

Computer Science Careers: Preparing High School Students for Success

AT A GLANCE

This resource provides helpful information for high school teachers and counselors to better understand computer science, an industry that has many high-wage jobs open across the country. The information below supports effective advising and includes an overview of computer science, cybersecurity, and networking; defines in-demand computer science skills students can begin developing; and lists higher education options students can pursue. In addition to this resource designed for educators, we also developed a [student-facing resource](#) and [computer science job profiles](#).

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Computer Science: A High-Wage Industry with Many Job Opportunities

Computer science is essential in today’s modern, connected, and digital society. Every day in the news there are exciting stories about up-and-coming technology that will change our lives for the better, as well as concerning stories about private information being stolen and misused through cyberattacks. Computer science is evolving rapidly to meet the needs of our world, and that means there are many job opportunities available for young people across the country. Because so many jobs in the industry can be done remotely, computer science is a great opportunity for all students—you don’t need to come from a large school in an area with lots of tech companies to be a future computer science professional!

Computer science occupations aren’t just in the technology sector, but in a wide array of fields including, but not limited to, health care, finance, education, and manufacturing. The median salary for jobs in computer science was \$91,250 in May 2020, compared to the median salary for all occupations, \$41,950.¹ Computing fields are expected to grow 13 percent from 2020 to 2030 and will add about 667,600 jobs, signaling the need for more students to study and start careers in computer science.²

5 REASONS COMPUTER SCIENCE SHOULD BE RECOMMENDED TO STUDENTS



1. Higher pay:

Computer science occupations are more stable and have higher wages than many other industries.



2. Flexibility:

Many careers offer flexible hours and/or remote work, making it easier to balance career and personal life. An organization’s physical office may be in one location, but remote workers can often work from home in a different region or state!



3. Opportunities for advancement:

Many people who start their careers in computer science can advance in their career as they develop technical skills and earn valuable credentials. For example, a person who starts their career as a computer user support specialist could progress to a computer network support specialist and then to a network administrator role with additional training and experience.



4. Transferable skills:

The skills computer science professionals develop, such as critical thinking and problem solving, are valuable across all industries. If a student decides they want to go into a different field, they will have skills valued across the job market.



5. Space for innovation and creativity:

Computer scientists aren't simply inputting code, they are thinking of ways to solve key challenges like how to make a website user friendly, how to protect customer information, and how to design new applications. There are always new adaptive challenges.

Industry Overview:

Computer Science, Cybersecurity, and Networking

Now that you know a little bit about computer science, particularly that the jobs pay well and have many expected openings, you might be wondering “**what can I tell my students when they ask me what computer science jobs look like in the day-to-day?**” Below is a brief description of computer science and two of its subfields, cybersecurity and networking.

Computer Science—Creating Technology to Solve Problems



Computer science is about **designing and developing computing systems to solve complex problems by telling computers what to do and how to do it.**³ This field focuses on using the power of computers to make improvements in business, health care, manufacturing, and many other industries. Computer science professionals are likely to work in software development, computer programming, database design, and web design—with many professionals writing code quite frequently. On the job, professionals can spend their days as a part of a team creating systems that can achieve complex tasks. For example, they may explore how to resolve a glitch in a new piece of software, help a bank process transactions and find fraudulent charges for the day, or develop visual aspects of video games and movies.

Cybersecurity—Protecting Information on Computers

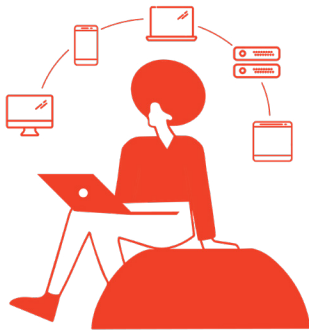
Cybersecurity is the **practice of protecting networks, systems, programs, and data from criminal or unauthorized use.**⁴ Digital attacks can include hacking, ransomware, browser hijacking, and other threats to:

- Access, change, or destroy sensitive information
- Obtain money from users
- Interrupt company processes



With increasing cyberattacks and cybersecurity breaches, careers in cybersecurity are continually expanding. The world needs hundreds of thousands more workers to protect computers and networks; **between October 2020 and September 2021, there were 597,767 job postings for cybersecurity-related positions.**⁵ There is a need for professionals who are creative thinkers to keep systems secure from threats. On a typical day, cybersecurity professionals may work with a team to install security solutions, write security policies, and teach coworkers how to keep their computers safe, or learn about the emerging digital threats and technology trends to continuously keep companies secure.

Networking— Monitoring Computer Connection Systems



A computer network is two or more computers that are connected to one another for the purpose of communicating data electronically.⁶ Simply put, a **computer network is the equipment (hardware and software) required to allow individuals, computers, and devices to share information with each other.** The best-known computer network is the internet! Other examples include a single connection between two offices or a large telecommunications system such as AT&T. Professionals in computer networking are responsible for keeping a network up and running—which is why it’s a valued, well-paid role across many industries, not just technology. On a typical day, computer networking professionals can be found upgrading network systems, backing up computer data, and providing support to network users.

Preparing Students for Computer Science Careers

Below we provide an overview of skills needed for success in the computer science industry, as well as example higher education program titles students can explore and pursue. Knowing what skills are desired can support a student in developing those abilities early and help them make strategic decisions about coursework and education/training opportunities.

Skills for Success

In the table below, we refer to “technical” and “employability” skills. **Technical skills, sometimes called “hard skills,” are specific to a particular industry and sometimes have training opportunities to learn and develop the skill**, such as a class on a specific computer science language. **Employability skills, sometimes called “soft,” “common,” or “21st-century skills” cut across industries and can be connected to an employee’s way of working and disposition**, such as if they have a growth mindset. Employability skills are difficult to measure and can be demonstrated in different ways so it’s helpful for students to have an example of a class or experience that helped them develop an employability skill. The skills included below were developed from sources including U.S. Department of Labor competency models, O*Net, and previous JFF competency development research.⁷

Skills can be developed in a variety of educational and professional ways including high school coursework, online programs and resources, extracurricular activities, internships, and job opportunities. While technical skills are generally best learned and applied through computer science-specific courses and professional opportunities, employability skills can be developed in all classes, including core academics (English, history, math, science).

The skills below are foundational skills for computer science broadly and would also benefit students interested in cybersecurity or networking. Keep in mind, mastery of skills will look different based on level of familiarity and experience. The skill definitions below were developed with students in mind, but a professional in cybersecurity would have to go beyond “understanding and describing basic threats” to master their security skills, for example.

Table 1: Top Skills for the Computer Science Industry

Skill	Skill Definition	Skill Type
Critical Thinking	Use logic and reasoning to analyze and address problems.	Employability
Problem Solving	Use critical thinking to generate and evaluate solutions as they relate to the needs of the team, customer, and company.	Employability
Decision Making	Use problem solving to think through options and communicate solutions.	Employability
Adaptability and Flexibility	Understand workplace change, be open to new ideas, and handle ambiguity.	Employability
Planning and Organizing	Use time management to plan effectively and accomplish assigned tasks.	Employability
Basic Principles of Computer Science Concepts, Systems, Platforms & Tools	Understand fundamental computer science concepts, systems, platforms, tools, and technology to understand the common roles of computer science professionals.	Technical
Logic & Fundamentals of Computer Languages	Understand how computer languages communicate to build basic mobile and web applications.	Technical
User & Customer Support	Provide assistance and technical support to help users implement and solve problems related to computer software and hardware.	Technical
Basic Principles of Software Development	Design, write, test, and maintain source code of computer programs to manage and maintain software	Technical
Networks	Use hardware and software to facilitate communication between people and computer systems.	Technical
Basic Principles of Hardware	Use communication systems hardware to describe the purpose and function of fundamental end-user devices, switches, routers, wireless access points, etc.	Technical
Security	Use understanding of malware, firewall, Intrusion Detection Systems (IDS), and Intrusion Prevention Systems (IPS) to recognize and describe basic threats to networked computers.	Technical
Risk Management & Information Assurance	Protect the confidentiality, integrity, and availability of information and information systems.	Technical

Higher Education Options

The table below includes example certificate and degree programs students may pursue if they are interested in a career in computer science, cybersecurity, or networking. It demonstrates an example of progression from an initial certification to an associate's degree, to a bachelor's degree, to a graduate degree, and also includes other advanced certifications (which may be earned prior to or in lieu of a formal degree if a worker has enough skills and experience to pass the exam).⁸ As demonstrated, **early on there is a decent amount of overlap between the fields, which allows students time to explore and learn foundational information before developing a specialization.** For example, if a student begins their education in computer science, it is possible to pivot to cybersecurity or networking.

Across the country, most companies prefer computer science job candidates to have a bachelor's degree, and higher education levels are correlated with higher salaries. **The field has traditionally preferred candidates with bachelor's degrees or more formal education, but there is evidence that more tech companies are showing interest in other kinds of preparation like internships, apprenticeships, and microcredentials.**⁹ However, it is too soon to say if these trends will last and if less-traditional education and training options have a high return on investment for participants.

One common job in computer science that is possible to obtain without a bachelor's degree is a computer user support specialist (also called a help desk technician)—many workers who start in this occupation and do well are able to advance to higher level job as they develop their skills and earn additional credentials. To learn more about computer science jobs, see our [job profiles](#) resource.

Table 2. Example of Potential Stackable Credentials in Computer Science, Cybersecurity, and Networking

	Initial Certifications	Associate's Degree	Bachelor's Degree	Graduate Degree	Advanced Certifications
Computer Science	CompTIA A+, IT Infrastructure Library (ITIL) Foundations, Microsoft Certified: Fundamentals	Computer Science, Information Technology, Software Engineering	Computer Science, Computer Programming, Software Engineering, Information Technology	Computer Science, Computer Programming, Software Engineering, Data Science	AWS Certified DevOps Engineer—Professional, Cisco Certified DevNet Professional (CCDP), Oracle Java EE Application Developer (OCPJAD)
Cyber-security	CompTIA A+, CompTIA ITF+, CompTIA Project+	Cybersecurity, Computer Science, Information Security	Cybersecurity, Computer Science, Information Security	Cybersecurity, Information Security, Cybercrime and Digital Investigation, Cyber Policy, Applied Security and Analytics	CompTIA Cybersecurity Analyst (CySA+), Certified Information Systems Security Professional (CISSP), Computer Hacking Forensic Investigator (CHFI)
Networking	CompTIA Cloud Essentials, CompTIA Network+, Linux Essentials	Computer Networking, Computer Science, Information Technology, Network Engineering	Computer Networking, Network Security, Computer Systems and Networks	Network Administration and Security, Network Management and Cloud Computing, Computer Systems and Networks	Certificate of Cloud Security Knowledge (CCSK), Cisco Certified Network Professional (CCNP)

Equity Considerations: Recruiting Female, Black, and Latinx Students

While computer science is a great career option for all students, data shows that women, Black people, and Latinx people are less likely to earn college degrees and get jobs in this field. Data from the Pew Research Center demonstrates that while Hispanic people make up 17 percent of the total workforce, they are only 8 percent of the computer workforce. Black people make up 11 percent of the workforce but only 7 percent of the computer workforce.¹⁰ When we look at demographics of those who earn STEM bachelor's degrees, Black students earn 7 percent of STEM degrees and Hispanic students earn 12 percent of STEM degrees.¹¹ To increase the number of Black and Latinx students pursuing computer science careers, students need career advising that supports them in selecting relevant postsecondary programs.

Similarly, while women make up 47 percent of the workforce, they are only 25 percent of the computer workforce.¹² Women earned 53 percent of STEM bachelor's degrees in 2018, but they are overrepresented in health-related programs, where they earned 85 percent of the degrees, and underrepresented in fields like computer science, where they earned 19 percent of the degrees.¹³

High school educators can play a key role in recruiting and retaining students who are currently underrepresented in the computer science industry. Here are a few ways to engage students with computer science:

1 Offer computer science learning opportunities:

Ideally this includes computer science coursework, but if your school isn't there yet, consider a computer science-related club and opportunities for computer science guest speakers to tell students about their careers. Think about how these learning spaces can be inclusive by having female, Black, and Latinx computer science role models.

Free resource: Microsoft Technology Education and Literacy in Schools (TEALS)—a program that provides support to build sustainable computer science programs in high schools.

2

Talk to students and their families about computer science:

The concept of computer science can be intimidating to students and their families, but we can demystify the field with resources. We developed this [computer science overview](#) for high school students to better understand the field and sample computer science [job profiles](#) to provide examples of what jobs in this industry look like. One way to gain interest in computer science is by talking about issues relevant to your community: is broadband access a challenge where you live? Was there a recent local news story about a cyberattack? Do you have any alumni who are currently studying or working in computer science?

Many other resources exist, such as this [Computer Science is for Everyone toolkit](#) and [Top 10 Ways to Engage Underrepresented Students in Computing](#)

3

Collect student demographic data:

If we don't know who is participating in computer science opportunities, it's hard to think of recruitment and retention strategies! Studies show that female students' participation in computer science decreases as they advance in their education: female students make up 49 percent of the elementary students enrolled in computer science, 44 percent of the middle school students, and only 31 percent of high school students.¹⁴ If we want the computer science workforce to reflect the diversity of your community, it's important to track data and identify where students are opting out of computer science coursework. If you have computer science coursework in your high school, do student demographics shift between grade 9 and grade 12?

As the computer science industry continues to grow and develop, businesses will be looking for talented young people to fill high-wage jobs. Teachers and counselors play a crucial role in guiding students toward a given college and career path, and we hope this resource supports educators in talking to their students about the possibilities of a career in computer science.

Endnotes

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