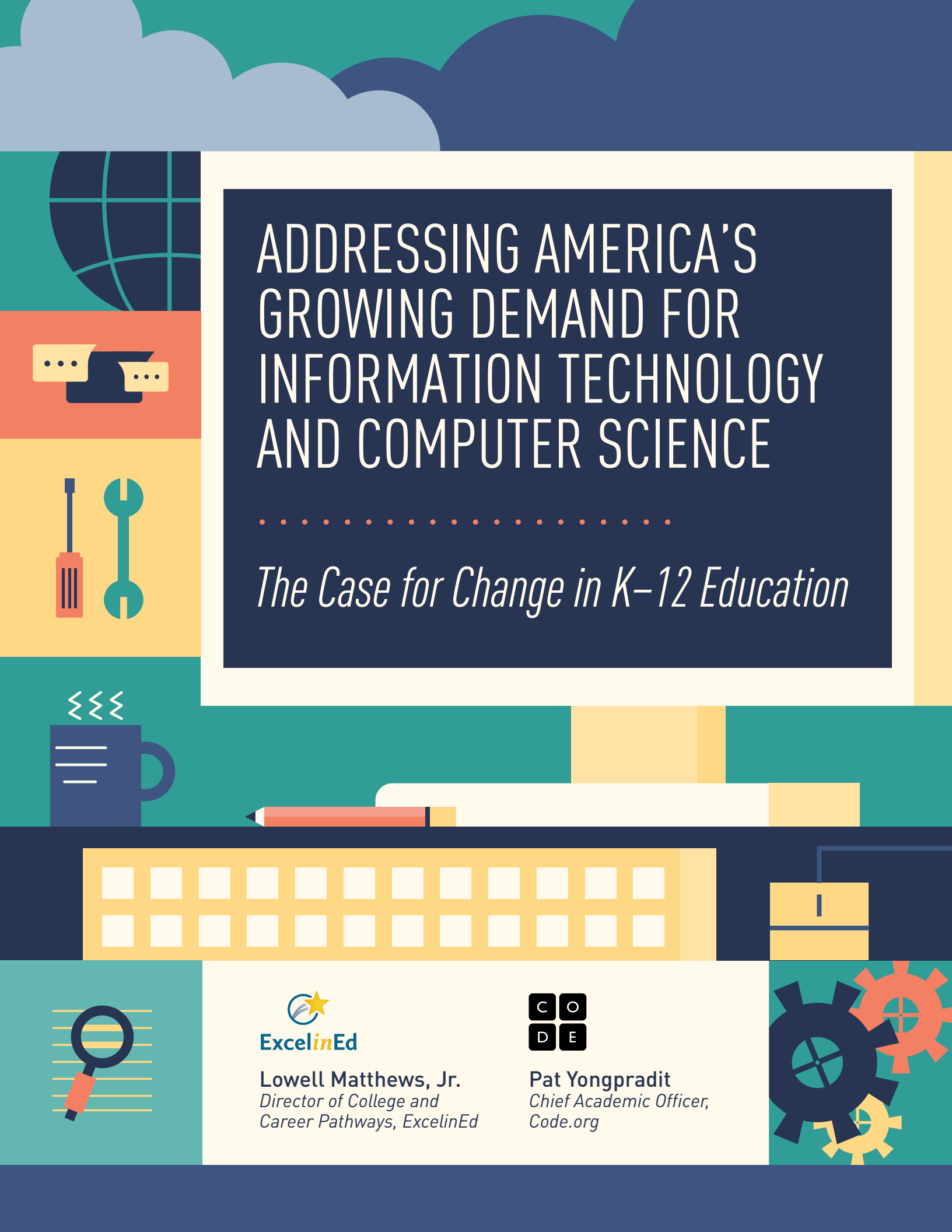


ADDRESSING AMERICA'S GROWING DEMAND FOR INFORMATION TECHNOLOGY AND COMPUTER SCIENCE

The Case for Change in K–12 Education

ExcelinEd

Lowell Matthews, Jr.
Director of College and Career Pathways, ExcelinEd

CODE

Pat Yongpradit
Chief Academic Officer, Code.org

About the Council

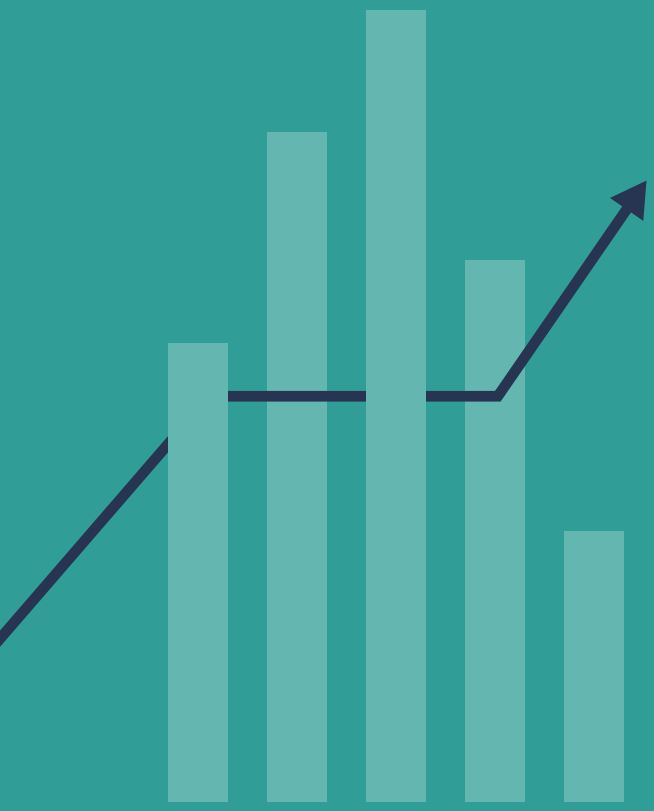
Excel*in*Ed and Code.org co-created the Information Technology (IT) and Computer Science (CS) Business Advisory Council (Council) and invited businesses and organizations to collaborate on increasing opportunities for all students to learn IT and CS skills. While progress is being made to help students access these opportunities, inequities remain that prohibit many students from learning and experiencing IT and CS. These IT and CS skills are becoming ever more important in the workplace and in life.

About the Report

The findings and recommendations in this report represent aggregated interview responses of IT + CS Business Advisory Council members focused on five key issues:

1. The relationship among IT and CS, and how that relationship affects hiring decisions.
2. The authentication of technical skills.
3. The authentication of soft skills.
4. Missing skillsets in demand by companies.
5. Alignment between industry and K-12 and postsecondary education.

Aggregated interview responses offer participating members an uninhibited response opportunity without jeopardizing their competitive positions.



America's need for top talent in information technology and computer science is a longstanding problem. However, as the pace of technological change accelerates, the demand for skilled IT and CS workers is reaching critical levels while the supply of skilled workers remains well below the needs of our nation's employers and economy.

UNDERSTANDING THE IT + CS LANDSCAPE

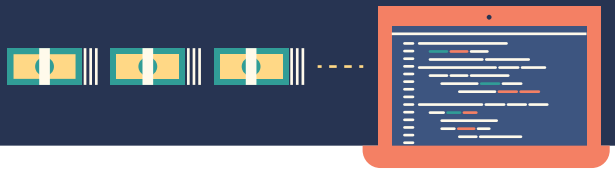
Workforce Supply and Demand

Companies are struggling to find workers with information technology (IT) and computer science (CS) skills to fill hundreds of thousands of jobs.[1] While the demand for IT and CS remains strong, the supply remains weak.

There are more than 150,000 unfilled IT support jobs in the U.S.[2] The demand for these IT support roles is also growing. The job outlook for computer support specialists is projected to grow 11% between 2016–2026, which is faster than the average for all occupations.[3]

There were roughly 49,000 computer science graduates in 2015 and more than 574,000 job postings requiring a degree in computer science.[6] And that only accounts for 24% of the 2.4 million job postings in IT overall.

In 2016, there were more than 223,000 job openings for software developers in the U.S.[4] In May 2018, the U.S. Bureau of Labor Statistics reported a median pay for software developers of almost $106,000 per year and forecasted a 24% increase in software developer jobs from 2016–2026.[5]



For the past 3 years, application software developer, software engineer or information security analyst has appeared on CareerCast's annual list of the 10 toughest jobs to fill.[7]

Supply problems begin long before individuals enter the workforce.

IT + CS Is Not a Priority in K–12 Education

The U.S. will not keep up with the growing demand for skilled workers in IT and CS unless something changes. Students need expanded opportunities to learn IT and CS knowledge and skills that sequentially build to a level of mastery and prepare them for college, careers and life. To better capitalize on these opportunities to earn positions requiring IT and CS skills, students need learning opportunities to begin at the K–12 level. However, IT and CS skill acquisition opportunities are limited in K–12 education.

Only 1 in 5 high schools offer AP Computer Science (AP Computer Science A or AP Computer Science Principles).[8]

Just 35% of American high schools teach computer science.[9]

In a Microsoft survey of 500 K–12 teachers, 2 out of every 10 teachers said their students didn't learn about computer science at all. 30% of the surveyed teachers felt under qualified to prepare students for a digital future.[10]

32 states do not have K–12 computer science standards.[11]

Only 20 states have dedicated funding to K–12 computer science professional learning.[12]

16 states do not have a computer science teacher certification.[13]

Only 13 states have state-approved preservice teacher preparation at higher education institutions.[14]

Yet, 90% of parents want their children to study computer science.[15]

The Relationship Between IT + CS

There is considerable confusion regarding the definitions of CS and IT. As a result, policymakers may create policy incentives that fail to match up with the problems they are trying to fix or fail to address both areas.

The important takeaway is the foundational nature of a comprehensive CS education for all students. This foundation will support students in most career paths, now and in the future. And when it comes to IT, this strong CS foundation is the best way to meet the current and future needs of specialized careers in information security, networking, software development and more.

COMPUTER SCIENCE, or CS, is the study of computers and algorithmic processes, including their principles, hardware and software design, and impact on society. It is a foundational subject (like math or language arts) and educates students about the digital world. It provides the fundamental underpinnings for individuals to grow and amplify their digital skills into middle- and high-skill jobs.

INFORMATION TECHNOLOGY, or IT, is a more specialized application of industry skills learned (like IT support) that can be strengthened by the foundational core that CS provides. Most jobs in career fields such as IT support do not require a college degree and are considered middle-skill jobs.

Because CS is a foundational subject, employers tend to look for CS related coursework, programs or degrees as signals of student mastery, knowledge and skills. IT on the other hand lends itself to more industry-recognized credentials and industry certifications such as CompTIA A+. These kinds of professional certifications signal mastery of very specific skills and knowledge employers require for more well-defined jobs such as cybersecurity specialists or programmers.

MAKING THE CASE FOR CHANGE: COUNCIL FINDINGS

Employers and Education Are Disconnected

There remains an employer disconnect with education, which has consequences for student acquisition of in-demand technical and soft skills.

Council members indicated that there remains a significant disconnect between employers and education. While acknowledging that many employers do not know how to work with education providers, much of the disconnect is attributed to limited communication between employers and education, conflicting priorities from multiple stakeholders, increased expectations and diminished resources at the K–12 and postsecondary levels. Employers are often impatient with the pace of change in education, too.

Employers indicate that applicants often lack the technical skills they need to fill positions and the soft skills needed to professionally grow within an organization.

Council members were unanimous in their recognition of soft skills—problem solving, critical thinking, creativity, project management, communication, teamwork, leadership, etc.—as a critical missing piece among job applicants. Complicating the hiring decisions, employers face real challenges in assessing these skills in an applicant prior to making a hiring decision. In response, employers are embracing several candidate review processes to look beyond a resume, including personality profiles or assessments.

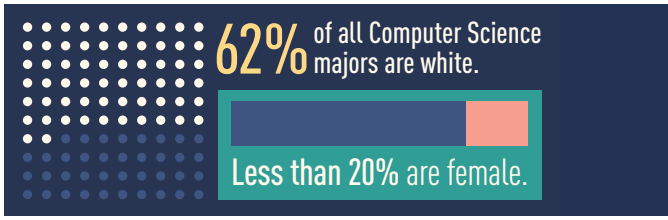
Employers indicate that applicants often lack the technical skills they need to fill positions *and* the soft skills needed to professionally grow within an organization.

Nonetheless, applicants without prior work histories are at a disadvantage. Students who will eventually become job applicants need an opportunity to demonstrate their skills in real-world settings. Employers and education will need to work together to ensure IT and CS opportunities incorporate in-demand knowledge and skills plus work experiences that add value to these skills.

Computing Lacks Diversity

Despite significant effort and investments by companies to hire more individuals from populations typically underrepresented in computing, technology remains predominantly white and male.

The proportion of CS majors by race/ethnicity in 2015–2016 still shows 62% of CS majors are white.[16] And while the percentages of underrepresented minorities have risen in the past 25 years, less than 20% of CS majors are female.[17]



While there are several reasons for low female participation in technology, Council members pointed out that gender and minority divergences begin in K-12. The College Board's Advanced Placement (AP) Computer Science A exam historically has had low female participation, with 76% participation by men and 24% by women in 2018.[18] Progress is being made, however. The College Board's new AP Computer Science Principles course, which introduces students to foundational concepts of CS, saw 70% growth in the number of female students taking the AP exam while black and Hispanic student enrollment increased 70% and 68%, respectively, from 2017 to 2018.[19] While this incredible growth should be lauded, more needs to be done.

Students Lack Access to Credentials & Skills That Matter

Too many students lack access to the skills, competencies and credentials that matter to employers.

In IT, career pathways in K–12 are largely defined with some pathway opportunities available at the home high school or in a dual enrollment format with a local community college. For example, the course sequences to become a computer user support specialist or IT help desk administrator are widely known. And the industry credentials that signal student mastery of the knowledge and skills are also known and valued.

In both IT and CS, there are significant problems in ensuring that K–12 students are on the appropriate career pathways.

However, in both IT and CS, there are significant problems in ensuring that K–12 students are on the appropriate career pathways. Students have few opportunities to earn the authenticating signals that demonstrate to employers that they have mastered the IT knowledge and skills employers require. These valuable IT career pathway programs often compete for funding and

enrollment with much larger school district legacy programs in lower-wage, lower-skill and lower-demand fields, such as cosmetology and culinary arts. The problem is exacerbated by IT career pathway programs offered in school districts that do not culminate in a student earning a stackable industry credential like Cisco's Certified Network Associate Routing & Switching (CCNA), CompTIA's Network+ and others.

The value of industry credentials in IT is reflected in job postings and wage premiums. According to Burning Glass Technologies[20], CompTIA A+ is requested in one out of every five entry-level IT help desk jobs and is worth a 5% wage premium. In cybersecurity, (ISC)²'s CISSP is worth a 7% wage premium. And certifications like Cisco's CCNA, CompTIA's Network+ and Linux+ are worth a 12% wage premium over entry-level certifications.

Council members also indicated that IT career pathways would benefit from students taking CS. Students who pursue the foundational CS skills and augment them with practical application of IT skills and related certifications may be better equipped to evolve in their careers than their counterparts who pursue an IT pathway without fundamental CS skills.

All Students Need Digital Skills

The rising use of technology including automation and—in the future—artificial intelligence is changing the nature of work.

Students who are not digitally literate will quickly become workers who do not have digital skills and are, therefore, ill-equipped to compete in a changing work environment. In a 2015 report, Change the Equation research showed that 7.7 million people in the U.S. use complex computing in their jobs, which includes developing software or programming. Almost half of these workers are in non-STEM fields.[21] Employees will need to constantly upskill to remain competitive.

The need for digital skills continues to expand in all jobs and across all fields—not just for jobs in high tech firms. Burning Glass Technologies found that more than 8 in 10 middle-skill jobs (82%) require digital skills.[22] These jobs also pay more than non-digital middle-skill jobs.[23]

> Without equitable access to CS skills, students in rural schools and low-income schools continue to be marginalized and as a result are more likely to be unprepared for the challenges of our world.

The value of IT and CS knowledge and skills extends beyond filling jobs. Council members were concerned that the democratizing influence of CS skills were not reaching a larger body of students. If the purpose of education is to create globally-prepared citizens, then students need to learn the foundational skills (reading, writing, arithmetic and CS) they need to succeed. While there has been greater attention paid to access

to high-quality reading, writing and math skills for all students, there has been far less focus on access to CS skills. Without equitable access to CS skills, students in rural schools and low-income schools continue to be marginalized and as a result are more likely to be unprepared for the challenges of our world.

Pathways in Computer Science Are Not Well-Defined

Pathways in computer science that would help students learn to be digitally literate or prepare for a computer science career are ill defined.

While IT career pathways are well defined, the same cannot be said for CS. The four-year CS degree remains the lodestar in employer hiring decisions for related occupations according to Council members. But, annually, there are not nearly enough CS graduates to meet employer demands. This four-year degree expectation is also beginning to create some unintended consequences. Some community colleges are beginning to shift resources away from CS to career pathways in fields like advanced manufacturing, which often require an industry credential short of a bachelor's degree.

There are also fewer industry certifications or other employer authenticated credentials available at the K–12 level for CS. This gap most likely exists because so few students from K–5 onward have access to CS opportunities and, even when they do have access, those opportunities fail to link to high school CS courses and beyond. In addition, the CS career pathway is broad and not as concretely defined or known to students. Even those students who complete an Hour of Code[24] may not have a plan for building on these skills through K–12 and beyond. Finally, industry certifications often focus on the knowledge and skills that are needed now by employers, which may change as these students may be several years away from being hired.

While IT career pathways are well defined, the same cannot be said for CS.

THE PATH FORWARD: COUNCIL RECOMMENDATIONS

To address the supply side skills gap in IT and CS, both IT and CS career pathways in K–12 need to be expanded and better aligned to postsecondary and professional opportunities. The Council recommends states and schools consider the following four solutions:

1. **CONNECT**
   Working together, employers and K-12 education can engage in more meaningful ways to connect learning and earning.
2. **ENGAGE**
   State-level employers and policymakers can focus engagement on offering high-quality opportunities to traditionally underserved students in IT and CS.
3. **EXPAND**
   Increase student access to career pathways in IT.
4. **BUILD**
   Provide students with access to career pathways in CS and expand opportunities for students to learn CS skills.

Solution 1
CONNECT

Working together, employers and K–12 education can engage in more meaningful ways to connect learning and earning.

While employers and education often speak different languages and maintain separate priorities, these barriers can be overcome.

What Can K–12 Education Do?

Education can bridge the differences by inviting businesses into schools to help with the following:

+ **Demand**
  Identify market demand for skills and credentials that employers need now, and in the future, and that will help all students improve their opportunities for economic

success. Currently, many districts offer programs based on teacher expertise, past investments in facilities and popularity to students. While well-intentioned, these legacy programs may leave students with poor employment prospects or few career advancement opportunities.

+ **Alignment**
  Conduct regular reviews of existing programs and offerings to ensure proper alignment with workforce needs. Tennessee conducted a review of its career and technical education programs in concert with its industry/employer partnerships. The state retired 130 low-value or obsolete courses and added 73 new courses that were informed by employer demand.

+ **Vertical Linkages**
  Establish vertical linkages through collaboration among K-12, postsecondary and employers to ensure that the pathways in demand and offered in secondary schools link to postsecondary options and credentials. Most of the higher-level IT and CS jobs will require postsecondary or professional knowledge, skills and credentials.

+ **Applied Learning Experiences**
  Create partnerships or structures with employers—funded and supported by the state—that can coordinate state and local efforts to maximize applied learning experiences for all students.

	Employment	Median Pay	Projected Growth
Floral Design	55,000	$26,350	-6%
Barbers, Hairstylists and Cosmetologists	673,700	$24,900	13%
Computer User Suport Specialist	835,300	$52,810	11%
Software Developer	1,256,200	$103,560	24%

U.S. Bureau of Labor Statistics, Occupational Outlook Handbook, 2017

This doesn't mean states should be preparing all students to become computer support specialists. Instead, states should be placing greater emphasis on understanding, developing and supporting course offerings and pathways that will result in better postsecondary outcomes which lead to higher wages and in-demand growth based on industry/employer input.

What Can Employers Do?

Employers, on the other hand, can help education through a variety of means:

- **Expertise**
  In addition to providing technical expertise on the alignment, curriculum and development of credentials, employers can help train professional educators to teach the competencies, knowledge and skills that students need and employers desire. In IT and CS, this could mean training the educators, co-teaching, allowing employees time to teach in schools or providing industry internships for educators to gain valuable knowledge and skills or reskill.

- **Applied Learning Experiences**
  Employers can provide work-based applied learning experiences to students through apprenticeship models, externships, internships and job shadowing for high school students, while helping coordinate career exploration through employer site visits, career fairs, career presentations and industry-based design projects for elementary and middle school students.[25] The applied learning experiences can also help to address equity where traditionally underserved students may not otherwise be able to gain valuable work experience in the field.

  - **Technical Skills**
    Students can gain work experience by seeing what it means to work in an IT or CS environment and apply the technical skills they are learning.

  - **Softs Skills**
    Additionally, students can learn and demonstrate soft skills in a workplace. They can observe soft skills in practice and the expectations that employers have with respect to these skills.

- **Voice for Change**
  As school leaders take the courageous step of closing dead-end pathways that may be popular or have legacy costs in their creation, employers can provide the political and community support to do the right thing and end dead-end pathways.

- **Funding Support**
  Employers can also provide funding and equipment to help schools access or upgrade their current technological infrastructure and access or improve their hardware and software resources.

Working together, employers and education can engage in a more meaningful way to connect learning and earning.

Progress in Action

TRANSITIONING FROM DEAD ENDS TO IN-DEMAND PATHWAYS

One school district evaluated its career and technical education (CTE) programs and discovered significant misalignment in the district's offerings. The district's schools offered numerous programs in cosmetology, audio-visual and fashion design. Meanwhile, employers had identified their need for skilled workers in advanced manufacturing, healthcare and technology. The ratio of district's offerings in cosmetology to health care was approximately 8:1.

When the school district announced a plan to align their offerings to reflect the in-demand pathways, teachers and administrators in programs of cosmetology, audio-visual and fashion design voiced opposition to the plan. To help support the needed changes, the school district turned to their local employers for assistance. The following happened in response:

+ Employers helped populate industry advisory councils for the proposed, in-demand pathways.
+ Employers provided employment and local wage data in a public-friendly report that showed to the community the jobs that are in demand and the education levels required to attain those positions.
+ Employers assisted with curriculum design.
+ Employers provided mentors to help teachers gain industry relevant experience. Additionally, employers helped revise professional development opportunities for these teachers.

With these supports, the school district was able to overcome resistance and create a better balance of CTE offerings aligned to employer demand. The school district created new industry-aligned programs in construction engineering, healthcare and technology. The school district also created a Pathways in Technology Early College High Schools (P-TECH) program in cybersecurity.

This is just one example of employers and education working together to build out career pathway offerings that better prepare students for middle- and higher-wage careers.

Solution 2
ENGAGE

State-level employers and policymakers can focus engagement on offering high-quality opportunities to traditionally underserved students in IT and CS.

Council members have invested significant time, resources and efforts in addressing issues of diversity in IT and CS. However, to provide greater scale and reach more students, these efforts must include state support in terms of supportive legislation and funding.

What Can States Do?

States can help facilitate opportunities for more students who are typically underrepresented in IT and CS. State approaches should include legislation enabling and promoting opportunities, as well as funding to support schools to help these students enroll and succeed in IT and CS courses and programs.

+ **College Acceleration Options**
  Enable and support college acceleration options in IT and CS through dual enrollment, AP and early college models like collegiate high schools and P-TECH. These options have been shown to improve underrepresented students' college degree attainment rates and college admittance test scores.[26] Enabling legislation would also need to address the barriers to participation created by college acceleration eligibility requirements—such as minimum GPA or test scores.[27]

+ **Partnerships**
  Partner with organizations like the College Board to identify underrepresented students in courses like AP, help students needing extra support to take and succeed in college acceleration options and train the professional cadre of educators in low-income or rural schools to expand these offerings to students. States like Florida[28] and North Carolina[29] have seen significant improvement in these students' success in AP. These partnerships can support the growth of AP participation or other college acceleration options for students traditionally underrepresented in CS. AP Computer Science A and AP Computer Science Principles could be included in an AP growth initiative.

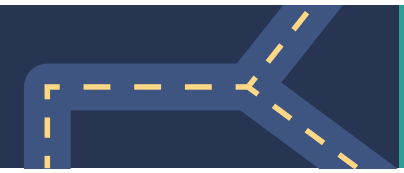
+ **Mentorships**
  Facilitate mentorships to help students with academic guidance, social support and career pathway assistance, including virtual mentorships to expand the reach of mentors. Exemplars include states such as Idaho[30] and Illinois.[31]

Progress in Action

P-TECH

An example of shared public and private efforts that can help push inclusion in IT and CS is the Pathways in Technology Early College High School (P-TECH). P-TECH is a grades 9–14 public school model combining high school, community college and industry to provide students with the academic, technical and workplace skills required for STEM fields and careers. Students graduate with their high school diploma and an industry-recognized associate degree, at no cost to the student, which will enable them to secure a competitive entry-level position or continue their studies at a four-year education institution. P-TECH grew out of a commitment from IBM, The City University of New York and the New York City Department of Education with the first school starting in Brooklyn, New York.

- High school and college coursework are linked to an industry skills map and are integrated, enabling students to graduate within a six-year timeframe.
- In addition to academic courses, students participate in a range of workforce experiences that include mentoring, site visits and paid internships. Upon graduation, students are first in line for jobs with their school's industry partner, which guarantees a coveted interview for appropriate positions up the career ladder.
- The school is open enrollment with a focus on traditionally underserved students. Between 70–80% of students qualify for free- and reduced-price lunches.
- From the initial class (2011–12), 16 were hired by IBM, and all were students of color. Many of these 16 are pursuing a four-year degree while working. Most remaining graduates have enrolled in four-year colleges.
- The first class had a graduation rate four times the national, on-time, community college graduation rate, and five times that for low-income students.
- Since the initial school, more than 100 P-TECH schools have opened across the U.S. and in several other countries, with more than 600 business partners now participating.



Solution 3
EXPAND

Increase student access to career pathways in IT.

The Council recommends two actions with respect to improving career pathways in IT.

First, states should create incentives to spur schools to offer students more opportunities to complete a career pathway in IT and earn an employer-valued, industry credential. These incentives can be a combination of financial and accountability enticements tied to students earning an IT industry credential that is labor-market informed, industry-verified and used, provides economic mobility to middle- and higher-wages, and is linked or stackable to a postsecondary or professional credential.

Several states have initiated industry certification incentives tied to student acquisition of an industry certification of value. States like Florida, Kansas, Wisconsin and Colorado have seen significant gains in students earning qualifying industry certifications when schools earn financial incentives from the state for each student earning a qualifying industry certification.[32] These incentives can be tailored to encourage student acquisition of industry certifications in IT, networking, information security, etc.

The incentives can begin in K-12, extend into postsecondary and culminate with career-changers or professionals in IT. States can help more students, career-changers and professionals access these industry credentials and can integrate these credentials into career pathways/college credit to expand the IT-skilled workforce.

Second, the Council recommends integrating foundational CS into IT and other technology-related pathways. The CS foundation gives individuals in computer user support specialist roles an opportunity to advance in the future using the skills and competencies achieved through CS mastery. In Chicago Public Schools, a foundational CS course is the first course for all pathways in the CTE IT cluster, which includes networking, programming, game programming, web design, software applications and computer engineering. This foundational course also satisfies a CS graduation requirement that is required for all Chicago Public Schools high school students entering as freshmen in 2016 and beyond.

Progress in Action

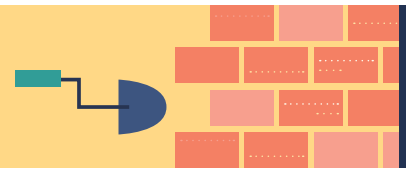
GOOGLE IT SUPPORT PROFESSIONAL CERTIFICATE

Google created the IT Support Professional Certificate program to help beginning level learners become job ready in IT support in about eight months. The course is available online through Coursera, and Google provided 10,000 scholarships for learners to complete the program and earn the certificate. More than 25 community colleges and Northeastern University have incorporated the program's lessons directly into their existing curriculum or are offering credit for learners who have already completed the certificate.[33]

Once learners complete the program, they can share their information directly with over 30 top employers hiring for IT support jobs, including Walmart, Bank of America, Hulu, Intel, Sprint and, of course, Google. Over 66,000 people have enrolled in the Google IT Support Professional Certificate program, and 84 percent of those enrollees say it helped them to advance their job search or career.

The certificate has helped students like Chelsea and Daniel. After moving to Nashville, Tennessee, Chelsea struggled to find housing for her family and ended up living in a shelter.[34] While working at Goodwill of Middle Tennessee, she was encouraged to enroll in the Google IT Support Professional Certificate program.[35] Chelsea is now working at Google's data center in Clarksville, Tennessee, and has moved into a house nearby with her family.[36]

Daniel moved to Grand Island, Nebraska, when his fiancé got her first teaching job there.[37] Without a college degree, he struggled to find a job.[38] Eventually, Central Community College hired him as a night security officer.[39] Knowing his passion for computers, a friend encouraged him to check out the Google IT Support Professional Certificate.[40] While working nights, he enrolled and got his certificate in five months.[41] Soon after that, Daniel got an email about an IT job at Central Community College.[42] His Google credentials stood out against other candidates and he got the role as an IT support specialist.[43]



Solution 4
BUILD

Provide students with access to career pathways in CS and expand opportunities for students to learn CS skills.

The Council recommends three solutions to increase career pathway access for more students in CS.

First, the Council recommends starting early exposure to CS through career awareness and exploration. More work needs to be done in the elementary grades. For example, Iowa has created the Computer Science Is Elementary project, which seeks to transform six high-poverty elementary schools into CS elementary schools.[44] The schools will teach computational thinking, problem solving, teamwork and other skills based on the Loess Hills Computer Science Elementary School model in Sioux City, Iowa.[45]

In middle and high schools, exemplars include: Georgia's statewide adoption of YouScience, which uses games to capture student aptitudes, including strengths and weaknesses, and then matches those aptitudes and interests with a career database;[46] Arkansas' statewide adoption for the middle grades of Learning Blade, which challenges students to take on problem solving strategies that expose them to CS and other areas of STEM;[47] and Nevada's creation of an interactive website that guides users in selecting a STEM career field based on their interests and aptitudes.[48] These states are using tools to expose students to STEM and CS by linking aptitudes and interests with career pathways.

Second, the Council recommends that states and policymakers build upon the work of organizations like Code.org to do the following:

+ **Expand CS offerings at every grade level, including a requirement to offer CS courses in high school.**
+ **Create the professional cadre of CS teachers through:**
  - Cross-training non-CS-teachers in CS and funding CS professional development.
  - Creating clear and flexible certification pathways for CS teachers.

Finally, the Council recommends that states work with organizations and employers to develop CS offerings that link K-5, middle school, high school and postsecondary/professional with the knowledge, skills and competencies employers desire. These linkages should have milestones that provide a clearer view of the CS pathway to students. Milestones could include badges, mini certifications or exam credit for AP Computer Science A or AP Computer Science Principles, that signal to employers, colleges and to the student that the student is showing promise along the CS pathway. However, the milestones should also link up to a CS four-year degree since that credential remains the lodestar for big technology companies.

Progress in Action

ARKANSAS CS INITIATIVE

Crediting his 11-year-old granddaughter, who programmed an app for his gubernatorial campaign to allow people to contribute to the campaign through their mobile phones, Governor Asa Hutchinson made CS in all schools a central plank in his policy platform. Upon election, he delivered, helping usher in the Arkansas Computer Science initiative. This initiative[49] includes: an allocation of $10 million to train CS educators and CS course support; a requirement that all high schools offer CS in the state; the development and adoption of CS standards; and clear certification pathways for CS teachers. Arkansas' CS initiative is being helped through a partnership with Code.org.

For more on how to help students in your state access IT and CS opportunities, please contact Excel*in*Ed or Code.org.

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Endnotes

1 Burning Glass Technologies Labor Insight, available at: https://www.burning-glass.com/products/labor-insight/.

2 The Google IT Support Professional Certificate, Grow with Google, citing Burning Glass Technologies, available at https://grow.google/programs/it-support/.

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