

# Restoring the Dignity of Work:

Transforming the U.S. Workforce Development  
System into a World Leader

RT 335

NCCER  
Construction Users Roundtable  
Ironworkers/IMPACT  
Construction Industry Institute

JULY 2018



# Research Team 335

NCCER is a not-for-profit 501(c)(3) education foundation created by the construction industry in 1996 to develop standardized curriculum with portable credentials and to help address the skilled construction workforce shortage. NCCER is recognized by the industry as the training, assessment, certification and career development standard for the construction and maintenance craft professional. Today, its mission continues to be building a safe, productive and sustainable workforce of craft professionals.

The Construction Industry Institute (CII), founded in 1983, is a research institute of leading owners, contractors and academics working together to advance the business effectiveness and sustainability of the world's capital facilities.

Recognizing that improving the delivery of capital facilities is impossible without a skilled and qualified workforce of craft professionals, NCCER and CII collaborated to create research team 335 whose efforts created "Restoring the Dignity of Work: Transforming the U.S. Workforce Development System into a World Leader." NCCER and CII are extremely grateful for the support of the Construction Users Roundtable, Ironworkers/IMPACT and the CII member firms who served on the research team.



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**We have become poor stewards of our nation's infrastructure system.** We are the nation whose transportation system was the envy of most other countries having built infrastructure achievements ranging from the transcontinental railroad to the interstate highway system. These achievements helped put in motion our nation's long-term pathway toward prosperity. Somewhere along the way we became distracted and have allowed the quality of our nation's infrastructure system to slip; the quality of our roads is now rated 14<sup>th</sup> in the world<sup>1</sup>. Furthermore, the nation's transportation system is indicative of the current state of the nation's infrastructure system, including its public water, sewer and civil works. Based on the latest evaluation of the nation's infrastructure system as rated by the American Society of Civil Engineering, all of the states involved in the evaluation had their infrastructure systems rated as a C or lower (Figure 1)<sup>2</sup>.

The erosion of our nation's infrastructure is obviously not the only challenge facing our industry and nation. With increased urbanization, our nation's health hinges on the ability to build affordable housing and new communities where none exists today. The nation's science, technology, engineering and math (STEM) economy continues to be a world leader in developing innovations that have potential to improve the health and safety of future societies; however, we must have a robust construction industry to build the facilities that harbor these innovations.

At the crossroads of future innovations and a robust future society lies the nation's construction industry, where everything starts. Ideas are evolved into designs that are transformed into a physical reality. All the promises of infrastructure renewal and the growth of our economy assumes that construction has a viable and qualified workforce.

Even with dramatic increases in infrastructure funding and stronger development of innovations, we as a nation no longer have the skilled construction workforce necessary to build the physical and technical infrastructure required for future generations. Over the past three decades, we have seen a shortage of skilled construction craft professionals emerge<sup>3,4,5,6</sup>. The skills shortage has worsened to the point that it is not only hard to find qualified craft professionals, but the shortage is affecting projects' schedules, costs and safety<sup>7,8</sup>.

The average age of a craft professional is 47<sup>9</sup>. In 2019, the last of the Baby boomers turn 55. By 2024, many will begin retiring. Eight years from now, 29 percent of the current construction workforce will retire in 2026<sup>10</sup>. Thirteen years from now, 41 percent of the current construction workforce will retire in 2031<sup>11</sup>. Considering the time it takes for an individual to become fully trained as a construction craft professional (8 to 12 years depending on the occupation), we should have already started addressing this challenge. Due to this inaction, we must start now.

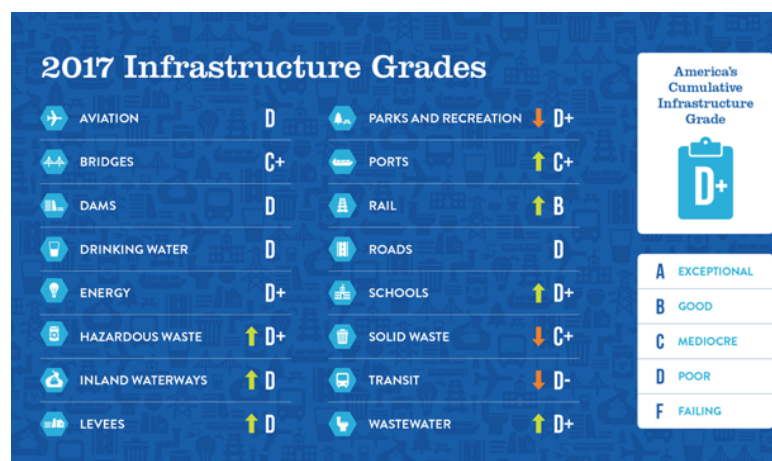


Figure 1: State of the Nation's Infrastructure System (ASCE 2017)

The United States' workforce development system desperately needs to be overhauled to address these challenges. As a process, workforce development includes the recruitment, training, placement and retention of individuals in gainful employment opportunities. Revitalizing our nation's workforce development system is the path forward toward addressing not only the shortage of skilled construction craft professionals but also the nation's skills shortages throughout numerous other industries that are highly dependent on skilled professionals. The effort will require new approaches in how we communicate career

opportunities to potential labor market entries and our youth in secondary and postsecondary education, as well as those already in work-based learning among other initiatives. To define this path forward, a series of policies have been identified that affect industry stakeholders and governmental agencies. Considering the relative benefits and costs with each policy, the policies have been organized among those that can be implemented in the short-term (less than three years) and those that will require a longer-term effort to implement. These policies include:

### Short-term workforce development policies:

**1. Establish and strengthen career awareness and education opportunities in our nation:**

Re-establish the nation's commitment to the equal dignity of all workers by communicating all career paths to students in secondary education and their parents.

**2. Revitalize our work-based learning programs:**

Significantly improve participation in work-based learning programs by removing barriers to company participation.

**3. Measure performance and involvement in workforce development when awarding construction contracts:**

Assess construction firms' commitment to workforce development and the quality of their program much like the industry does with safety.

### Longer-term workforce development policies:

**4. Redefine how we measure the quality of our nation's secondary education system by career and college readiness:**

The nation's secondary education system must be provided greater incentive to ensure the career readiness of all high school graduates.

**5. Increase the participation of underrepresented groups in Career and Technical Education (CTE):**

Increase the recruitment of underrepresented groups in CTE through greater outreach and mentoring.

**6. Establish and expand collaboration between industry, education and government:**

Promote industry involvement and investment into our nation's secondary and postsecondary CTE programs.

**7. Develop more balanced funding among postsecondary CTE versus higher education:**

Increase funding available to CTE programs most needed by industry.



The justification for each of the above policies and deeper explanation about what they mean are detailed in the following sections.

# 1 Establish and Strengthen Career Awareness and Education Opportunities in Our Nation

## WHY:

A poll conducted by the Robert Wood Johnson Foundation and the Harvard T.H. Chan School for Public Health found that 26 percent of parents whose children played high school athletics hoped their child would play professional sports<sup>12</sup>. For families with household incomes less than \$50,000/year, the number is 39 percent. Reality is far different. The National Collegiate Athletic Association estimates that the probability of a male high school athlete participating in the NCAA (across all divisions) in basketball is 3.4 percent and football is 6.8 percent. Of these selected few student athletes, only 1.1 percent will go on to play professional basketball and 1.5 percent will go on to play professional football<sup>13</sup>. Clearly, professional sports are not a suitable career choice for the vast majority of high school students.

Although the low probability of success in professional sports may seem reasonable to some extent, the chance

of success after college graduation is relatively low as well. Eighty percent of young people at age 18 or 19 expect to earn a bachelor's degree after high school graduation<sup>14</sup>. The most important reason they pursue a four-year college degree is that they think this way will result in a high-paying job<sup>15</sup> (Figure 2). Despite this goal, only 59 percent of students entering college will earn a bachelor's degree within six years<sup>16</sup>. Of those who finally complete the four-year college degree, many will graduate with a significant amount of personal debt. According to an analysis, college students graduate with the average debt of more than \$35,000 and most likely, it will increase<sup>17</sup>. Moreover, not only the average student debt has increased; more students are accumulating it (Figure 3). Meanwhile only 33 percent of jobs require a four-year degree<sup>18</sup>. Clearly, the four-year college degree is not a suitable career path for a significant number of high school students.

### Top Five Reasons noted as either “Very Important” or “Important” in Deciding to Go to College

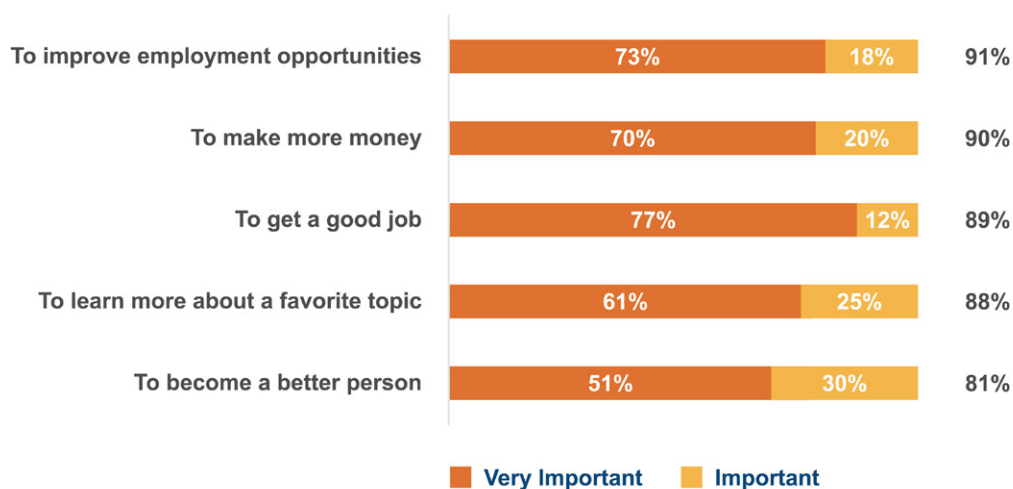


Figure 2: Top Five Reasons in Deciding to Go to College

Source: New America Education Policy Program, College Decisions Survey, 2015.

## Growth in Student Loan Debt at Graduation

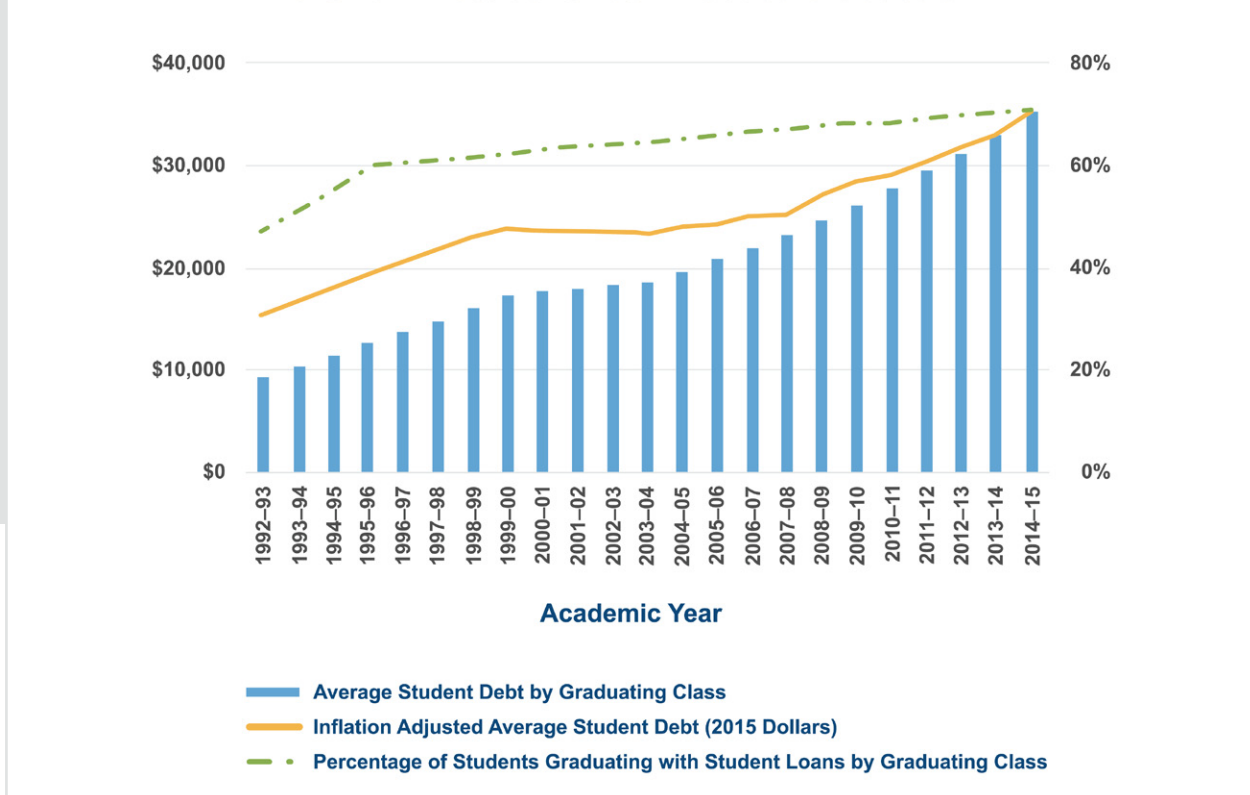


Figure 3: Growth in Student Loan Debt at Graduation

Note: Debt includes federal and private education loans.

Source: Mark Kantrowitz Analysis of National Center for Education (NCES) Statistics Data, Debt at Graduation, 2014. Retrieved from <https://www.edvisors.com/media/files/student-aid-policy/20140107-debt-at-graduation.pdf>

Parents and industry representatives are some of the main influencers in education and career decision-making processes<sup>19,20,21</sup>. Many parents, teachers and school counselors consider going to college as the only acceptable career path following high school. More interestingly, among students with the least academic ability (based on standardized test scores), the growth in the percentage of parents recommending college experienced the fastest increase<sup>22</sup>. On the other hand, there is a perception surrounding CTE programs that these programs are only suitable for low-performing students and cannot prepare students for success in postsecondary education<sup>23</sup>. However, students who attend CTE programs have better academic grade point averages, higher rates of on-time graduation and greater success in college preparatory mathematics<sup>24,25,26</sup>.

CTE programs have a positive impact on labor market transitions of young adults. CTE students reportedly are more likely to develop skills such as problem solving, math, communication, employability skills and critical thinking during high school than their non-CTE counterparts<sup>27</sup>. Most human resource professionals are looking for these skills in today's workforce<sup>28</sup>.

**“Students who attend CTE programs have better academic grade point averages, higher rates of on-time graduation and greater success in college preparatory mathematics.”**

Part of the lack of awareness about technical occupations in society is due to not understanding the labor market as it relates to the future supply and demand for CTE occupations. The main misconceptions of the future labor market are:

- *In the future, most jobs will require a four-year degree.*
- *All high wage occupations will require a four-year degree.*
- *The total labor force demand for college graduates will be sufficient to provide equivalent employment for all who receive a four-year degree.*
- *There will be so many individuals who have a four-year degree that they will take all the good jobs, including those that do not require a baccalaureate degree<sup>29</sup>.*

The reality is much different. In any given year, only 33 percent of jobs in the U.S. economy require a bachelor's degree or higher<sup>30</sup>. Furthermore, the supply of four-year degrees significantly outpaces the demand. Figure four provides the comparison of occupational supply and demand for bachelor's level or above in labor market. From 2015 to 2024, there are on average 955,320 jobs that will need a bachelor's degree each year; meanwhile 1,921,200 people with a bachelor's degree will be in the labor market, indicating a 50 percent underemployment level in labor market, which includes delayed entry into the labor market in order to acquire the knowledge and skills an individual actually need for the jobs they attain.

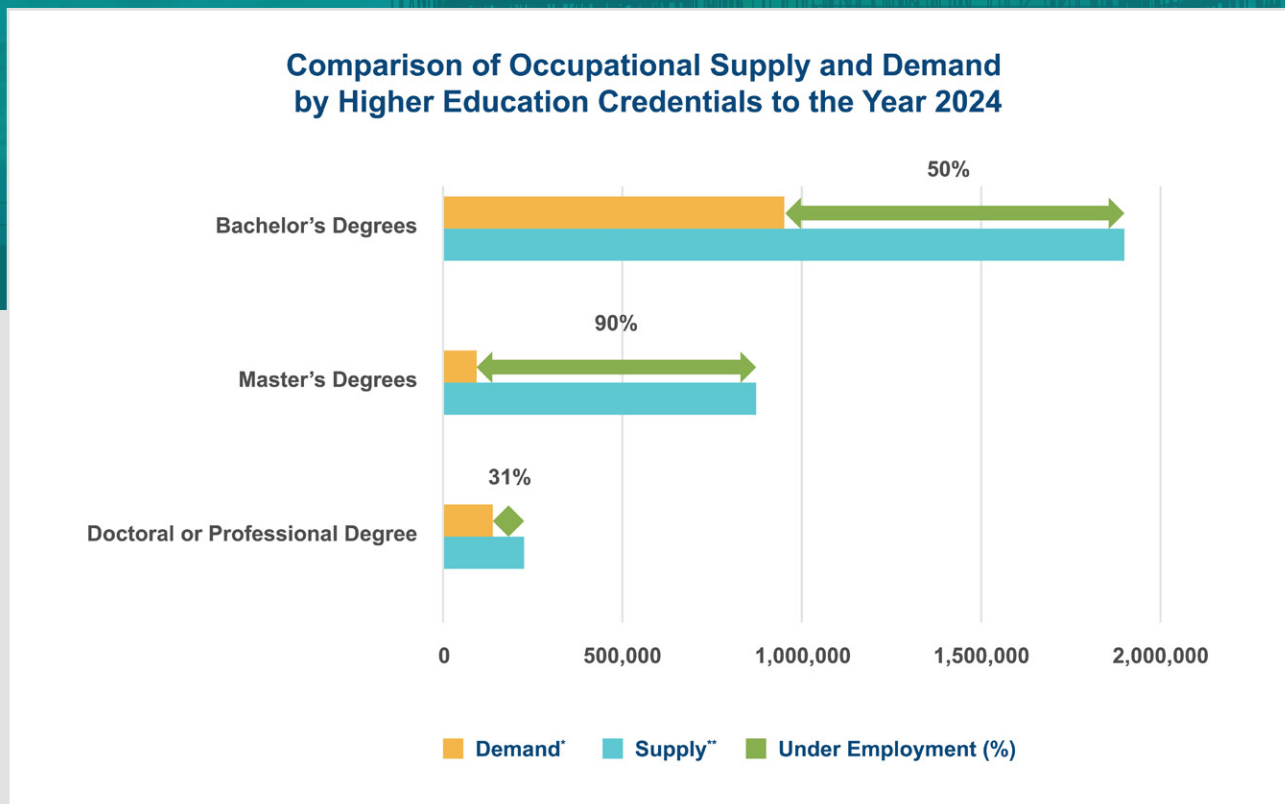


Figure 4: Comparison of Occupational Supply and Demand by Higher Education Credentials to the Year 2024

Note: Demand data reflect the average of annual job openings from 2015 to 2024. Supply data reflect the average of annual degrees expected to be conferred by degree-granting postsecondary institutions from 2015 to 2024.

\* Source: Projection of Education Statistics to 2024 by the National Center for Education Statistics, 2016. Retrieved from <https://nces.ed.gov/pubs2016/2016013.pdf>

\*\* Source: Occupational Employment Projections to 2024 by the Bureau of Labor Statistics. Retrieved from <https://www.bls.gov/emp/ind-occ-matrix/occupation.XLSX>

Another reason for the lack of information and awareness about career and technical occupations is that they are not as well highlighted as majors to students in secondary education compared to university degrees and do not have clear career paths for many in society. Most young people start to realize their opportunities in technical occupations after pursuing other career paths and thereby lose precious time to build their career path in other fields, like construction. As an indication, only 20 percent of apprentices are under the age of 25 and the average age is 30<sup>31</sup>. In addition, the average age for apprentices in construction trades was reported 27, which is higher than that observed in other industrialized countries<sup>32</sup>. It is also significantly higher than 20 years of age, which is the average age of an undergraduate student at many U.S. universities.

Earlier discussion of the options that young people have for their career path along with future predictions of occupational supply and demand and other labor market facts can help the students and their parents make better decisions about their future. A public awareness campaign can significantly correct the misconceptions mentioned earlier. As a good example, a national marketing campaign in England has dramatically improved society's perception towards apprenticeships and trades in recent years<sup>33</sup>. As a result, the number of people starting apprenticeship programs each year has been doubled from 2009 to 2012 in England (Figure 5).

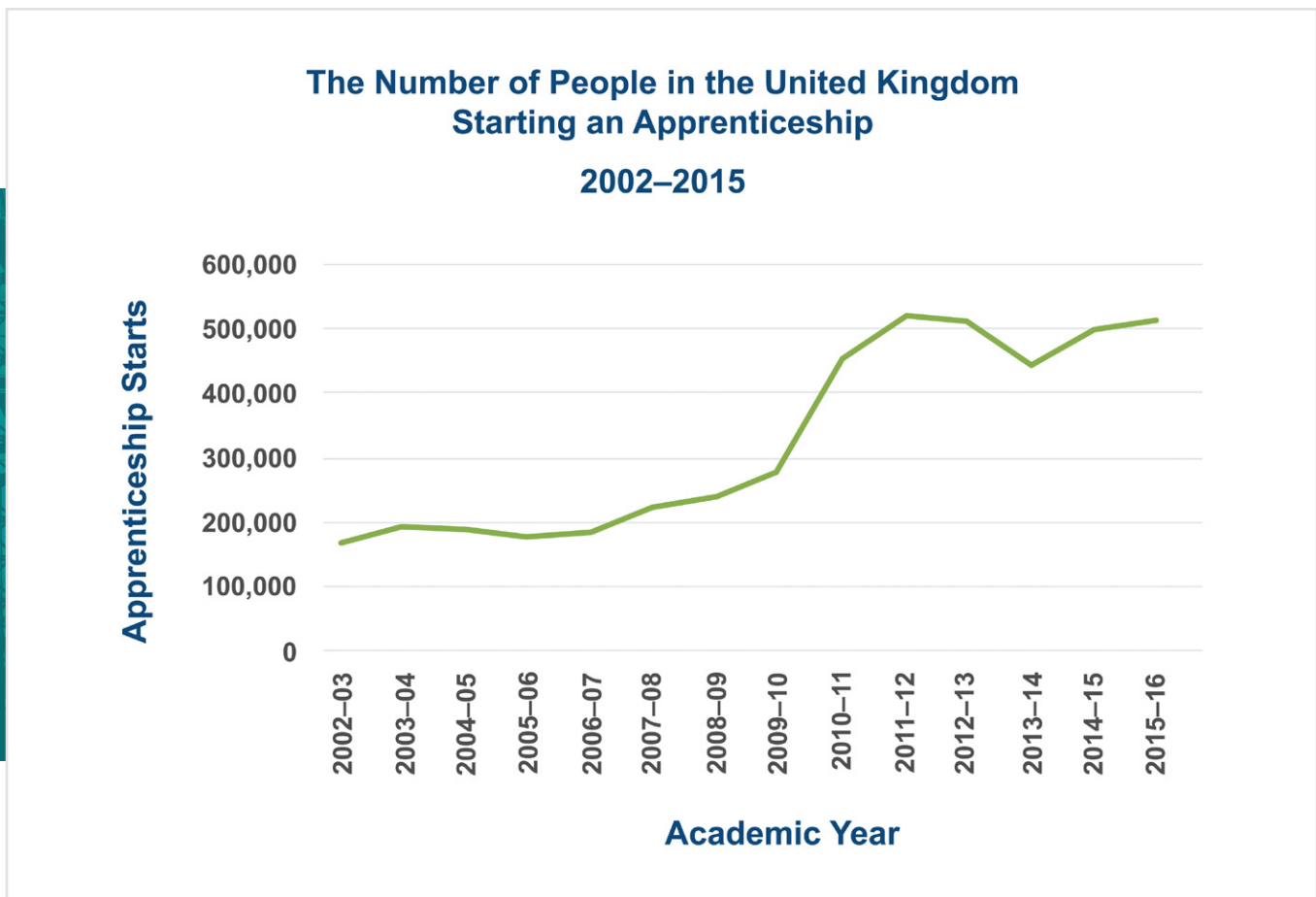


Figure 5: Growth in Apprenticeship Participation in UK

Source: Provided by U.K. Department for Education, "Apprenticeships geography, equality & diversity and sector subject area: starts 2002/03 to 2015/16", Retrieved from [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/530824/apprenticeships-starts-by-geography-learner-demographics-and-sector-subject-area.xls](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/530824/apprenticeships-starts-by-geography-learner-demographics-and-sector-subject-area.xls)

## WHO:

- Department of Education
- Department of Labor
- Business and Industry Leaders

## WHAT:

The message communicated to all young people in the primary and secondary education system about their future must be balanced and focused on postsecondary success instead of an emphasis on university admission. Young people and their parents need to be aware of different opportunities, the benefits and their costs.

Several authors argued that skilled workers have become largely undervalued in the U.S. society<sup>34,35</sup>. The research team believe that society needs to recognize and reembrace the dignity of work and stop classifying jobs as “middle skills” or “blue collar.” Instead, the construction industry uses the term “craft professionals” and other industries need to follow similar suite. This policy must establish our nation’s commitment to the equality of all workers by recognizing the dignity of their contribution to society.

The communication should target federal, state and local politicians, business and industry leaders, guidance counselors, teachers, parents and young people with focus on postsecondary success instead of an emphasis on university admission.

### Key areas of communication include:

- *Informing young people about the options they have for navigating their chosen career pathways and the related costs.*
- *Clarifying labor market facts and future supply and demand of occupations in the labor market.*
- *Recognizing successful people who progressed through different career pathways.*
- *Promoting the public image of the nation’s CTE system and the quality of people in the workforce that it created.*
- *Educating all high school students and their parents about career pathways, credentials, apprenticeship programs and work-based learning programs such as NCCER’s accredited craft training.*
- *Educating all high school students and their parents about how to get involved in CTE programs, apprenticeship and work-based learning programs.*

**“This policy must establish our nation’s commitment to the equality of all workers by recognizing the dignity of their contribution to society.”**



## 2 Revitalize Our Work-based Learning Programs

### WHY:

Work-based learning refers to learning technical, academic, employability skills, discipline specific knowledge and competencies by working in a real work environment<sup>36</sup>. Work-based learning programs can be implemented in different forms. However, they generally have six characteristics in common:

- *Formal arrangements are overseen by establishment of partnerships between educational institutions and external organizations.*
- *Some sort of contractual relationship exists between learners and organizations.*
- *The programs are designed based on the needs of workplace and learner utilizing structured curriculum.*
- *The educational level of the program is established through learners' current competencies and needs rather than their existing educational qualifications.*
- *An important part of learning occurs in the workplace.*
- *The educational institute assesses the outcomes of the programs with respect to a framework of standards to assure the quality of learning<sup>37</sup>.*

Three main forms of work-based learning include apprenticeships, internship and co-operative education<sup>38,39</sup>. The emphasis in apprenticeship programs is on learning by doing. Being the most common form of work-based learning in construction, apprentices are instructed by

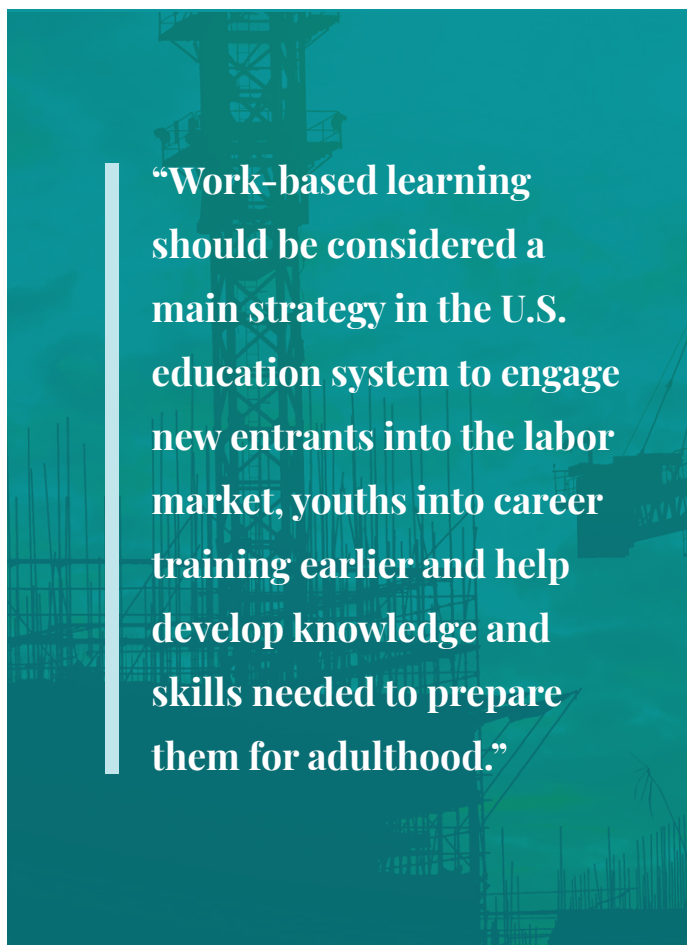
experienced workers and supervisors at the job site and practice their skills in real work environment<sup>40</sup>. Internships are less well-defined and intense form of work-based learning. Usually, students spend time ranging from a few weeks to a full academic year in a position that may be paid or unpaid<sup>41</sup>. The learning connection to school curricula can vary largely<sup>42</sup>. Co-operative education is a form of internship but more structured. Co-operative programs are designed to place students in companies during an academic term in either a paid or an unpaid position as part of a course for credit. The student's learning experience is monitored by a coordinator and/or the teacher of the course<sup>43</sup>.



Many education reformers argue that work-based learning should be a much more significant part of the U.S. education system, however it remains an underutilized academic strategy<sup>44,45</sup>, although there are current on-going efforts at the time of this publication to significantly expand the use of work-based learning in the U.S workforce system.

Some believe that work-based learning is limited to those who have already completed professional education and need to gain experience in their fields. From this perspective, work-based learning is a mean of transition to work and occurs after people choose their career<sup>46</sup>. Work-based learning can be utilized as a strategy for exploring career possibilities and gaining the knowledge and skills to prepare young people into mature and responsible members of society. Work-based learning emphasizes education through occupations, instead of education for occupations<sup>47,48</sup>. Furthermore, work-based learning is not only teaching new entrants into the labor market and youths

a specific trade but also preparing them for adulthood<sup>49</sup>. Work-based learning should be considered a main strategy in the U.S. education system to engage new entrants into the labor market, youths into career training earlier and help develop knowledge and skills needed to prepare them for adulthood.



**“Work-based learning should be considered a main strategy in the U.S. education system to engage new entrants into the labor market, youths into career training earlier and help develop knowledge and skills needed to prepare them for adulthood.”**

Per the Department of Labor, approximately 500,000 apprentices were registered with the Bureau of Apprenticeship and Training in 2016<sup>50</sup>. The average age of participants is 30 with most having a formal education attainment of a high school degree<sup>51</sup>. This creates a 12-year gap between postsecondary and secondary education for this population.

Since most participants are well beyond high school, the registered apprentice system has not been considered as a component of secondary school education reform<sup>52</sup>.

Employers’ participation is one of the main elements of work-based learning programs<sup>53,54</sup>. Many European countries, like Germany where work-based learning is common, have a culture of employer participation in workforce development efforts including apprenticeship. Three main reasons motivate employers to enter these programs: philanthropic motivations, individual self-interests and collective benefits<sup>55</sup>. Several researchers indicated that

employers’ commitment to their communities is at least as important as self-interest factors<sup>56,57,58</sup>. Effectively utilizing work-based learning programs in the construction industry will lead to reduced labor costs, qualified journeymen and, ultimately, long-term sustenance of the industry<sup>59</sup>.

There are a number of issues preventing significant expansion of work-based training. These challenges include limited occupational and gender reach, poor understanding of apprenticeships among American workers and businesses, costs to businesses to be involved in the programs and lack of integration with the education system<sup>60</sup>. The reluctance or unwillingness of U.S. employers to invest in apprenticeship programs is due to several factors, including the long periods of indentured service required by apprenticeships, the administrative burdens of maintaining an apprenticeship and the reluctance of employers to train people who may take their skills to another employer<sup>61</sup>.

The administrative processes and procedures required for the U.S. registered apprenticeship programs deter the participation of companies and training programs, which results in under reporting and potentially misallocation of governmental resources. While the federal government provides significant aid for college students through subsidized and unsubsidized student loans, there is no automatic and direct assistance for businesses or workers in work-based learning programs. In contrast, the government in many other countries significantly subsidize the cost of apprenticeships. In addition, not all states have tax incentives for businesses offering apprenticeships. Other specific barriers with current apprenticeship, include time requirements that are rigid, not always business-relevant and not suitable for individuals to excel and progress. Furthermore, on-the-job training (OJT) hours are limited by available work hours on construction job sites, although some companies do collaborate with other companies and trade associations to overcome this challenge. Another challenge is to ensure that the OJT hours are rotated among different construction tasks and are valid in actual supervised work being performed to support the necessary learning outcome of an apprenticeship.

Adult learners need to be treated differently compared to younger learners and this has implications for work-based learning. One model that can adapt to adult learners is competency-based learning. Competency is the capability to apply or use a set of related knowledge, skills and abilities required to successfully perform work functions in a defined work setting<sup>62</sup>. Main advantages of a competency-based approach towards work-based learning include:

- *Giving learners greater flexibility in balancing their studies and personal responsibilities.*
- *Giving learners the opportunity to study at their own pace.*
- *Enabling pre-assessment of competencies.*
- *More easily communicating the competencies needed to master or achieve career goals.*
- *Accelerating completion of qualification by enabling prior learning to be recognized.*
- *Entering the workforce based on demonstration of competency<sup>63,64</sup>.*

Traditional four-year apprenticeships as a main form of work-based learning may be too long to be attractive in today's labor market, and efforts need to be made to determine the shortest potential length of training necessary by employing the latest techniques, without sacrificing proficiency to ensure competency of the learners<sup>65</sup>.

There have been long-term debates in the industry regarding the reform of Davis-Bacon in terms of its classification of apprenticeships to allow their wages to be below prevailing wages. Many considered the restrictions that only the apprenticeships registered with the U.S. Department of Labor be allowed to be paid less than prevailing wages as too restrictive and counter to the intent of the law that individuals in their formative training years be paid less than certified journeymen. A broader definition of apprenticeship without sacrificing quality as to the training and mentorship received by apprentices would serve the industry well and encourage greater use of apprentices on construction job sites throughout the nation.

In addition, there is a difference between employers' and individuals' view on required skills. Usually employers tend to have a narrower vision of the individual's skill needs, which is more short-term in nature. Therefore, it is necessary to ensure that work-based learning programs

balance this employer priority with the long-term need to equip individuals with a broader set of transferable skills. This approach ensures that individuals are equipped with a broad set of foundational skills, which will make them more resilient to potential changes in the labor market<sup>66</sup>. Industry-, education- and government- recognized certification programs that allow workers to demonstrate proficiency against appropriate industry-defined criteria are a valuable workforce development asset.

Finally, students and parents' lack of knowledge about successful career opportunities afforded by work-based learning programs may be a more significant problem for promoting these programs than other barriers<sup>67</sup>. The perception of parents, school administrators, counselors and politicians towards work-based learning should be changed. Work-based learning should not be considered a lesser alternative compared to traditional academic learning or failure. Rather, it is an equivalent occupational pathway.



## WHO:

- Federal and State Governments
- Department of Education
- Department of Labor
- State Department of Economic Opportunity
- State Department of Commerce
- Business and Industry Leaders

## WHAT:

To significantly improve work-based learning programs, these initiatives need to occur:

- *Streamline the bureaucratic requirements and administrative processes for both employers and training providers in order to encourage them to participate in registered apprenticeship programs by*
  - *Reducing time to approval.*
  - *Providing consistent guidelines for applications and reporting guidelines across all states.*
- *Recognizing work-based learning models as equivalent to registered apprenticeship such as the ones provided by the NCCER and North America Building Trades Apprenticeship Programs and recognize these programs in adherence to Davis Bacon.*
- *Providing federal and state tax incentives for employers who invest in developing their workers.*
- *Creating more flexible training schedule options according to companies' constraints and available positions by encouraging the development of competency-based and accelerated training.*
- *Allocating federal and state funding and providing tax incentives to registered apprenticeships and work-based learning programs based on both program enrollments and their performance.*



# 3 Measure Performance and Involvement in Workforce Development When Awarding Construction Contracts

## WHY:

A skilled workforce is essential to safety, productivity and sustainability of construction and maintenance activities. Studies show that projects with skilled workforce shortage experience cost and schedule overruns and increased safety incidents<sup>68,69</sup>(Figure 6 & 7).

As owners recognized the importance of safety, they held their contractors to high standards of safety performance. Owner initiatives in this regard, such as improvement in construction safety and industry adoption of advanced technologies, have resulted in significant industry-wide changes in safety performance.

Similarly, owners have noticed that a qualified workforce is critically important to safety, productivity, on-time and on-budget completion of construction projects. They also understand that the competence and quality of a contractor’s workforce is the direct result of the contractor’s commitment to workforce development.

A previous CII research (CII RT-252) examined the use of the Construction Workforce Development Assessment (CWDA), which was developed by NCCER and the Construction Users Roundtable in collaboration with Associated Builders and Contractors and Associated General Contractors of America<sup>70</sup>.

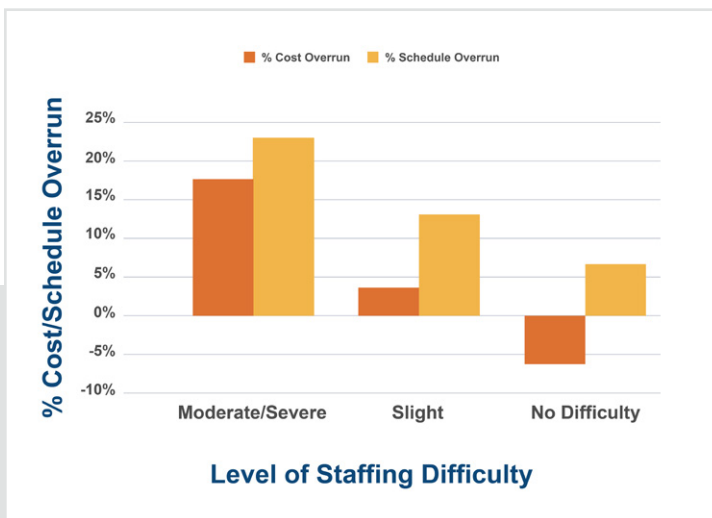


Figure 6: Impact of Workforce Shortages on Cost and Schedule

Note: All results statistically significant beyond 95 percent confidence.

Source: Karimi, H., Taylor, T. R., & Goodrum, P. M. (2017). "Analysis of the impact of craft labor availability on North American construction project productivity and schedule performance." *Construction Management and Economics*. 35(6). pp. 368-380.

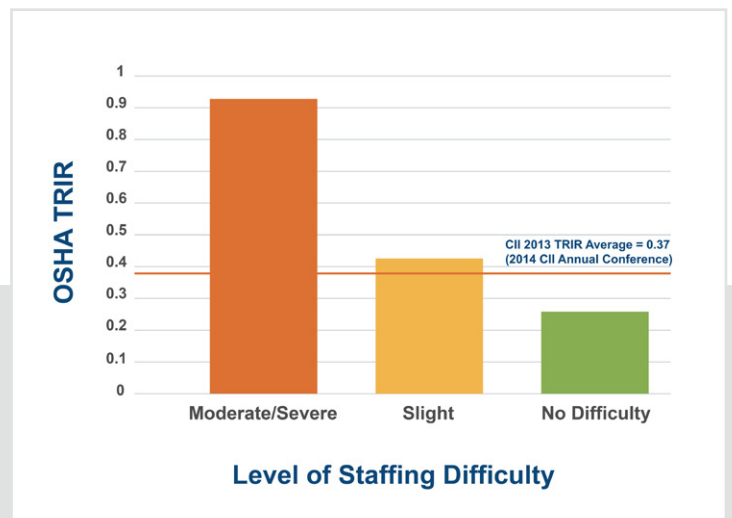


Figure 7: Impact of Workforce Shortages on Safety Performance

Note: All results statistically significant beyond 95 percent confidence.

Source: Karimi, H., Taylor, T., Goodrum, P., and Srinivasan, C. (2016). "Quantitative Analysis of the Impact of Craft Worker Availability on Construction Project Safety Performance." *Emerald Journal of Construction Innovations*. 16.3.

The CWDA provides a 0 to 100 rating of a contractor's commitment to workforce development across a range of elements. The intention of the CWDA is to allow workforce development to become a key criterion in both the prequalification and the final selection of contractors, just as contractor safety, quality and schedule are key selection criteria.

CII RT-252 found that construction firms that score higher on the CWDA also reported lower recordable incident rates, which is an indication of overall improved construction performance. The study also revealed that the most important workforce development element is the firm's formal policy for or commitment to providing a formal craft skills training program. Interestingly, the contractors, owners and other training professionals that participated in the study had the same perception towards the relative importance of workforce development elements.

"Owners should only do business with contractors who invest in training and maintain the skills of their workforce<sup>71</sup>." Moreover, "individual contractors must recognize the necessity and benefits of training their employees and be willing to invest in it<sup>72</sup>."

**“Owners should only do business with contractors who invest in training and maintain the skills of their workforce.”**



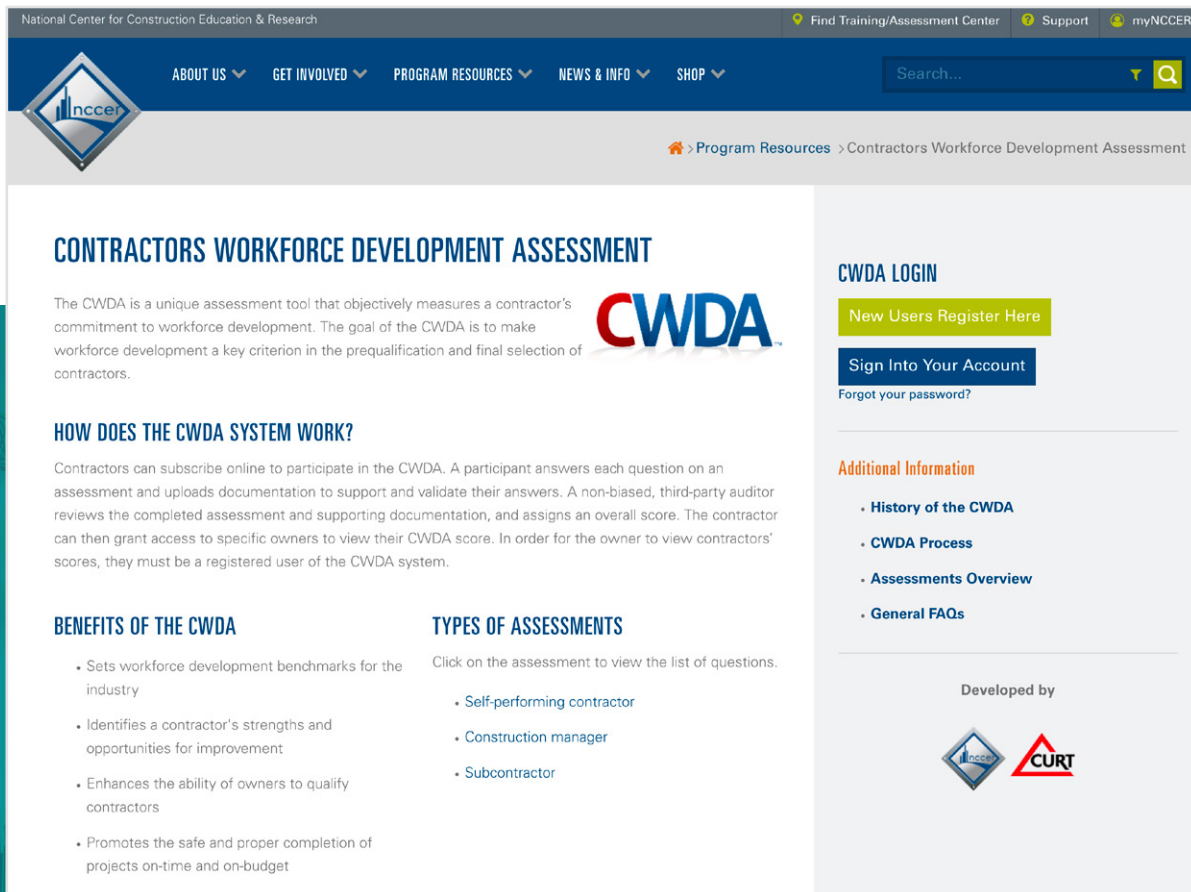
## WHO:

- Municipal and Private Purchasers of the Construction Industry Services

## WHAT:

The nation's government and businesses must become more engaged in workforce development as part of ensuring the future availability of skilled labor. Governmental agencies and businesses who issue construction contracts need to include construction firms' dedication and commitment to workforce development in much the same way as safety, quality, schedule and cost is considered today. Perhaps by offering high tax incentives to employers whose workforce

development programs have been evaluated and rated by a third party, the federal and state government can encourage construction firms to provide more rigorous workforce development programs. Metrics such as CWDA, which allow a contractor's workforce development commitment and program quality to be effectively evaluated, can be used by third parties to audit construction firms.



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### CONTRACTORS WORKFORCE DEVELOPMENT ASSESSMENT

The CWDA is a unique assessment tool that objectively measures a contractor's commitment to workforce development. The goal of the CWDA is to make workforce development a key criterion in the prequalification and final selection of contractors.

### HOW DOES THE CWDA SYSTEM WORK?

Contractors can subscribe online to participate in the CWDA. A participant answers each question on an assessment and uploads documentation to support and validate their answers. A non-biased, third-party auditor reviews the completed assessment and supporting documentation, and assigns an overall score. The contractor can then grant access to specific owners to view their CWDA score. In order for the owner to view contractors' scores, they must be a registered user of the CWDA system.

### BENEFITS OF THE CWDA

- Sets workforce development benchmarks for the industry
- Identifies a contractor's strengths and opportunities for improvement
- Enhances the ability of owners to qualify contractors
- Promotes the safe and proper completion of projects on-time and on-budget

### TYPES OF ASSESSMENTS

Click on the assessment to view the list of questions.

- Self-performing contractor
- Construction manager
- Subcontractor

### CWDA LOGIN

New Users Register Here

Sign Into Your Account

Forgot your password?

### Additional Information

- History of the CWDA
- CWDA Process
- Assessments Overview
- General FAQs

Developed by

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Figure 8: Contractors Workforce Development Assessment (CWDA)

# 4 Redefine How We Measure the Quality of Our Nation's Secondary Education System by Career and College Readiness

## WHY:

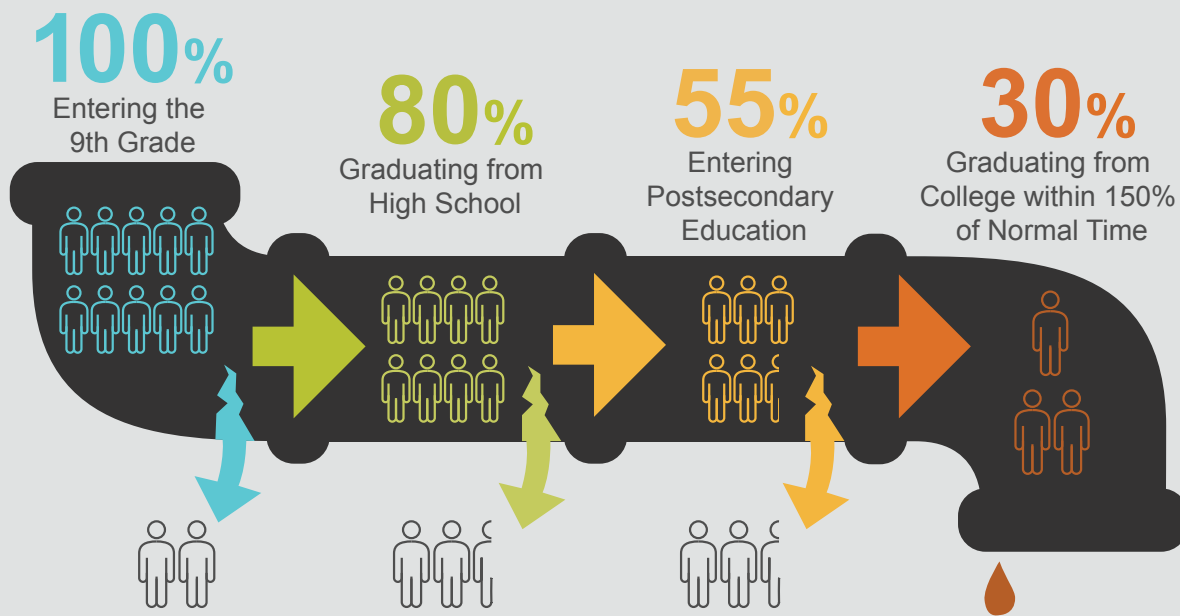
In terms of preparing graduates of our nation's secondary education system, "career readiness" and "college readiness" are currently used interchangeably. Although academic proficiency is essential for any post-high school achievement, career readiness is a broader concept than just preparing individuals for university studies. The goal of career readiness is to prepare every student for a successful transition into the workplace as a productive member of society. From a macro perspective, the interconnectedness of the secondary education system with the economy makes career readiness important.

However, several indicators show that there is disconnect between the education system and the U.S. economy. Studies indicate there is a skills gap in the labor market<sup>73,74</sup>.

A recent survey conducted by Manpower Group found that construction craft workers, technicians, sales representatives and machine operators are the top jobs that employers have the greatest trouble finding qualified applicants<sup>75</sup>. These are the type of jobs that CTE programs are meant to address by providing a qualified workforce. Specifically, about 26,000 construction firms participated in the AGC's survey in 2017 and reported that growing workforce shortages have made it difficult to find qualified workers and will continue to be a challenge in the foreseeable future<sup>76</sup>. The U.S. labor market faces a situation in which many young adults lack the skills required for many jobs needed by the economy<sup>77</sup>.

In today's society, there is an implicit assumption that just entering college can guarantee a young adult's success





**Figure 9: Educational Pipeline**

Source: U.S. Department of Education, National Center for Education Statistics. (2017). *The Condition of Education 2017 (NCES 2017-144)*, Public High School Graduation Rates, Retrieved from [https://nces.ed.gov/programs/coe/indicator\\_coi.asp](https://nces.ed.gov/programs/coe/indicator_coi.asp)

U.S. Department of Education, National Center for Education Statistics. (2017). *The Condition of Education 2017 (2017-144)*, Immediate College Enrollment Rate, Retrieved from [https://nces.ed.gov/programs/coe/indicator\\_cpa.asp](https://nces.ed.gov/programs/coe/indicator_cpa.asp)

U.S. Department of Education, National Center for Education Statistics. (2017). *The Condition of Education 2017 (NCES 2017-144)*, Undergraduate Retention and Graduation Rates, Retrieved from [https://nces.ed.gov/programs/coe/indicator\\_ctr.asp](https://nces.ed.gov/programs/coe/indicator_ctr.asp)

in the labor market and this is the only way to succeed<sup>78</sup>. However, data suggests a different story. Figure 9 indicates that for every 100 students entering the ninth grade, only 80 will graduate from high school on time; only 55 will enter postsecondary education and training; and only 30 will graduate from college with a bachelor's degree within six years or an associate in three years. Despite this enthusiasm for earning a four-year college degree, not all young adults can successfully finish college. In fact, the college dropout rate in the U.S. is the highest rate among the industrialized countries<sup>79</sup>. According to U.S. Department of Education, only 59 percent of those enrolling in a four-year college attain a bachelor's degree after six years<sup>80</sup>. Only about 40 percent of young people attained either an associate's or bachelor's degree by their mid-twenties. This number is even lower for young people of color: 30 percent for African-Americans and 20 percent for Latinos<sup>81</sup>. These numbers remind us that while attaining a four-year college degree is a viable option for some, it cannot be the only path for success.

One of the main goals of the education system is to train accountable professionals. Accountability refers to the expectation that professionals should have enough knowledge in their fields and ability to employ that knowledge in practice<sup>82</sup>. Nevertheless, the education system does not have any specific plan for young people who neither intend to go to college nor finish it successfully. Some authors referred to these group as the "forgotten half" and argue that the education system prevents them from pursuing an opportunity of meaningful participation in society, because they are not well equipped with required skills and knowledge<sup>83,84</sup>.

However, our education system places significant emphasis on college readiness<sup>85</sup>. High schools exert significant implicit and explicit pressure on students to choose to go college. Some of these pressures are institutionalized in form of: college fairs, campus visitations, financial aids, college-choice workshops for parents, announcing

list of graduates, the colleges they are planning to attend scholarships they have been awarded and giving extra value to grades earned in special college prep courses<sup>86</sup>. In addition, some argued that the state and federal programs, such as No Child Left Behind, renewed the push for high scores on standardized tests<sup>87</sup>.

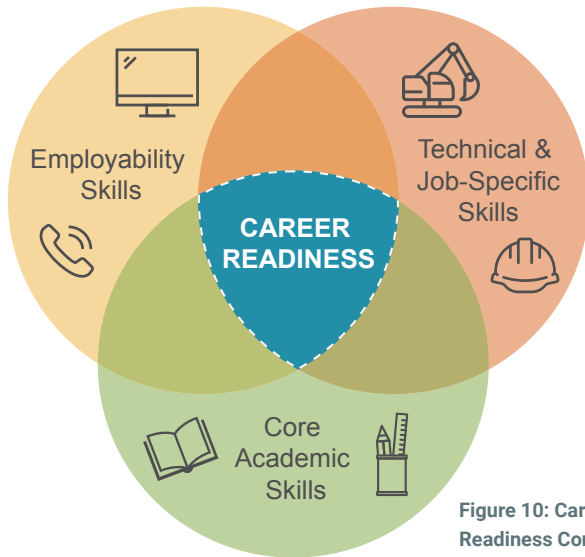


Figure 10: Career Readiness Components

It is noteworthy to mention indicators measured by non-governmental entities such as U.S. News' and Newsweek's high school rankings also do not consider career readiness<sup>88,89</sup>. Rather, most high school rating indexes place significant weight on college readiness, which does not meet the need of many high school graduates whose interest are in occupations are outside the scope of university studies. However, the goal of CTE is to provide people with the academic, technical, and employability skills and knowledge to pursue postsecondary training or higher education and enter a career path<sup>90</sup>. These programs are designed to help individuals to attain the competencies such as critical thinking, collaboration, problem solving, teamwork and communication by work and workplace exposure<sup>91</sup>.

According to the Association for Career and Technical Education (ACTE), career readiness is defined as:

- Core academic skills and the ability to apply those skills to concrete situations in order to function in the workplace and in routine daily activities.
- Employability skills (such as critical thinking and responsibility) that are essential in any career area.
- Technical, job-specific skills related to a specific career pathway.

Several studies document the positive effects of CTE on students' test scores, academic grade point averages and graduation rates<sup>92,93</sup>. U.S. Department of Education data also indicates average high school graduation rate for students concentrating in CTE is 93 percent compared to the 80percent national average<sup>94</sup>. One possible explanation for these positive impacts is that students who are participating in these programs can see the clear connection between learning materials and tangible opportunities in the labor market<sup>95</sup>. Other research found that the work-based learning environment provided by CTE training programs helps students apply their learning in real settings, increase academic motivation, navigate their career path and develop critical understanding of the work requirements<sup>96</sup>. Although these positive effects are not limitless and there is a threshold for it<sup>97</sup>.

Since the education system is a key driver of our nation's economic system, one of its main goals is to provide the economy with the inflow of required talents. The over-focus of U.S. society on four-year college degrees over the past several decades, through a noble and well-intended goal, has thrown the interconnected systems of society out of balance and is detrimental to both society and the individual. By measuring the performance of our secondary education system based on both students' career readiness and college readiness, we can ensure that the needs of all of our nations' high school students are met as well as the needs of our nation's economy.

## WHO:

- Federal and State Government
- Department of Education
- Department of Labor
- Business and Industry Leaders
- Community Colleges and Universities

## WHAT:

This policy recommends that the U.S. education system adopt a standard to measure individuals' career readiness in order to evaluate the performance of the nation's secondary education system and to provide greater incentive to ensure the career readiness of all high school graduates. At a minimum, all high school graduates should be career ready. In addition, all high school graduates should be prepared to pursue a variety of postsecondary opportunities, including career and technical education, work-based learning and higher education. Furthermore, primary and secondary school systems should be evaluated on their effectiveness in preparing students for career readiness for postsecondary opportunities with equal weighting to all postsecondary options.

The message communicated to all young people in our primary and secondary education system about their future should be balanced and focused on postsecondary success instead of an emphasis on a single postsecondary opportunity (e.g. university admission). Young people and their parents should be aware of all opportunities and their costs.

**“Students who are participating in these programs can see the clear connection between learning materials and tangible opportunities in the labor market.”**



# 5 Increase the Participation of Underrepresented Groups in CTE

## WHY:

The groups that represent the greatest opportunity for new workers in the construction industry include women, minorities and veterans. Underrepresented groups in construction are populations that hold a smaller percentage in the U.S. construction industry than that same population holds in the total U.S. workforce. In the context of the U.S. construction industry, this definition applies to women (who represent 9.1 percent of the U.S. construction workforce compared to 46.9 percent of the total employed U.S. workforce), blacks or African Americans (who represent 6.1 percent of the U.S. construction workforce compared to 12.1 percent of the total employed U.S. workforce), and Asians (who represent 1.9 percent of the U.S. construction workforce compared to 6.2 percent of the total employed U.S. workforce). To increase the numbers of these groups within the construction industry we must increase their presence within secondary and postsecondary CTE programs. This policy helps in recruiting these individuals into construction, but the industry must also do a better job of retaining these future professionals with improved worksite conditions and other incentives.

Increasing female and minority participation in construction craft occupations is one of the quickest solutions available to the industry to reduce its skilled workforce shortage<sup>98</sup>. Regarding participation of women craft workers, a study conducted by National Women’s Law Center indicated the percentage of women in construction trades has remained almost the same from 1983 to 2010<sup>99</sup>. This creates a major contrast between jobs in the construction industry and other industries regarding gender diversification. In fact, the percentage of women in many occupations that used to be more male-dominated have increased during the same time (i.e., 1983 to 2010). African Americans represent less than 10 percent of the construction industry workforce. Studies suggest that the low participation rate among African Americans stems from a misconception that construction is

**“Increasing female and minority participation in construction craft occupations is one of the quickest solutions available to the industry to reduce its skilled workforce shortage.”**

a dead-end career for them. In addition, these studies also indicate that African Americans are not choosing careers in construction because of the industry’s negative image, a lack of understanding of the rewarding careers construction offers, and a lack of positive mentors from within the construction industry. To begin attracting greater numbers of African Americans, the industry must provide effective career education to both students and parents, especially in urban school districts. This effort should focus on the satisfaction and lifestyle they can achieve through careers in construction; comprehensive training and education leading to industry-recognized credentials through CTE and industry-provided work and learn programs; and positive role models and mentors within the industry. Finally, the industry must be willing to invest in assisting these students in meeting fundamental logistical challenges such as tuition and lab fees, transportation to schools and job sites, proper personal protective clothing, equipment and tools.



Immigrants have always played a significant role in the U.S. labor force<sup>100</sup>. The construction industry has experienced a dramatic growth in the number of immigrant workers during last decades, vast majority of them coming from Latin America countries<sup>101</sup>. It is estimated that immigrants now account for about 23 percent of the construction workforce while 84 percent of them come from Mexico and other Latin America countries<sup>102</sup>. However, most immigrant workers are concentrated in occupations with relatively low wages which do not require high skills and a formal education<sup>103,104</sup>. Immigrant workers have also higher percentage of job-related incidents and fatalities<sup>105,106,107</sup>. These findings suggest greater demand for investing in immigrant workers in areas such as hiring, education and training, communicating and building trust, improving working conditions and overcoming language and cultural barriers<sup>108,109,110</sup>.

There are programs to assist veterans in transitioning into the civilian workforce, such as Hard Hat Heroes and Helmets to Hard Hats. However, the communication and utilization of these programs must be improved. Additionally, ex-offenders represent a huge labor pool but they are not always welcomed into the construction industry<sup>111</sup>. Ex-offenders can also be another source of skilled workers. In spite of having received certification through NCCER, American Welding Society, Automotive Service Excellence and other entities, many ex-offenders are either unemployed or underemployed<sup>112</sup>. The construction industry can help and motivate ex-offenders to be employed in the industry and provide better long-term outcomes for these individuals by offering initiatives suggested under this policy. However, there are a number of obstacles to reaching these specific labor populations:

- *The lack of CTE programs available to these individuals in either their secondary, postsecondary or communities.*
- *Currently, many lack the educational background, fundamental intermediate technical skills and industry experience for entry-level employment, and the skill sets required for success.*
- *Many individuals from underrepresented groups do not understand or are not aware of the industry career opportunities.*
- *Many lack knowledge on how to tap into the industry for job opportunities.*
- *Many lack financial resources to attend technical training and may have cultural and language barriers that hinder their ability to learn and grow.*

## WHO:

- Federal and State Government
- Department of Education
- Department of Labor
- Department of Defense
- Department of Corrections
- Community-based Organizations
- Business and Industry

## WHAT:

We increase the recruitment of underrepresented groups in CTE through these initiatives:

- *Without a more inclusive and accommodating workplace environment, increased participation within CTE programs from these groups will not be successful. The construction industry must improve job site conditions and company policies to attract and retain under-represented groups into construction.*
- *Initiate mentoring programs specifically designed for women within CTE programs.*
- *Utilize community/faith-based organizations that are familiar with the immigrant population for outreach, recruitment and coordination of Vocational English-as-a Second-Language, training activities, job readiness, job requirements and expectations.*
- *To assist and raise the awareness of veteran-focused CTE training programs, strengthen and support hiring opportunities for veterans.*
- *Develop and implement marketing, career education and outreach strategy that specifically targets the underserved areas/populations.*
- *Establish a pool of resources such as retiring industry personnel to teach, mentor and tutor CTE program participants.*
- *To better support CTE programs within correctional facilities, encourage project owners with low security level clearance requirements on their projects to utilize ex-offenders to fill staffing needs.*



# 6 Establish and Expand Collaboration between Industry, Education and Government

## WHY:

At a minimum, all secondary and postsecondary graduates must be career ready and better collaboration between industry, education and government will ensure this standard is satisfied. Industry and business leaders directly feel the challenge of recruiting people in non-managerial role with required skills, training and education<sup>113</sup>. To promote CTE in both secondary and postsecondary education levels, the industry must take an active role and educational institutions must value industry feedback. Since CTE courses often combine classroom-based instruction with work-based learning, internships or apprenticeships, students will be provided with the opportunity to work with local employers<sup>114</sup>. On the other hand, industry can carry out several important roles to reinforce CTE. Businesses and firms can serve as advisors to CTE programs to ensure that curriculum and instruction are relevant, up-to-date and reflect changing technologies and knowledge. They can provide information about careers and the skill sets needed to hold certain jobs, mentor students about career opportunities and pathways, donate equipment, provide industry experts as adjunct faculty or volunteer teachers and offer teachers externships during the summer so that they can learn about new careers, processes and technologies<sup>115,116</sup>.

However, there are obstacles facing government, businesses and educators to cooperate in promoting CTE. Finding community colleges and/or employers that are willing to develop partnerships or offer work-based placements can be challenging<sup>117</sup>. Some employers, particularly in small and medium sized firms where the majority of new jobs are being created, neglect to engage in workforce development initiatives<sup>118</sup>.

On the other hand, employers are often frustrated with the speed of government agencies and educational institutions to respond to their immediate needs. To respond to this challenge, states have established regional groups of employers within an industry, who advise workforce and education agencies. Such examples exist in both Alabama and California, which have developed regional workforce development boards to provide an interface between industry and regional school districts and community colleges<sup>119,120</sup>. Such industry and governmental collaborations, include European Chambers of Commerce organization in Austria, Germany and Switzerland, play a significant role in fostering CTE programs in these respected countries and help industry develop work-based training programs. A similar collaboration on a national scale in the U.S. is the National Fund for Workforce Solutions, although it does not have that level of governmental involvement due to its private source of funding.

Another successful example of such collaboration in the U.S. is Louisiana's Jump Start program. The program provides high school students with the opportunities to attain industry-valued credentials in their career paths that lead them to high demanding jobs. At the same time, they are prepared to continue their postsecondary education. This collaboration between school districts, colleges, businesses and workforce development experts help K-12 CTE strategy to be aligned with the state's economic development strategies<sup>121</sup>.

Most successful and sustainable CTE programs have succeeded in establishing partnerships among business, industry, the state, and educators. Therefore, this policy helps to improve the collaborative relationships between government, education system, construction training providers and industry.



## WHO:

- Federal and State Government
- Department of Education
- Business and Industry

## WHAT:

The goals of expanding business and industry collaboration with government and education are to:

- *Establish meaningful performance metrics that drive effective collaboration with education, industry and government.*
- *Identify competencies needed by the industry for the jobs and careers they provide.*
- *Help to evaluate and identify CTE curricula and training materials according to industry needs.*
- *Support and encourage industry workforce development by collaborating with mentors, instructors and other stakeholders in the education system at all levels.*
- *Promote industry involvement and investment into our nation's secondary and postsecondary CTE programs.*
- *Assist industry and educational institutions in navigating governmental regulations as it relates to CTE and work-based training programs.*



# Develop More Balanced Funding between Postsecondary CTE and Higher Education

## WHY:

Several data sources show that the overall money received by CTE programs across the U.S. has declined over the last decade. In fiscal year 2016, Department of Education assigned \$1.13 billion or just 1.7 percent of the total \$68 billion budget to CTE<sup>122</sup>. It is estimated that federal contribution to CTE is at 5 percent with state and local dollars supporting teachers' salaries and much of the CTE infrastructure<sup>123</sup>. The nominal federal budget for CTE has declined by 18 percent since 2005, although the overall education budget has increased during this period (Figure 10). Considering the decrease in value of the U.S. dollar between 2005 and 2016, the actual CTE budget has experienced even greater declines.

According to ACTE, approximately 96 percent of CTE educators reported that their program budgets have declined or have been stagnant<sup>124</sup>. Another survey conducted by National Association of State Directors of Career Technical Education Consortium indicated that most secondary and

postsecondary CTE programs experienced a decline in both federal and state funding while interest in CTE has increased at the same time<sup>125</sup>.

The U.S. must invest more in CTE. CTE programs offer various benefits to students by improving educational attainment and engagement and providing a clear and meaningful connection between education and career paths<sup>126,127,128,129</sup>. From a macro perspective, skilled workforce shortages have become critical in several industries such as construction and manufacturing<sup>130,131</sup>. It is vital for the government to understand the value of CTE in providing industries with a greater skilled workforce. As discussed in other policy recommendations, the U.S. industry typically requires 30 percent of the workforce with a university degree (including a bachelor's or graduate degree) and the remaining 70 percent possess some form of CTE certification<sup>132</sup> (Figure 11). As a result, industry need supports the increased funding in CTE education.

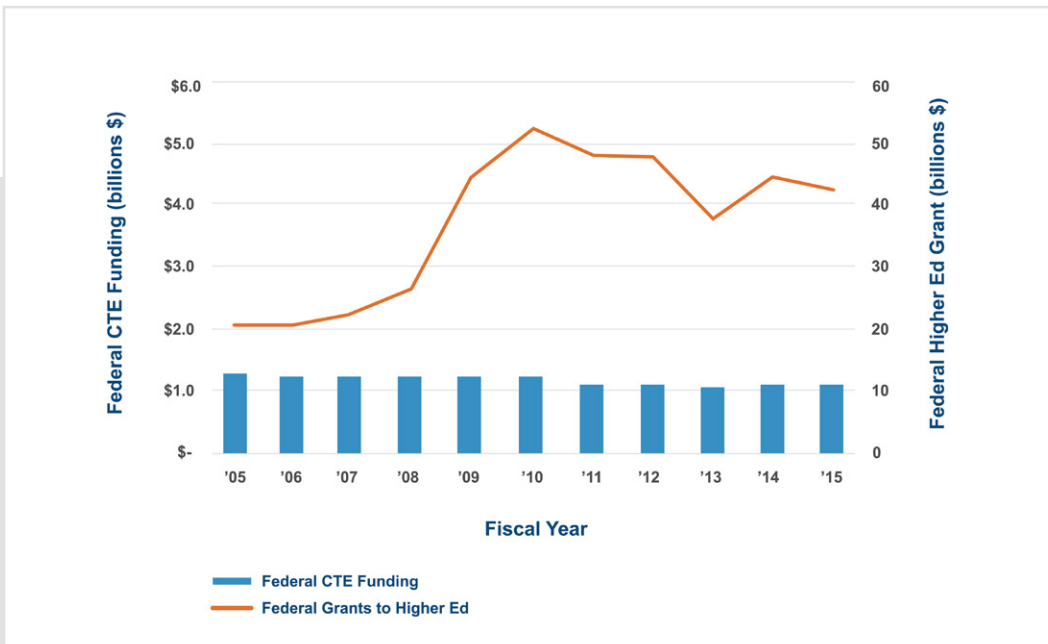


Figure 11: Federal Funding for All CTE

Source: Numbers adopted from the U.S. Department of Education annual budget summary from 2005 to 2016 available at <https://www.ed.gov/>

## The True Ratio of Jobs in the US Economy



Figure 12: True Ratios of Jobs in the US Economy

Note: Based on the U.S. labor market data, for every occupation that needs a master's degree or more, two professional jobs require a university degree, and there are seven jobs requiring a one-year certificate or two-year degree. This ratio is a fundamental to all industries

Source: Gray, K. C., & Herr, E. L. (2006). *Other ways to win: Creating alternatives for high school graduates*. Corwin Press.

CTE is expensive to implement due to costs associated with lab set-up, equipment and materials purchase. Funding issues also influence recruitment of appropriate instructors. Because they can earn so much more money performing the work, it is always difficult to find knowledgeable and industry-certified instructors for CTE programs at the high school and technical college/community college level.

Improved balanced funding will promote more CTE and internship programs and encourage greater industry engagement among postsecondary education institutions. Existing public funding sources are often misaligned with business and industry needs and are not well coordinated from program to program and agency to agency. In addition, the industry is often unaware of the types of funding available to support needed workforce development programs or the mechanism to influence the type and direction of program funding.

**“Most secondary and postsecondary CTE programs experienced a decline in both federal and state funding while interest in CTE has increased at the same time.”**

## WHO:

- Federal and State Government
- Department of Education

## WHAT:

A sizable portion of public education and workforce funding is not effectively allocated to meet the needs of the national economy. To address this issue, the goal of this policy is to increase funding available to CTE programs that prepare the individuals most needed by industry. To achieve this goal, these initiatives are recommended:

- *Incorporate work-based training requirements into federal funding of education programs.*
- *Re-evaluate how existing funding can be used to support technical training and expand the allowance for Title IV funding (e.g. Pell grants and Perkins Bill funding) to apply to appropriate, industry-recognized, accredited technical schools and programs.*
- *Streamline governmental funding for workforce development by consolidating both federal programs and emphasize the use of industry match to better align the available resources with industry need. Examples include:*
  - *Canada-Alberta Job Grant Program.*
  - *Workforce Innovation and Opportunity Act (WIOA) solutions.*
  - *State-supported tuition programs for CTE such as Tennessee College of Applied Technology.*
- *Increase industry/company funding/investment in CTE programs through appropriate governmental tax incentives, internships and scholarships.*
- *Establish competitive grants for states seeking to expand their work-based training and apprenticeship programs.*
- *Ensure incentives exist for individuals to enter into and complete the program (qualifications and employment).*
- *Raise awareness among both public and private funding organizations of the imminent need to focus their attention on high growth industries, such as construction.*





## Endorsements:

The policies advocated in this document were developed by an industry-driven research team led by NCCER and the Construction Industry Institute (CII) and supported by the Construction Users Roundtable, Ironworkers/IMPACT and representatives from CII member firms. The following organizations endorse these policies:

- ACE Mentoring
- American Council for Construction Education (ACCE)
- American Fire Sprinkler Association (AFSA)
- Association for Skilled and Technical Services (ASTS)
- Baker Concrete Construction Inc.
- Barton Malow
- Bechtel
- Brown & Root
- Central Gulf Industrial Alliance (CGIA)
- Cianbro Companies
- Construction Labor Market Analyzer (CLMA)
- Current Builders
- Fluor Corporation
- Gaylor Electric, Inc.
- GRANIX, LLC
- Greater Baton Rouge Industry Alliance, Inc. (GBRIA)
- Gulf Electric Company, Inc.
- Gulf States Shipbuilders Consortium (GSSC)
- Hargrove
- Jacobs
- LPR Construction Company
- McCarthy Building Companies, Inc.
- National Academy of Construction (NAC)
- National Insulation Association (NIA)
- National Maritime Education Council (NMEC) *(Representing the Shipbuilding Industry)*
- National Technical Honor Society (NTHS)
- North American Crane Bureau (NACB)
- Pearson
- Power Up, Inc.
- S&B Engineers and Constructors
- SkillsUSA
- Southeastern Construction Owners and Associates Roundtable (SCOAR)
- Southern States Automotive Contractors Association (SSACA)
- Steel Erectors Association of America (SEAA)
- Sundt Construction, Inc.
- The Association of Union Contractors (TAUC)
- The Austin Company
- The Dow Chemical Company
- The Haskell Company
- The Southern Company
- TIC - The Industrial Company
- Turner Industries Group, LLC
- University of Colorado at Boulder
- University of Florida, M.E. Rinker, Sr. School of Construction Management
- University of Kentucky
- Wayne J. Griffin Electric, Inc.
- Willmar Electric Service

## References:

- <sup>71</sup> The Business Roundtable (1997). *Confronting the Skilled Construction Workforce Shortage: A Blueprint for the Future*.
- <sup>72</sup> The Construction Users Roundtable – CURT (2004). *Confronting the Skilled Construction Workforce Shortage*. WP-401. (Reprint)
- <sup>1</sup> World Economic Forum (2015). *Quality of Roads*. Last Retrieved March 1, 2018 from [https://www.theglobaleconomy.com/rankings/roads\\_quality/](https://www.theglobaleconomy.com/rankings/roads_quality/)
- <sup>2</sup> American Society of Civil Engineers – ASCE (2017). *Infrastructure Report Card*. Last Retrieved March 1, 2018 from <https://www.infrastructurereportcard.org/>
- <sup>3</sup> Business Round Table – BRT (1983). *More construction for the money. Construction Industry Cost Effectiveness Project, Summary Report, The Business Round Table*.
- <sup>4</sup> Business Round Table – BRT (1997). *Confronting the skilled construction workforce shortage. Construction Cost Effectiveness Task Force, Summary Report, The Business Round Table*.
- <sup>5</sup> Construction Users Roundtable - CURT (2001). *The Skilled Construction Workforce Shortage and the CURT 2001 Workforce Development Survey Results. The Construction Users Roundtable*.
- <sup>6</sup> Construction Industry Institute – CII (2015). *Is there a demographic craft labor cliff that will affect project performance? Research Team number RT318*, Austin, TX, 2015.
- <sup>7</sup> Karimi, H., Karimi, H., Taylor, T. R., Taylor, T. R., Goodrum, P. M., Goodrum, P. M., & Srinivasan, C. (2016). Quantitative Analysis of the impact of craft worker availability on construction project safety performance. *Construction Innovation*, 16(3), 307-322.
- <sup>8</sup> Karimi, H., Taylor, T., & Goodrum, P. M. (2017). Analysis of the impact of craft labor availability on North American construction project productivity and schedule performance. *Construction Management and Economics* 35(6), 368-380.
- <sup>9</sup> Construction Industry Resources, LLC. Estimates developed January 31, 2017
- <sup>10</sup> Construction Industry Resources, LLC. Estimates developed January 31, 2017
- <sup>11</sup> Construction Industry Resources, LLC. Estimates developed January 31, 2017
- <sup>12</sup> Robert Wood Johnson Foundation and the Harvard T.H. Chan School for Public Health (2015). *Sports and Health in America*, Last Retrieved January 1, 2018 from <https://media.npr.org/documents/2015/june/sportsandhealthpoll.pdf>
- <sup>13</sup> National Collegiate Athletic Association (NCAA) (2017). *Estimated probability of competing in college athletics*, Retrieved January 1, 2018 from <http://www.ncaa.org/about/resources/research/estimated-probability-competing-college-athletics>
- <sup>14</sup> Gray, K. C., & Herr, E. L. (2006). *Other ways to win: Creating alternatives for high school graduates*. Corwin Press.
- <sup>15</sup> New America Education Policy Program (2015). *College decisions survey*. Last accessed March 2, 2018. <https://www.newamerica.org/education-policy/edcentral/collegedecisions3/>
- <sup>16</sup> U.S. Department of Education (2017), U.S. Department of Education, National Center for Education Statistics. (2017). *The Condition of Education 2017* (NCES 2017-144), Retrieved January 1, 2018 from [https://nces.ed.gov/programs/coe/indicator\\_ctr.asp](https://nces.ed.gov/programs/coe/indicator_ctr.asp)
- <sup>17</sup> Kantrowitz M. (2014). *Debt at graduation*. Retrieved January 1, 2018 <https://www.edvisors.com/media/files/student-aid-policy/20140107-debt-at-graduation.pdf>
- <sup>18</sup> Carnevale, A., Smith, N., and Strohl, J. (2010). *Help Wanted: Projections of jobs and education requirements through 2018*. Center for Education and the Workforce. Georgetown University.
- <sup>19</sup> Taylor, A. (2005). It's for the rest of your life: The pragmatics of youth career decision making. *Youth & Society*, 36(4), 471-503.
- <sup>20</sup> Zafar, B. (2011). How do college students form expectations? *Journal of Labor Economics*, 29(2), 301-348.

- <sup>21</sup> Granitz, N., Chen, S., & Kohli, K. K. (2014). Choosing business as a college major: A survey of high school students. *Journal of the Academy of Business Education*, 15, 1.
- <sup>22</sup> Gray, K. C., & Herr, E. L. (2006). *Other ways to win: Creating alternatives for high school graduates*. Corwin Press.
- <sup>23</sup> Brand, B., Valent, A., & Browning, A. (2013). How Career and Technical Education Can Help Students Be College and Career Ready: A Primer. *College and Career Readiness and Success Center*.
- <sup>24</sup> Plank, S. B., DeLuca, S., & Estacion, A. (2008). High school dropout and the role of career and technical education: A survival analysis of surviving high school. *Sociology of Education*, 81(4), 345-370.
- <sup>25</sup> Castellano, M., Sundell, K., Overman, L. T., & Aliaga, O. A. (2012). Do career and technical education programs of study improve student achievement? Preliminary analyses from a rigorous longitudinal study. *International Journal of Educational Reform*, 21(2), 98-118.
- <sup>26</sup> Neild, R. C., Boccanfuso, C., & Byrnes, V. (2013). The academic impacts of career and technical schools: A case study of a large urban school district. *Center for Social Organization of Schools, Everyone Graduates Center. John Hopkins University*.
- <sup>27</sup> Lekes, N., Bragg, D., Loeb, J. W., Oleksiw, C. A., Marszalek, J., Brooks-LaRaviere, M., Zhu, R., Kremidas, C. C., Akukwe, G., Lee, H., & Hood, L. K. (2007). Career and Technical Education Pathway Programs, Academic Performance, and the Transition to College and Career. *National Research Center for Career and Technical Education*.
- <sup>28</sup> Society for Human Resource Management (2014). *Workforce readiness and skills shortages*, Retrieved January 1, 2018 from [https://www.shrm.org/ResourcesAndTools/hr-topics/behavioral-competencies/Documents/13-0146%20workplace\\_forecast\\_full\\_fnl.pdf](https://www.shrm.org/ResourcesAndTools/hr-topics/behavioral-competencies/Documents/13-0146%20workplace_forecast_full_fnl.pdf)
- <sup>29</sup> Gray, K. C., & Herr, E. L. (2006). *Other ways to win: Creating alternatives for high school graduates*. Corwin Press.
- <sup>30</sup> Carnevale, A., Smith, N., and Strohl, J. (2010). Help Wanted: Projections of jobs and education requirements through 2018. Center for Education and the Workforce. Georgetown University.
- <sup>31</sup> Lerman, R. I., & Rauner, F. (2012). Apprenticeship in the United States. In *Work and Education in America* (pp. 175-193). Springer Netherlands.
- <sup>32</sup> Glover, R. W., & Bilginsoy, C. (2005). Registered apprenticeship training in the U.S. construction industry. *Education+ Training*, 47(4/5), 337-349.
- <sup>33</sup> Olinsky, B., & Ayres, S. (2013). *Training for success: A policy to expand apprenticeships in the United States* (pp. 9-15). Washington, DC: Center for American Progress.
- <sup>34</sup> Schleifer, T. C. (2002). Degenerating image of the construction industry. *Practice Periodical on Structural Design and Construction*, 7(3), 99-102.
- <sup>35</sup> Gray, K. C., & Herr, E. L. (2006). *Other ways to win: Creating alternatives for high school graduates*. Corwin Press.
- <sup>36</sup> Alfeld, C., Charner, I., Johnson, L., & Watts, E. (2013). Work-based learning opportunities for high school students. *National Research Center for Career and Technical Education, Louisville, KY*.
- <sup>37</sup> Boud, D., & Solomon, N. (2001). *Work-based learning: a new higher education?* McGraw-Hill Education (UK).
- <sup>38</sup> Bailey, T. R., Hughes, K. L., & Moore, D. T. (2004). *Working knowledge: Work-based learning and education reform*. Psychology Press.
- <sup>39</sup> Alfeld, C., Charner, I., Johnson, L., & Watts, E. (2013). Work-based learning opportunities for high school students. *National Research Center for Career and Technical Education, Louisville, KY*.
- <sup>40</sup> Lerman, R., Eyster, L., & Chambers, K. (2009). The Benefits and Challenges of Registered Apprenticeship: The Sponsors' Perspective. *Urban Institute (NJ1)*.
- <sup>41</sup> Alfeld, C., Charner, I., Johnson, L., & Watts, E. (2013). Work-based learning opportunities for high school students. *National Research Center for Career and Technical Education, Louisville, KY*.
- <sup>42</sup> Bailey, T. R., Hughes, K. L., & Moore, D. T. (2004). *Working knowledge: Work-based learning and education reform*. Psychology Press.

- <sup>43</sup> Stern, D. (1995). *School to work: Research on programs in the United States* (Vol. 17). Psychology Press.
- <sup>44</sup> Bailey, T. R., Hughes, K. L., & Moore, D. T. (2004). *Working knowledge: Work-based learning and education reform*. Psychology Press.
- <sup>45</sup> Alfeld, C., Charner, I., Johnson, L., & Watts, E. (2013). Work-based learning opportunities for high school students. *National Research Center for Career and Technical Education, Louisville, KY*.
- <sup>46</sup> Bailey, T. R., Hughes, K. L., & Moore, D. T. (2004). *Working knowledge: Work-based learning and education reform*. Psychology Press.
- <sup>47</sup> Hamilton, S. F. (2010). *Apprenticeship for adulthood*. Simon and Schuster.
- <sup>48</sup> Bailey, T. R., Hughes, K. L., & Moore, D. T. (2004). *Working knowledge: Work-based learning and education reform*. Psychology Press.
- <sup>49</sup> Hamilton, S. F. (2010). *Apprenticeship for adulthood*. Simon and Schuster.
- <sup>50</sup> The U.S. Department of Labor (2016). Data and Statistics, Registered Apprenticeship National Results Fiscal Year (FY) 2016, Retrieved January 1, 2018 from [https://doleta.gov/oa/data\\_statistics.cfm](https://doleta.gov/oa/data_statistics.cfm)
- <sup>51</sup> Lerman, R. I., & Rauner, F. (2012). Apprenticeship in the United States. In *Work and Education in America* (pp. 175-193). Springer Netherlands.
- <sup>52</sup> Bailey, T. R., Hughes, K. L., & Moore, D. T. (2004). *Working knowledge: Work-based learning and education reform*. Psychology Press.
- <sup>53</sup> Boud, D., & Solomon, N. (2001). *Work-based learning: a new higher education?* McGraw-Hill Education (UK).
- <sup>54</sup> Bailey, T. R., Hughes, K. L., & Moore, D. T. (2004). *Working knowledge: Work-based learning and education reform*. Psychology Press.
- <sup>55</sup> Bailey, T. R., Hughes, K. L., & Moore, D. T. (2004). *Working knowledge: Work-based learning and education reform*. Psychology Press.
- <sup>56</sup> Lynn, I., & Wills, J. (1994). *School Lessons, Work Lessons. Recruiting and Sustaining Employer Involvement in School-to-Work Programs*. Institute for Educational Leadership, 1001 Connecticut Avenue, NW, Suite 310, Washington, DC 20036.
- <sup>57</sup> Pauly, E., Kopp, H., & Haimson, J. (1994). Home-Grown Lessons: Innovative Programs Linking Work and High School. School-to-Work Transition Project. New York: Manpower Demonstration Research Corporation, 1994.
- <sup>58</sup> Bailey, T. R., Hughes, K. L., & Moore, D. T. (2004). *Working knowledge: Work-based learning and education reform*. Psychology Press.
- <sup>59</sup> Fayek, A. R., Shaheen, A., & Oduba, A. (2003). Results of a pilot study to examine the effective integration of apprentices into the industrial construction sector. *Canadian Journal of Civil Engineering*, 30(2), 391-405.
- <sup>60</sup> Olinsky, B., & Ayres, S. (2013). *Training for success: A policy to expand apprenticeships in the United States* (pp. 9-15). Washington, DC: Center for American Progress.
- <sup>61</sup> Lewis, M. V., & Stone III, J. R. (2011). Should Your School Offer Apprenticeship Training?. *Techniques: Connecting Education and Careers (J1)*, 86(3), 16-21.
- <sup>62</sup> Competency Model Clearinghouse (2015). Competency Models – Communicating Industry’s Education and Training Needs Competency Model Development and Use – A Technical Assistance Guide. Last accessed March 2, 2018. [https://www.careeronestop.org/competencymodel/info\\_documents/tag.pdf](https://www.careeronestop.org/competencymodel/info_documents/tag.pdf)
- <sup>63</sup> Ratcliffe, A. E. (2002). Participants’ perceptions of the effectiveness of a competency-based apprenticeship program (Doctoral dissertation).
- <sup>64</sup> Yasinski, L. (2014). A Competency-Based Technical Training Model That Embraces Learning Flexibility And Rewards Competency. *American Journal of Business Education* (Online), 7(3), 171.
- <sup>65</sup> Sparks, A., Ingram, H., & Phillips, S. (2009). Advanced entry adult apprenticeship training scheme: a case study. *Education+ Training*, 51(3), 190-202.

- <sup>66</sup> Hamilton, S. F. (2010). *Apprenticeship for adulthood*. Simon and Schuster.
- <sup>67</sup> Bailey, T. R., Hughes, K. L., & Moore, D. T. (2004). *Working knowledge: Work-based learning and education reform*. Psychology Press.
- <sup>68</sup> Karimi, H., Karimi, H., Taylor, T. R., Taylor, T. R., Goodrum, P. M., Goodrum, P. M., & Srinivasan, C. (2016). Quantitative Analysis of the impact of craft worker availability on construction project safety performance. *Construction Innovation*, 16(3), 307-322.
- <sup>69</sup> Karimi, H., Taylor, T., & Goodrum, P. M. (2017). Analysis of the impact of craft labor availability on North American construction project productivity and schedule performance. *Construction Management and Economics* 35(6), 368-380.
- <sup>70</sup> Construction Industry Institute (CII) Research Team 252 (2012). Construction Productivity Research Program – Phase IV, *Construction Industry Institute (CII)*, Version 1.1.
- <sup>73</sup> Symonds, W. C., Schwartz, R., & Ferguson, R. F. (2011). *Pathways to prosperity: Meeting the challenge of preparing young Americans for the 21st century*.
- <sup>74</sup> Albattah, M. A., Goodrum, P. M., & Taylor, T. R. (2015). Demographic influences on construction craft shortages in the U.S. and Canada.
- <sup>75</sup> Manpower Group (2016). Talent shortage survey results, Retrieved January 1, 2018 from <http://www.manpowergroup.com/wps/wcm/connect/8ccb11cb-1ad4-4634-84ea-1656ee74b3ed/GlobalTalentShortageSurvey-PressRelease.pdf?MOD=AJPERES&ContentCache=NONE&>
- <sup>76</sup> Associated General Contractors of America (2017). Expecting growth to continue: the 2018 construction hiring and business outlook, Retrieved January 1, 2018 from <https://www.agc.org/sites/default/files/Files/Communications/2018%20Construction%20Hiring%20and%20Business%20Outlook%20Report.pdf>
- <sup>77</sup> Symonds, W. C., Schwartz, R., & Ferguson, R. F. (2011). *Pathways to prosperity: Meeting the challenge of preparing young Americans for the 21st century*.
- <sup>78</sup> Gray, K. C., & Herr, E. L. (2006). *Other ways to win: Creating alternatives for high school graduates*. Corwin Press.
- <sup>79</sup> Symonds, W. C., Schwartz, R., & Ferguson, R. F. (2011). *Pathways to prosperity: Meeting the challenge of preparing young Americans for the 21st century*.
- <sup>80</sup> U.S. Department of Education (2017), U.S. Department of Education, National Center for Education Statistics. (2017). *The Condition of Education 2017* (NCES 2017-144), Retrieved January 1, 2018 from [https://nces.ed.gov/programs/coe/indicator\\_ctr.asp](https://nces.ed.gov/programs/coe/indicator_ctr.asp)
- <sup>81</sup> Symonds, W. C., Schwartz, R., & Ferguson, R. F. (2011). *Pathways to prosperity: Meeting the challenge of preparing young Americans for the 21st century*.
- <sup>82</sup> Norton, R.E., Harrington, L.G. & Gill, J. (1978). *Performance-based teacher education: the state of the art*, Athens, Georgia: American Association for Vocational Instructional Materials.
- <sup>83</sup> Gray, K. C., & Herr, E. L. (2006). *Other ways to win: Creating alternatives for high school graduates*. Corwin Press.
- <sup>84</sup> Symonds, W. C., Schwartz, R., & Ferguson, R. F. (2011). *Pathways to prosperity: Meeting the challenge of preparing young Americans for the 21st century*.
- <sup>85</sup> Symonds, W. C., Schwartz, R., & Ferguson, R. F. (2011). *Pathways to prosperity: Meeting the challenge of preparing young Americans for the 21st century*.
- <sup>86</sup> Gray, K. C., & Herr, E. L. (2006). *Other ways to win: Creating alternatives for high school graduates*. Corwin Press.
- <sup>87</sup> Clark, E. (1997). Designing and implementing an integrated curriculum. *Designing and implementing and integrated curriculum*.
- <sup>88</sup> Newsweek (2017). "Frequently asked questions about Newsweek's high school rankings." Last accessed March 2, 2018. <http://www.newsweek.com/frequently-asked-questions-about-newsweeks-high-school-rankings-268771>
- <sup>89</sup> U.S. News (2017). How U.S. News calculated the 2017 best high schools rankings? , Last accessed March 2, 2018. <https://www.usnews.com/education/best-high-schools/articles/how-us-news-calculated-the-rankings>

- <sup>90</sup> Association for Career and Technical Education (ACTE) (2007). Issue Brief: CTE's role in secondary-postsecondary transitions, Retrieved January 1, 2018 from [https://www.acteonline.org/uploadedFiles/Assets\\_and\\_Documents/Global/files/Publications/Transitions.pdf](https://www.acteonline.org/uploadedFiles/Assets_and_Documents/Global/files/Publications/Transitions.pdf)
- <sup>91</sup> Brand, B., Valent, A., & Browning, A. (2013). How Career and Technical Education Can Help Students Be College and Career Ready: A Primer. *College and Career Readiness and Success Center*.
- <sup>92</sup> Kulik, J. A. (1994). Curricular tracks and high school vocational education. *DOCUMENT RESUME*, 64.
- <sup>93</sup> Plank, S. B., DeLuca, S., & Estacion, A. (2008). High school dropout and the role of career and technical education: A survival analysis of surviving high school. *Sociology of Education*, 81(4), 345-370.
- <sup>94</sup> U.S. Department of Education (2014). Building a Grad Nation: Progress and Challenge in Ending the High School Dropout Epidemic: Annual Update.
- <sup>95</sup> Symonds, W. C., Schwartz, R., & Ferguson, R. F. (2011). Pathways to prosperity: Meeting the challenge of preparing young Americans for the 21st century.
- <sup>96</sup> Alfeld, C., Hansen, D., Aragon, S., & Stone III, J. (2007). Inside the black box: Exploring the value added by career and technical student organizations to students' high school experience. *Career and Technical Education Research*, 31(3), 121-156.
- <sup>97</sup> Plank, S. B., DeLuca, S., & Estacion, A. (2008). High school dropout and the role of career and technical education: A survival analysis of surviving high school. *Sociology of Education*, 81(4), 345-370.
- <sup>98</sup> Schleifer, T. C. (2002). Degenerating image of the construction industry. *Practice Periodical on Structural Design and Construction*, 7(3), 99-102.
- <sup>99</sup> National Women's Law Center. (2012). Women in construction: 6.9 percent is not enough. Retrieved August 10, 2017, from <http://www.nwlc.org/sites/default/files/pdfs/womeninconstructionfactsheet.pdf>
- <sup>100</sup> The Center for Construction Research and Training (2010). Immigrant workers in U.S. Construction: Sharing lessons learned in our unions. Last Retrieved January 1, 2018 from [https://www.cpwr.com/sites/default/files/immigrant\\_workers\\_in\\_construction\\_cpwr-lohp\\_report.pdf](https://www.cpwr.com/sites/default/files/immigrant_workers_in_construction_cpwr-lohp_report.pdf)
- <sup>101</sup> Brunette, M. J. (2004). Construction safety research in the United States: targeting the Hispanic workforce. *Injury Prevention*, 10(4), 244-248.
- <sup>102</sup> Siniavskaia, N. (2015). Immigrant workers in the construction labor force. National Association of Home Builders (NAHB), Last Retrieved January 1, 2018 from [https://www.nahbclassic.org/fileUpload\\_details.aspx?contentTypeID=3&contentID=241345&subContentID=637756](https://www.nahbclassic.org/fileUpload_details.aspx?contentTypeID=3&contentID=241345&subContentID=637756)
- <sup>103</sup> Goodrum, P. M. (2004). Hispanic and non-Hispanic wage differentials: Implications for United States construction industry. *Journal of Construction Engineering and Management*, 130(4), 552-559.
- <sup>104</sup> Siniavskaia, N. (2015). Immigrant workers in the construction labor force. National Association of Home Builders (NAHB), Last Retrieved January 1, 2018 from [https://www.nahbclassic.org/fileUpload\\_details.aspx?contentTypeID=3&contentID=241345&subContentID=637756](https://www.nahbclassic.org/fileUpload_details.aspx?contentTypeID=3&contentID=241345&subContentID=637756)
- <sup>105</sup> Dong, X., & Platner, J. W. (2004). Occupational fatalities of Hispanic construction workers from 1992 to 2000. *American journal of industrial medicine*, 45(1), 45-54.
- <sup>106</sup> Goodrum, P. M., & Dai, J. (2005). Differences in occupational injuries, illnesses, and fatalities among Hispanic and non-Hispanic construction workers. *Journal of Construction Engineering and Management*, 131(9), 1021-1028.
- <sup>107</sup> Hurley, D. T., & Lebbon, A. R. (2012). A comparison of nonfatal occupational injuries and illnesses among Hispanic versus non-Hispanic workers in the United States. *Hispanic Journal of Behavioral Sciences*, 34(3), 474-490.
- <sup>108</sup> Goodrum, P. M., & Dai, J. (2005). Differences in occupational injuries, illnesses, and fatalities among Hispanic and non-Hispanic construction workers. *Journal of Construction Engineering and Management*, 131(9), 1021-1028.
- <sup>109</sup> Dai, J., & Goodrum, P. M. (2011). Differences in perspectives regarding labor productivity between Spanish-and English-speaking craft workers. *Journal of Construction Engineering and Management*, 137(9), 689-697.

- <sup>110</sup> Hurley, D. T., & Lebbon, A. R. (2012). A comparison of nonfatal occupational injuries and illnesses among Hispanic versus non-Hispanic workers in the United States. *Hispanic Journal of Behavioral Sciences*, 34(3), 474-490.
- <sup>111</sup> Schleifer, T. C. (2002). Degenerating image of the construction industry. *Practice Periodical on Structural Design and Construction*, 7(3), 99-102.
- <sup>112</sup> Louisiana Workforce Commission (2013).
- <sup>113</sup> Bridgeland, Richard., J. Milano, and E. Rosenblum (2011), *Across the Great Divide: Perspectives of CEOs and College Presidents on America's Higher Education and Skills Gap*, Civic Enterprises Corporate Voices for Working Families.
- <sup>114</sup> Brand, B., Valent, A., & Browning, A. (2013). How Career and Technical Education Can Help Students Be College and Career Ready: A Primer. *College and Career Readiness and Success Center*.
- <sup>115</sup> Hamilton, S. F. (2010). *Apprenticeship for adulthood*. Simon and Schuster.
- <sup>116</sup> Brand, B., Valent, A., & Browning, A. (2013). How Career and Technical Education Can Help Students Be College and Career Ready: A Primer. *College and Career Readiness and Success Center*.
- <sup>117</sup> Brand, B., Valent, A., & Browning, A. (2013). How Career and Technical Education Can Help Students Be College and Career Ready: A Primer. *College and Career Readiness and Success Center*.
- <sup>118</sup> Hamilton, S. F. (2010). *Apprenticeship for adulthood*. Simon and Schuster.
- <sup>119</sup> Hamilton, S. F. (2010). *Apprenticeship for adulthood*. Simon and Schuster.
- <sup>120</sup> Made in Alabama (2018), Regional Workforce Councils, Last Retrieved January 1, 2018 from <http://www.madeinalabama.com/workforce-and-training/regional-workforce-councils/>
- <sup>121</sup> Louisiana Department of Education (2015), *Louisiana's Jump Start Program*, Last Retrieved January 1, 2018 from <https://www.louisianabelieves.com/docs/default-source/jumpstart/louisiana's-jump-start-program.pdf?sfvrsn=5>
- <sup>122</sup> U.S. Department of Education (2016), *Fiscal Year 2016 Budget Summary and Background Information*, Retrieved January 1, 2018 from <https://www2.ed.gov/about/overview/budget/budget16/summary/16summary.pdf>
- <sup>123</sup> Dortch, C. (2012, December). Carl D. Perkins career and technical education act of 2006: implementation issues. In CRS Report for Congress (Vol. 42858).
- <sup>124</sup> Association for Career and Technical Education (2016), *Building pathways to success*, Retrieved January 1, 2018 from [https://www.acteonline.org/uploadedFiles/Assets\\_and\\_Documents/Global/files/Policy/Funding%20Infographic%202016.pdf](https://www.acteonline.org/uploadedFiles/Assets_and_Documents/Global/files/Policy/Funding%20Infographic%202016.pdf)
- <sup>125</sup> National Association of State Directors of Career Technical Education Consortium (2013). *A Look Inside: A Synopsis of CTE Trends: Funding*, Retrieved January 1, 2018 from <https://careertech.org/sites/default/files/SynopsisofCTETrends-Funding-2012.pdf>
- <sup>126</sup> Kulik, J. A. (1994). Curricular tracks and high school vocational education. *DOCUMENT RESUME*, 64.
- <sup>127</sup> Plank, S. B., DeLuca, S., & Estacion, A. (2008). High school dropout and the role of career and technical education: A survival analysis of surviving high school. *Sociology of Education*, 81(4), 345-370.
- <sup>128</sup> Symonds, W. C., Schwartz, R., & Ferguson, R. F. (2011). Pathways to prosperity: Meeting the challenge of preparing young Americans for the 21st century.
- <sup>129</sup> Castellano, M., Sundell, K., Overman, L. T., & Aliaga, O. A. (2012). Do career and technical education programs of study improve student achievement? Preliminary analyses from a rigorous longitudinal study. *International Journal of Educational Reform*, 21(2), 98-118.
- <sup>130</sup> Symonds, W. C., Schwartz, R., & Ferguson, R. F. (2011). Pathways to prosperity: Meeting the challenge of preparing young Americans for the 21st century.
- <sup>131</sup> Albattah, M. A., Goodrum, P. M., & Taylor, T. R. (2015). Demographic influences on construction craft shortages in the U.S. and Canada.
- <sup>132</sup> Gray, K. C., & Herr, E. L. (2006). *Other ways to win: Creating alternatives for high school graduates*. Corwin Press.