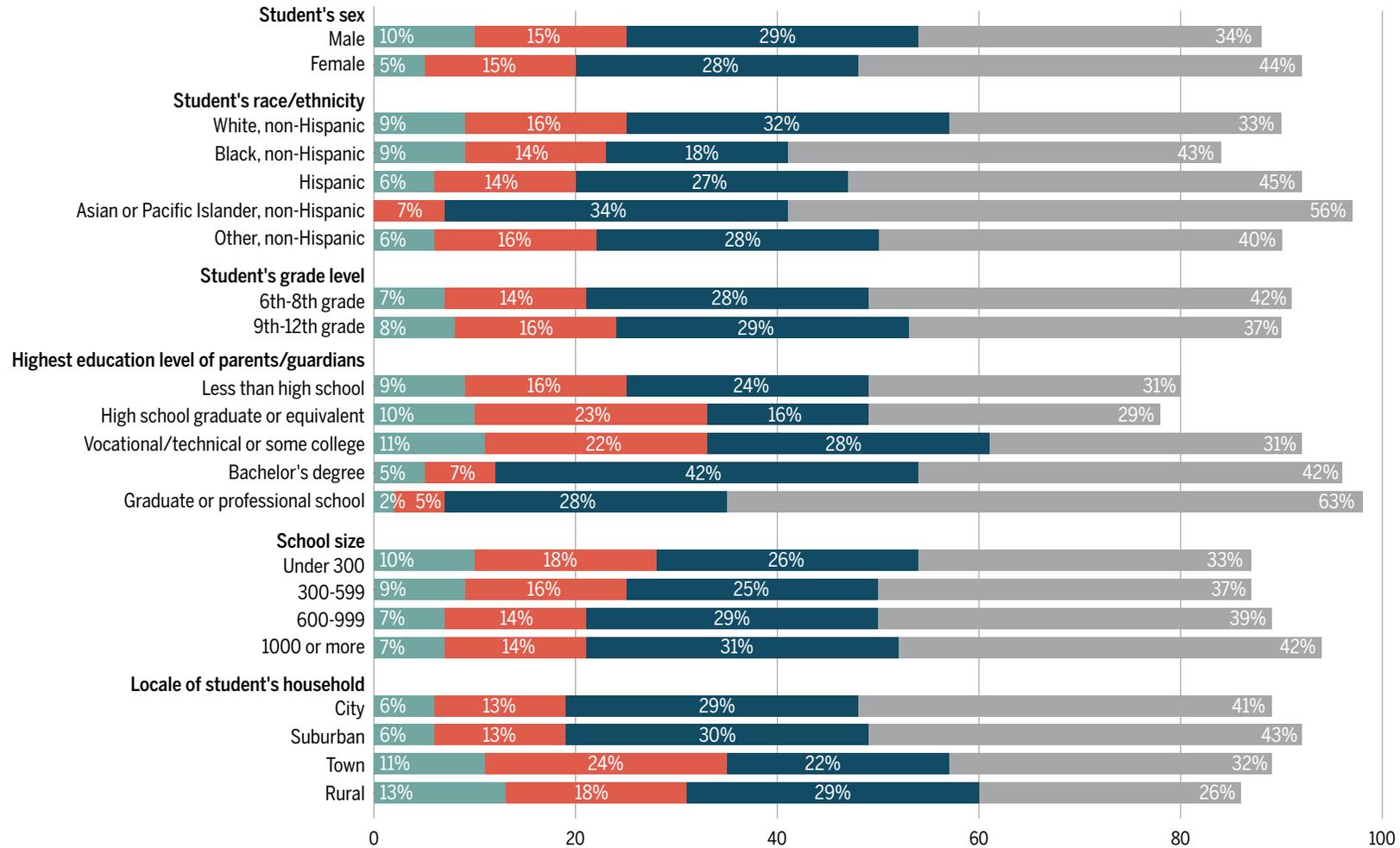
- among parents of male students (10%) than among parents of female students (5%);
- among parents with vocational education background (11%) than among parents with bachelor's degree (5%) or parents with a graduate/professional school educational level (2%).
- among parents from rural area (13%) than among parents from cities or suburbs (6%)

Every student has an unalienable right to pursue higher education, and all parents have perfect reasons to expect their children to go to college, including the potential for higher lifetime earnings. However, even after completing formal academic education, it is essential for workers to keep acquiring updated, job-related practical skills (Cappelli, 2015). As shown in our analysis, apprenticeships help individuals to develop employability skills. Thus, we suggest that parents and students be well informed of quality apprenticeship programs as an alternative career path.

**Figure 15: Parents' expectations of educational attainment beyond high school**

Percentage of students in grade 6 through 12 whose parents reported expectations of specific educational attainment levels (except high school or lower than high school), by school, student and family characteristics (2015-16)

Attend vocational or technical school after high school    Earn a bachelor's degree  
 Attend 2 or more years of college    Earn a graduate or professional degree



Source: U.S. Department of Education, National Center for Education Statistics, Parent and Family Involvement in Education Survey of the National Household Education Surveys Program (NHES), 2016  
 Note: The chart was compiled based on the statistics published on <https://nces.ed.gov/pubs2017/2017102.pdf>. The total of each bar is not 100 percent, because we did not show the percentage of parents who reported expectations of "Receive less than a high school diploma" and "Graduate from high school."



## IV. What should school districts consider?

For school districts, the ultimate goal is to prepare every student for college, the workplace, and above all, “a satisfying and productive life” ([NSBA](#)). In this section, we first introduce some apprenticeship programs that attempt to meet one of those goals by addressing 21st century workforce needs. We also propose some perspectives for school districts to consider in developing apprenticeship programs and partnerships.

### **APPRENTICESHIP PROGRAMS IN THE 21ST CENTURY**

- Embedded in industries with cutting-edge technology (e.g., Information technology, Geospatial technology, Biotechnology)

*Example 1:* “IT Generalist” Apprenticeship Program in New Jersey (NPower program)

- ✓ offers free tuition to young adults who are 18-25 years old, and have a high school diploma or GED
- ✓ includes 15 weeks of half-day in-class instruction followed by a seven-week paid internship
- ✓ provides a holistic approach to its IT training, including soft skills, corporate mentoring, career counseling, lifelong alumni support, guest lectures and site visits
- ✓ has trained over 45 young adults and veterans since December 2015, 75% of which were granted extended internships, placed in full-time jobs, or decided to continue their education.

Example 2: St. Louis apprenticeship program for cybersecurity (Cybersecurity Analyst Apprenticeship) in the Midwest

- ✓ attracts young people who are at least 18, with a high school diploma or GED, and just entered the job market, seeking growth in the field of cybersecurity
- ✓ solves the issue of a shortage of cybersecurity professionals (more than 200,000 such jobs will go unfilled in the U.S. in 2018).
- Strengthening seamless cohesion with local industries (e.g., aerospace, automobile, fabric, agriculture, health care)

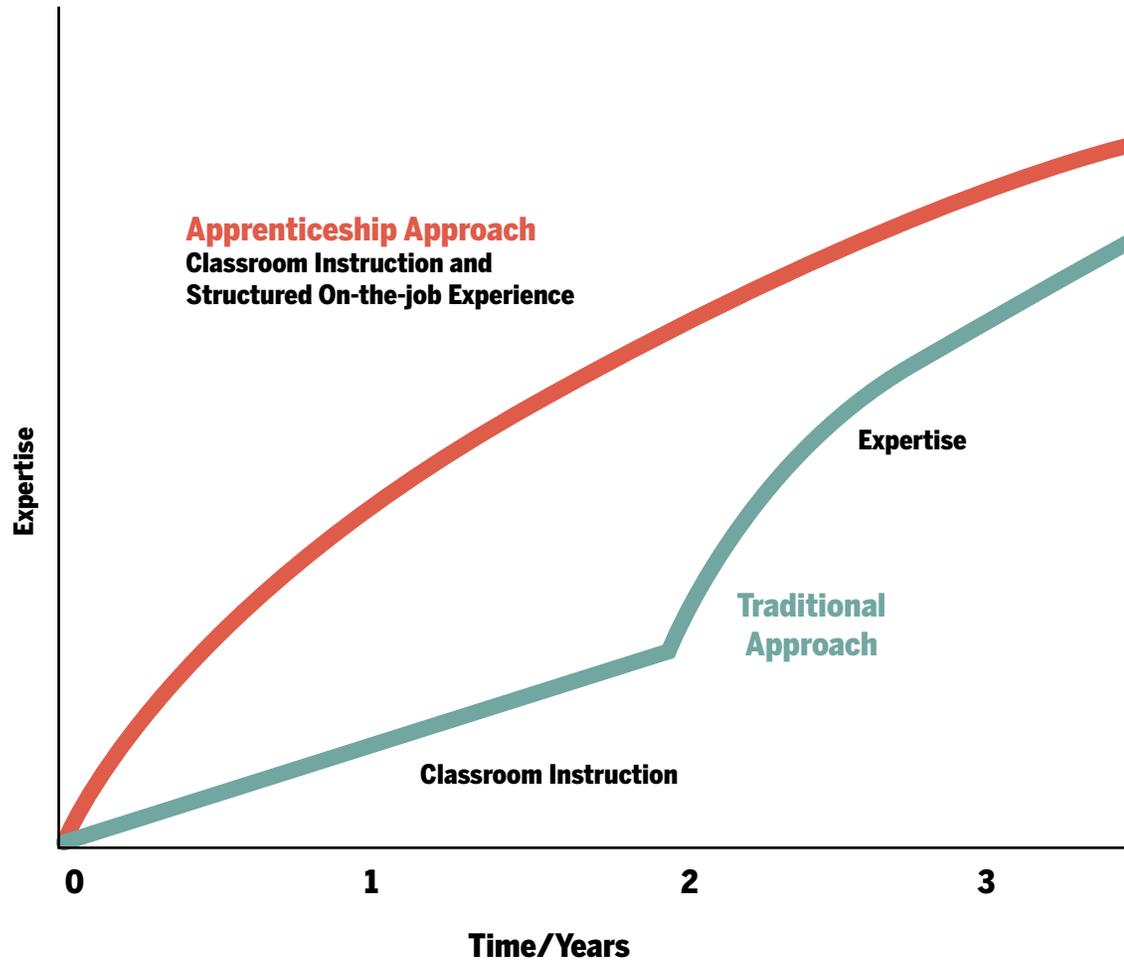
Example 3: Washington Aerospace Joint Apprenticeship Program

- ✓ uses State and Federal funds to design, develop, and implement apprenticeship programs for multiple aerospace and advanced manufacturing occupations and various size employers
- ✓ has workforce recruitment and pre-employment training program designed by local employers and taught by industry professionals to prepare workers for manufacturing and aerospace careers.

Example 4: Sun Mechanical Contracting Inc. program in Tucson, Arizona (Sheet metal, HVAC and plumbing apprenticeships)

- ✓ was created with the cooperation of the Arizona Department of Commerce Apprenticeship Office and the U.S. Department of Labor Office of Apprenticeship
- ✓ closes the skilled labor gap and gives employees an opportunity for advancement.
- Promoting time-effective learning (e.g. classroom instruction, structured on-the-job experience)

**Figure 16:** Comparison between apprenticeship approach and traditional approach



Source: U.S. NAVSEA — Navel Undersea Warfare Center —Division Keyport, NA;  
retrieved from <https://doleta.gov/OA/brochure/2017%20Seven%20Industries.pdf>

*Example 5:* Apprenticeship programs for high school juniors and seniors in Texas

The Alamo Colleges and the San Antonio Manufacturers Association established the Advanced Technology and Manufacturing Academy, a two-year education, training and apprenticeship program for high school juniors and seniors. It encourages students to explore career paths in manufacturing and helps them acquire college credits and get work experience through summer internship programs at local companies.

**TESTIMONY FROM [ARIZONA](#):**

*For 25-year-old Patrick Schlaefer, an apprenticeship program was a way to learn a trade that could become a career. “I got into the trade because I didn’t fully graduate high school and my father drilled into me, ‘If you don’t go to school you need something to fall back on,’” he said. “When the program presented itself, I realized it is school — college-level classes for construction.” He learned formulas and layout skills.*

*Example 6:* Youth apprenticeship programs in Washington state

The Washington State Apprenticeship Training Council approved the state’s first Youth Apprenticeship program for the local aerospace and advanced manufacturing industries. This program will provide high school students with an opportunity to earn tuition-free college credit, high school credit for graduation completion, 2,000 hours of paid on-the-job training, and mentorship from industry professionals.

**TESTIMONY FROM [KENTUCKY](#):**

*Barren County Schools partners with a local business Span Tech and expand educational opportunities for high school students. The Superintendent Bo Matthews said, “Through the apprenticeship model, students can earn income while attending high school.” The Superintendent also remarked, “Apprenticeships are crucial in training a highly skilled local workforce to meet industry demands while also retaining talent in our local community.”*

## APPRENTICESHIP-RELATED CONSIDERATIONS

- Options and choices

In your school district, how do you develop a culture in which parents are convinced and assured that every student must be prepared for both college and careers, and that certain apprenticeship programs are options in postsecondary education that can also lead to a level of higher education?

The biggest issue is cultural: The “college-for-all” movement in the United States over the last four decades has pushed many youths to campuses even when they weren’t ready or didn’t want to follow that well-trod pathway. – [The Washington Post](#) (2017)

- Trainings and orientations

In your school district, do you have enough career counselors to serve all students? What training do you provide for these counselors in terms of knowledge about apprenticeship programs? Do you periodically share the updated information about the trend of job market?

Libbie Rorabaugh bends and curves the copper wiring into a switch and a light bulb. She is sitting in an electrician’s class Friday morning, learning a full set of trade skills along with 80 others at the NECA-IBEW Electrical Training Center in Northeast Portland. Rorabaugh is not an aspiring electrician, lineman or roofer, but a high school career counselor.

Hands-on workshops for high school educators are intended to raise awareness of alternatives to college. – [The Oregonian](#) (2010)

- Partnerships with community colleges and local businesses

Does your school district have plans and strategies to connect students, community and local businesses in apprenticeship programs?

Like many Colorado mountain communities, affordable housing in Salida is challenging to find, especially for local educators. The Salida School District, in close partnership with local business and the community college, took matters into their own hands.

The Salida School District's building trades apprenticeship program, launched in 2015, enables students to work directly with local businesses to build affordable housing for local teachers. Students gain marketable, real-world skills while local industry builds a sustainable local talent pipeline. Through it all, they produce a vital resource for both the school district and the greater community. – [Colorado Succeeds](#) (2017)

- Linking school learning to the 21<sup>st</sup> Century skills

In your school district, how do you strategically link school-based learning to the development of the 21st Century skills needed at the workplace (e.g., communication, collaboration, and problem solving)?

The program titled *Backpack of Success Skills* was designed to ensure that graduates leave Jefferson County (Kentucky) schools equipped with “a virtual backpack” of key skills and experiences necessary for success in a rapidly changing world. The virtual backpack embodies three main compartments—one for literacy and numeracy, one for success skills like communication and collaboration, and one for skills or qualities that speak to an individual school. – [American School Board Journal](#) (2018)

Schools should be more relevant to the job market. With the penetration of information technology and the transformation of industries, the skills gap has become a great challenge for American school leaders. We suggest that school districts identify literacy and numeracy skills that are mostly needed at the workplace, modify classroom instruction accordingly, provide enough well-trained school career counselors, and develop a culture in which every student must be equipped with both hard and soft skills.



## Conclusions

In this report, we briefly reviewed the history of apprenticeship regulations in the United States. Cases and personal testimonies about successful apprenticeship programs give us some insight into the characteristics of the 21<sup>st</sup> Century vocational education and training (VET). We also analyzed a national-representative dataset (i.e., PIAAC), and the data show that the population with apprenticeship background generally feel positive about their formal education and are more likely to become lifelong learners.

Although the major limitation of our data analysis is the small sample of individuals with apprenticeships, the results provide substantial evidence to support the apprenticeship model. Consistent with previous studies (e.g., Helper et al., 2016; Lerman, 2018), apprenticeship programs help students to acquire not only occupational skills, but also soft skills employers want. Therefore, we believe that school districts could explore using various apprenticeship-related resources to help make sure that every student is “equipped with tools and knowledge for success” ([Michelle Healy, ASBJ-August 2018](#)).

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# References

- Buxton, M. (2010). High school educators get hands-on training with trade apprenticeship programs. *The Oregonian*. Retrieved from [https://www.oregonlive.com/portland/index.ssf/2010/10/high\\_school\\_educators\\_get\\_hand.html](https://www.oregonlive.com/portland/index.ssf/2010/10/high_school_educators_get_hand.html)
- Cappelli, P. H. (2015). Skill Gaps, Skill Shortages, and Skill Mismatches: Evidence and Arguments for the United States. *ILR Review*, 68(2), 251-290. doi:10.1177/0019793914564961
- Colorado Succeeds. (2017). Salida school district's building trades program tackles affordable housing head-on. Retrieved from <https://coloradosucceeds.org/work-based-learning/salida-school-districts-building-trades-program-tackles-affordable-housing-head-on/>
- Ellas, P. (1997). *Occupational classification (ISCO-88): Concepts, methods, reliability, validity and cross-national comparability*. OECD Labor Market and Social Policy Occasional Papers, No. 20. OECD Publishing, Paris. Retrieved from <https://www.oecd-ilibrary.org/docserver/304441717388.pdf?expires=1534344303&id=id&accname=guest&checksum=028E968F-0C4EE8ECA181AD6714215106>
- Finnish National Board of Education. (2016). Key figures on apprenticeship training in Finland. Retrieved from [https://www.oph.fi/download/177964\\_Key\\_figures\\_on\\_apprenticeship\\_training\\_in\\_Finland.pdf](https://www.oph.fi/download/177964_Key_figures_on_apprenticeship_training_in_Finland.pdf)
- Harriman, K. (2017). United States Department of Labor Office of Apprenticeship Registers NPower as the first "IT Generalist" apprenticeship program in NJ. Retrieved from <http://www.prweb.com/releases/2017/03/prweb14125985.htm>
- Healy, M. (2018). What should your graduates know?. *American School Board Journal*, August 2018, 19-23. Retrieved from <https://www.nsba.org/newsroom/american-school-board-journal/asbj-august-2018>
- Helper, S., Noonan, R., Nicholson, J. R., Langdon, D., Case Western Reserve Univ., C. O., & Economics and Statistics Administration, (. (2016). *The Benefits and Costs of Apprenticeships: A Business Perspective*. Retrieved from <https://www.esa.gov/sites/default/files/the-benefits-and-costs-of-apprenticeships-a-business-perspective.pdf>
- H.R.2353 – Strengthening Career and Technical Education for the 21<sup>st</sup> Century Act. Retrieved from <https://www.congress.gov/bill/115th-congress/house-bill/2353>
- Ladika, S. (2016). Apprenticeships: Can they help solve the skills gap? (Introduction). Retrieved from <http://library.cqpress.com/cqresearcher/document.php?id=cqresrre2016101400>
- Lerman, R. I. (2018). *Building a robust apprenticeship system in the U.S.: Why and how?*. Urban Institute, Meetings of the Labor and Employment Relations Association Allied Social Science Association (January 5-7, 2018, Philadelphia, Pennsylvania). Retrieved from [file:///C:/Users/jcai/Downloads/BuildingARobustApprenticeshipSystem\\_preview.pdf](file:///C:/Users/jcai/Downloads/BuildingARobustApprenticeshipSystem_preview.pdf)
- Lowry, A. (2017). St. Louis apprenticeship program for cybersecurity launches. *Midwest Cyber Center*. Retrieved from <https://midwestcybercenter.org/2017/04/26/st-louis-apprenticeship-program-for-cybersecurity-launches/>

McQuiggan, M. and Megra, M. (2017). Parent and Family Involvement in Education: Results from the National Household Education Surveys Program of 2016 (NCES 2017-102). U.S. Department of Education. Washington, DC: National Center for Education Statistics. Retrieved from <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2017102>.

National School Boards Association. (2018). What are school board members' goals for students? Retrieved from <https://www.nsba.org/about-us/frequently-asked-questions>

OECD. (2013). Education policy outlook: Australia. Retrieved from [http://www.oecd.org/education/EDUCATION%20POLICY%20OUTLOOK%20AUSTRALIA\\_EN.pdf](http://www.oecd.org/education/EDUCATION%20POLICY%20OUTLOOK%20AUSTRALIA_EN.pdf)

OECD. (2015). Education policy outlook: Canada. Retrieved from <http://www.oecd.org/education/EDUCATION%20POLICY%20OUTLOOK%20CANADA.pdf>

OECD. (2013). Education policy outlook: Finland. Retrieved from [http://www.oecd.org/education/EDUCATION%20POLICY%20OUTLOOK%20FINLAND\\_EN.pdf](http://www.oecd.org/education/EDUCATION%20POLICY%20OUTLOOK%20FINLAND_EN.pdf)

OECD. (2014). Education policy outlook: Germany. Retrieved from [http://www.oecd.org/education/EDUCATION%20POLICY%20OUTLOOK%20GERMANY\\_EN.pdf](http://www.oecd.org/education/EDUCATION%20POLICY%20OUTLOOK%20GERMANY_EN.pdf)

OECD. (2015). Education policy outlook: Japan. Retrieved from <http://www.oecd.org/education/Japan-country-profile.pdf>

OECD. (2016). *Skills Matter: Further Results from the Survey of Adult Skills*. OECD Skills Studies. OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264258051-en>

Perkins, W. (2017, May 15). Span Tech, Barren County ATC announce apprenticeship program. *Glasgow Daily Times*. Retrieved from [http://www.glasgowdailytimes.com/news/span-tech-barren-county-atc-announce-apprenticeship-program/article\\_a1446eb0-39bf-11e7-a9b5-af7befeda34b.html](http://www.glasgowdailytimes.com/news/span-tech-barren-county-atc-announce-apprenticeship-program/article_a1446eb0-39bf-11e7-a9b5-af7befeda34b.html)

Rico, G. (2017, November 4). Tucson company creates in-house apprenticeship to address skilled worker crunch. *Arizona Daily Star*. Retrieved from [https://tucson.com/business/tucson-company-creates-in-house-apprenticeship-to-address-skilled-worker/article\\_cef64d9b-d70d-55e3-90b1-1af6c9d6440f.html](https://tucson.com/business/tucson-company-creates-in-house-apprenticeship-to-address-skilled-worker/article_cef64d9b-d70d-55e3-90b1-1af6c9d6440f.html)

San Antonio Economic Development Foundation. (n.d.). Manufacturing fact sheet. Retrieved from [http://www.sanantonioedf.com/images/uploads/ManufacturingFactSheet\\_1.pdf](http://www.sanantonioedf.com/images/uploads/ManufacturingFactSheet_1.pdf)

Selingo, J. J. (2017, December 22). Why are apprenticeships a good idea that have never really taken off in the U.S.? *The Washington Post*. Retrieved from [https://www.washingtonpost.com/news/grade-point/wp/2017/12/22/why-are-apprenticeships-a-good-idea-that-have-never-really-taken-off-in-the-u-s/?noredirect=on&utm\\_term=.7f451968f282](https://www.washingtonpost.com/news/grade-point/wp/2017/12/22/why-are-apprenticeships-a-good-idea-that-have-never-really-taken-off-in-the-u-s/?noredirect=on&utm_term=.7f451968f282)

Singmaster, H. (2015, July 9). Why we need apprenticeship programs for high school students. *Education Week*. Retrieved from [http://blogs.edweek.org/edweek/global\\_learning/2015/07/why\\_we\\_need\\_an\\_apprenticeship\\_program\\_for\\_high\\_school\\_students.html](http://blogs.edweek.org/edweek/global_learning/2015/07/why_we_need_an_apprenticeship_program_for_high_school_students.html)

Sun Mechanical. (n.d.). Training + Apprenticeship. Retrieved from <http://sunmechanical.net/training-apprenticeship/>

Swoope, A. (n.d.). *Strengthening our nation's workforce with demand-driven solutions*. Employment and Training Administration, United States Department of Labor. Retrieved from <https://doleta.gov/OA/brochure/2007%20Seven%20Industries.pdf>

Torpey, E. (2017). Apprenticeships: Occupations and outlook. *U.S. Department of Labor*. Retrieved from [https://www.bls.gov/career-outlook/2017/article/apprenticeships\\_occupations-and-outlook.htm?view\\_full](https://www.bls.gov/career-outlook/2017/article/apprenticeships_occupations-and-outlook.htm?view_full)

U.S. Department of Education. (2008). Current funding opportunities: Pathways to STEM apprenticeship for high school career and technical education (CTE) students. Retrieved from <https://cte.ed.gov/grants/funding-opportunities>

U.S. Department of Education. (n.d.). Perkins Act. Retrieved from <https://cte.ed.gov/legislation/about-perkins-iv>

U.S. Department of Labor. (n.d.). Apprenticeship. Retrieved from <https://www.apprenticeship.gov/>

U.S. Department of Labor. (n.d.). A quick-start toolkit: Building Registered Apprenticeship programs. Retrieved from [https://www.doleta.gov/oa/employers/apprenticeship\\_toolkit.pdf](https://www.doleta.gov/oa/employers/apprenticeship_toolkit.pdf)

U.S. Department of Labor. (2018). All about YouthBuild. Retrieved from [https://www.doleta.gov/youth\\_services/pdf/AllAboutYouth-Build.pdf](https://www.doleta.gov/youth_services/pdf/AllAboutYouth-Build.pdf)

U.S. Department of Labor. (2018). Case studies: Washington aerospace joint apprenticeship program. Retrieved from [https://www.doleta.gov/OA/new\\_sstories.cfm](https://www.doleta.gov/OA/new_sstories.cfm)

U.S. Department of Labor. (2018). Data and statistics: Registered apprenticeship national results. Retrieved from [https://doleta.gov/oa/data\\_statistics.cfm](https://doleta.gov/oa/data_statistics.cfm)

U.S. Department of Labor. (2018). History and Fitzgerald Act. Retrieved from <https://doleta.gov/OA/history.cfm>

U.S. Department of Labor. (2018). Registered Apprenticeship state contact list. Retrieved from <https://doleta.gov/oa/contactlist.cfm>

U.S. Department of Labor. (2018). *Task force on apprenticeship expansion: Final Report to the President of the United States*. Retrieved from <https://www.dol.gov/apprenticeship/docs/task-force-apprenticeship-expansion-report.pdf>

U.S. Department of Labor. (July 24, 2018). YouthBuild information. Retrieved from [https://www.doleta.gov/Youth\\_services/YouthBuild.cfm](https://www.doleta.gov/Youth_services/YouthBuild.cfm)

Washington State Department of Labor & Industries. (n.d.). History of apprenticeship. Retrieved from <http://www.lni.wa.gov/Trade-sLicensing/Apprenticeship/About/History/>

Wehling, R. L. (2007). *Building a 21<sup>st</sup> Century U.S. education system*. The National Commission on Teaching America's Future. Retrieved from <https://nctaf.org/wp-content/uploads/Chapter13.Riley.pdf>

Wichner, D. (2018, August 12). Efforts to prepare Tucson-area youth for workforce get boost in funding. *Arizona Daily Star*. Retrieved from [https://tucson.com/business/efforts-to-prepare-tucson-area-youth-for-workforce-get-boost/article\\_2e8191d3-45db-5538-93db-50d494467678.html](https://tucson.com/business/efforts-to-prepare-tucson-area-youth-for-workforce-get-boost/article_2e8191d3-45db-5538-93db-50d494467678.html)

Ydstie, J. (2018, January 4). Robust apprenticeship program key to Germany's manufacturing might. *NPR*. Retrieved from <https://www.npr.org/2018/01/04/575114570/robust-apprenticeship-program-key-to-germanys-manufacturing-might>

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