

## Computer Science Instructor Position

### **Background:**

Computer science has become a basic skill in today's economy. Below are excerpts from a post that was published this fall on the Gallup blog:

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### **Educators Say Computer Science Lifts Students' Job Options**

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With computing driving innovation in almost every field -- art, business, communications, healthcare, STEM, etc. -- it is important for students to be exposed to computer science education early to help ensure they can thrive in their careers and as informed citizens.

A new Google/Gallup study finds that eight in 10 U.S. school district superintendents either "strongly agree" (42%) or agree (38%) that having computer science education would significantly improve the future career options for students in their school district. Another 14% are neutral on this question, and only 6% disagree.

### **Implications**

It is only through continued commitment, effort and action that there can be equitable access to computer science education.

Toward this end, Iowa has set a goal that every student will graduate from high school having had computer science instruction.

### **Iowa Vision**

All Iowa students will engage in the concepts and practices of computer science through an intentional progression of experiences in order to prepare them to become enterprising citizens that positively impact society.

In the spring of 2017, the Iowa Legislature passed Senate File 274 that encourages computer science in every Iowa school, establishes computer science standards, and creates a computer science professional development incentive fund. The statute also set a goal that by July 1, 2019,

- each accredited high school would offer at least one high-quality computer science course,
- each accredited middle school would offer instruction in exploratory computer science, and
- each accredited elementary school would offer instruction in the basics of computer science.

**Iowa Definition**

Computer Science is understanding how and why technologies work, exploring whether and how technology could solve real-life problems, investigating procedures, creating solutions, and learning about computing systems, programming, data, networks, and the effects on society and the individual. Computer Science is learning how to create new technologies, rather than simply using them.

**The Standards**

Iowa's Computer Science Standards are recommended standards and are identical to the 2017 [CSTA K-12 Computer Science Standards](#). These standards were written by educators to be coherent and comprehensible to teachers, administrators, and policy makers. "The CSTA K–12 Computer Science Standards delineate a core set of learning objectives designed to provide the foundation for a complete computer science curriculum and its implementation at the K–12 level."

To this end, the CSTA Standards:

- Introduce the fundamental concepts of computer science to all students, beginning at the elementary school level.
- Present computer science at the secondary school level in a way that can fulfill a computer science, math, or science graduation credit.
- Encourage schools to offer additional secondary-level computer science courses that will allow interested students to study facets of computer science in more depth and prepare them for entry into the workforce or college.
- Increase the availability of rigorous computer science for all students, especially those who are members of underrepresented groups." (<https://www.csteachers.org>)

The Computer science standards are guideposts and should be used to develop or determine curriculum, assessment, and professional development. Whether computer science is integrated into existing learning or offered as a separate course, the standards create clear and specific measures. The Computer Science Standards are correlated to the K12 CS Framework Core Concepts (i.e., what students should know) and Core Practices (i.e., what students should do).

**Evaluation of Current Program:**

The administrative team holds the opinion that computer science instruction is the single biggest weakness in our curriculum.

Grade Level	State Goals Set by Senate File 274	Current B-K Computer Science Program
Grade 9 – 12	Each accredited high school will offer at least one high-quality computer science course	Our high school computer courses consist of <ul style="list-style-type: none"> <li>• Computer Applications,</li> <li>• Microsoft Office, and</li> <li>• Desktop Publishing.</li> </ul>
Grade 7 – 8	Each accredited middle school will offer instruction in exploratory computer science	In both middle school grades, students take a nine-week mini-course in keyboarding and basic computer applications.
Grade K – 6	Each accredited elementary school will offer instruction in the basics of computer science.	Budget cuts a few years ago removed a separate teacher for K-6 keyboarding and computer instruction. This work was supposed to move into the regular classroom, but implementation has been inconsistent.

**Review of Research:**

The need for computer science in careers is clear.

A report from Burning Glass, a job markets analytics firm, found there were as many as 7 million job openings in 2015 in occupations that require coding skills. The report found that half of the programming openings came from industries outside of technology. The Burning Glass report indicates that there are an increasing number of businesses that rely on computer code. “A software engineer could find themselves working at [a tech company], as they could in a hospital or at an automotive manufacturer.”

Iowa industries have a need for their workforce in computer science related occupations. From Iowa’s Future Ready Iowa *Metrics That Matter*, two of the high demand jobs are information security analysts and computer systems analysts.

**Recommended Action:**

I recommend the board move to add the position of computer science instructor.

## Potential Computer Courses:

The following is a list of computer courses sanctioned by the Iowa Department of Education.

<b>Course Title</b>	<b>Course Code</b>	<b>Course Description</b>
Computing Systems	10002	Computing Systems courses offer a broad exploration of the use of computers in a variety of fields. These courses have a considerable range of content, but typically include the introduction of robotics and control systems, computer-assisted design, computer-aided manufacturing systems, and other computer technologies as they relate to industry applications.
Computer Science Principles	10011	Computer Science Principles courses provide students the opportunity use programming, computational thinking, and data analytics to create digital artifacts and documents representing design and analysis in areas including the Internet, algorithms, and the impact that these have on science, business, and society. Computer Science Principles courses teach students to use computational tools and techniques including abstraction, modeling, and simulation to collaborate in solving problems that connect computation to their lives.
Exploring Computer Science	10012	Exploring Computer Science courses present students with the conceptual underpinnings of computer science through an exploration of human computer interaction, web design, computer programming, data modeling, and robotics. While these courses include programming, the focus is on the computational practices associated with doing computer science, rather than just a narrow focus on coding, syntax, or tools. Exploring Computer Science courses teach students the computational practices of algorithm design, problem solving, and programming within a context that is relevant to their lives.
PLTW Computer Science Essentials	10013	Following Project Lead the Way's suggested curriculum, PLTW Computer Science Essentials (formerly known as PLTW Introduction to Computer Science) courses introduce students to computational thinking concepts, fundamentals, and tools. Students will increase their understanding of programming languages through the use of visual and text-based programming. Projects will include the creation of apps and websites to address real-life topics and problems.
PLTW Computer Science A	10014	Following Project Lead the Way's suggested curriculum to prepare students for the College Board's Advanced Placement Computer Science A exam, PLTW Computer Science A (formerly known as PLTW Computer Science Applications) courses focus on extending students' computational thinking skills through the use of various industry-standard programming and software tools. In these courses, students collaborate to design and produce solutions to real-life problems.
PLTW Computer Science Principles	10015	Following Project Lead the Way's suggested curriculum to prepare students for the College Board's Advanced Placement Computer Science Principles exam, PLTW Computer Science Principles (formerly known as PLTW Computer Science and Software Engineering) courses are designed to help students develop computational thinking, and introduce students to possible career paths involving computing. These courses help students build programming expertise and familiarity with the Internet using multiple platforms and programming languages. Course content may include application development, visualization of data, cybersecurity, and simulation.
PLTW Cybersecurity	10016	Following Project Lead the Way's suggested curriculum, PLTW Cybersecurity courses introduce students to the tools and concepts of cybersecurity. In these courses, students are encouraged to understand vulnerabilities in computational resources and to create solutions that allow people to share computing resources while retaining privacy. These courses also introduce students to issues related to ethical computing behavior.
AP Computer Science Principles	10019	Following the College Board's suggested curriculum designed to parallel college-level computer science principles courses, AP Computer Science Principles courses introduce students to the fundamental ideas of computer science and how to apply computational thinking across multiple disciplines. These courses teach students to apply creative designs and innovative solutions when developing computational artifacts. These courses cover such topics as abstraction, communication of information using data, algorithms, programming, the Internet, and global impact.

Cybersecurity	10020	Cybersecurity courses introduce students to the concepts of cybersecurity. These courses provide students with the knowledge and skills to assess cyber risks to computers, networks, and software programs. Students will learn how to create solutions to mitigate cybersecurity risks. These courses may also cover the legal environment and ethical computing behavior related to cybersecurity.
Computer Science Discoveries	10021	Computer Science Discoveries is a highly interactive and collaborative introduction to the field of computer science. The course takes a wide lens on computer science by covering topics such as problem solving, programming, physical computing, user centered design, and data. Students build their own websites, apps, animations, games, and physical computing systems. Students create and share their own content to meet various design challenges, as well as implement computational solutions to problems that impact their communities. Along the way, they practice design, testing, and iteration, as they come to see that failure and debugging are an expected and valuable part of the programming process.
Network Technology	10101	Network Technology courses address the technology involved in the transmission of data between and among computers through data lines, telephone lines, or other transmission media, such as hard wiring, wireless, cable networks, and so on. These courses may emphasize the capabilities of networks, network technology itself, or both. Students typically learn about network capabilities and network technology, including the software, hardware, and peripherals involved in setting up and maintaining a computer network.
Networking Systems	10102	Networking Systems courses are designed to provide students with the opportunity to understand and work with hubs, switches, and routers. Students develop an understanding of LAN (local area network), WAN (wide area network), wireless connectivity, and Internet-based communications (including cloud-based computing), with a strong emphasis on network function, design, and installation practices. Students acquire skills in the design, installation, maintenance, and management of network systems that may help them obtain network certification.
Area Network Design and Protocols	10103	Area Network Design and Protocols courses address the role of computers in a network system, the Open Systems Interconnection (OSI) model, structured wiring systems, and simple LAN (local area network) and WAN (wide area network) designs.
Router Basics	10104	Router Basics courses teach students about router components, installation, and configuration using routers (e.g., CISCO) switches and the IOS (Internetwork Operation System). These courses also cover such topics as TCP/IP protocol, IP addressing, subnetting concepts, and network trouble-shooting.
NetWare Routing	10105	NetWare Routing courses introduce students to such topics as Virtual LANs (VLAN) and switched internetworking, comparing traditional shared local area network (LAN) configurations with switched LAN configurations, and they also discuss the benefits of using a switched VLAN architecture. These courses also may cover routing protocols like RIP, IGRP, Novell IPX, and Access Control Lists (ACLs).
Wide Area Telecommunications and Networking	10106	Wide Area Telecommunications and Networking courses provide students with the knowledge and skills to enable them to design Wide Area Networks (WANs) using ISDN, Frame-Relay, and PPP. These courses provide students with an understanding of internetworking and expertise in trouble-shooting and assessing the adequacy of network configurations to meet changing conditions. Topics may include also Local Area Network (LAN) segmentation.
Wireless Networks	10107	Wireless Networks courses focus on the design, planning, implementation, operation, and trouble-shooting of wireless computer networks, including local access networks (LANs). These courses typically include a comprehensive overview of best practices in technology, security, and design.
Network Security	10108	Network Security courses provide students with an understanding of network security principles and implementation. Course topics usually include authentication, the types of attacks and malicious code that may be used against computer networks, the threats and countermeasures for e-mail, Web applications, remote access, and file and print services. These courses may also cover a variety of security topologies as well as technologies and concepts used for providing secure communication channels, secure internetworking devices, intrusion detection systems, and firewalls.

Essentials of Network Operating Systems	10109	Essentials of Network Operating Systems courses provide students with an overview of multi-user, multi-tasking network operating systems. In these courses, students study the characteristics of operating systems, such as Linux, and various Windows network operating systems and explore a range of topics including installation procedures, security issues, back-up procedures, and remote access. Advanced topics may include network administration, including account management, training, evaluating new technology, developing system policies, troubleshooting, e-mail and business communications and Web site management.
Microsoft Certified Professional (MCP)	10110	Microsoft Certified Professional courses provide students with the knowledge and skills necessary to be employed as a network administrator in the latest Windows server-networking environment. Topics include installing, configuring, and trouble-shooting the Windows server. These courses prepare students to set up network connections; manage security issues and shares; and develop policies. Students are typically encouraged to take the MCP exam.
Local Area Networking	10112	Local Area Networking courses introduce students to local area networking (LAN) administration skills, operating systems, basic user skills, defining network objects, building a simple LAN topology applying principles of cabling, LAN switching, designing file systems, managing user access, securing file systems, working with directory service software security, implementing network printing, implementing login scripts, and managing user environments.
Business Programming	10151	Business Programming courses provide students with experience in using previously written software packages. Topics may include loops, arrays, and functions as well as instruction on how to design and write programs of their own. These courses contain a business industry focus and provide an overview of the principles of object-oriented design and programming (e.g., Visual Basic [VB], C++, Java, RPL) related to the business industry.
Computer Programming	10152	Computer Programming courses provide students with the knowledge and skills necessary to construct computer programs in one or more languages. Computer coding and program structure are often introduced with the BASIC language, but other computer languages, such as Visual Basic (VB), Java, Pascal, C++, and C#, may be used instead. Students learn to structure, create, document, and debug computer programs. Advanced courses may include instruction in object-oriented programming to help students develop applications for Windows, database, multimedia, games, mobile and/or Web environments. An emphasis is placed on design, style, clarity, and efficiency. In these courses, students apply the skills they learn to relevant authentic applications.
Visual Basic (VB) Programming	10153	Visual Basic (VB) Programming courses provide an opportunity for students to gain expertise in computer programs using the Visual Basic (VB) language. As with more general computer programming courses, the emphasis is on how to structure and document computer programs and how to use problem-solving techniques. These courses cover such topics as the use of text boxes, scroll bars, menus, buttons, and Windows applications. More advanced topics may include mathematical and business functions and graphics.
C++ Programming	10154	C++ Programming courses provide an opportunity for students to gain expertise in computer programs using the C++ language. As with more general computer programming courses, the emphasis is on how to write logically structured programs, include appropriate documentation, and use problem-solving techniques. More advanced topics may include multi-dimensional arrays, functions, sorting, loops, and records.
Java Programming	10155	Java Programming courses provide students with the opportunity to gain expertise in computer programs using the Java language. As with more general computer programming courses, the emphasis is on how to structure and document computer programs, using problem-solving techniques. Topics covered in the course include syntax, I/O classes, string manipulation, and recursion.
Computer Programming—Other Language	10156	Computer Programming—Other Language courses provide students with the opportunity to gain expertise in computer programs using languages other than those specified (such as Pascal, FORTRAN, Python, or emerging languages). As with other computer programming courses, the emphasis is on how to structure and document

computer programs, using problem-solving techniques. As students advance, they learn how to best utilize the features and strengths of the language being used.

AP Computer Science A	10157	Following the College Board's suggested curriculum designed to mirror college-level computer science courses, AP Computer Science A courses emphasize object-oriented programming methodology with a focus on problem solving and algorithm development. These courses cover such topics as object-oriented program design; program implementation; program analysis; standard data structures; standard algorithms; and the ethical and social implications of computing systems.
IB Computer Science	10159	IB Computer Science courses prepare students to take the International Baccalaureate Computer Science exams. The courses emphasize system fundamentals, computer organization, and networks, as well as the fundamental concepts of computational thinking, the development of practical computational solutions, and programming. IB Computer Science courses also cover the applications and effects of the computer on modern society as well as the limitations of computer technology.
Particular Topics in Computer Programming	10160	These courses examine particular topics in computer programming other than those already described elsewhere in this classification system.
Computer Programming—Independent Study	10197	Computer Programming—Independent Study courses, often conducted with instructors as mentors, enable students to explore topics related to computer programming. Independent Study courses may serve as an opportunity for students to expand their expertise in a particular specialization, to explore a topic in greater detail, or to develop more advanced skills.
Computer Programming—Workplace Experience	10198	Computer Programming—Workplace Experience courses provide students with work experience in fields related to computer programming. Goals are typically set cooperatively by the student, teacher, and employer (although students are not necessarily paid). These courses may include classroom activities as well, involving further study of the field or discussion regarding experiences that students encounter in the workplace.
Computer Gaming and Design	10205	Computer Gaming and Design courses prepare students to design computer games by studying design, animation, artistic concepts, digital imaging, coding, scripting, multimedia production, and game play strategies. Advanced course topics include, but are not limited to, level design, environment and 3D modeling, scene and set design, motion capture, and texture mapping.
Mobile Applications	10206	Mobile Applications courses provide students with opportunities to create applications for mobile devices using a variety of commercial and open source software. These courses typically address the installation and modification of these applications, as well as customer service skills to handle user issues.
Computer Forensics	10301	Computer Forensics courses address the preservation, identification, extraction, documentation, and interpretation of computer data. Topics covered may include legal concepts, evidence handling and preservation, file system structures, chain of custody, and identification and recovery of computer data. These courses may also cover the need to perform an investigation and how to collect evidence and analyze data.
Cyber Crime	10302	Cyber Crime courses cover legal and ethical behavior associated with network security. Topics may include discussions about current common practices used to secure networks, how to test these networks, and presents methods that can be used to create a secure network environment. These courses may also cover the impact federal and state legislation has had on information technology practices.
Robotics	21009	Robotics courses help students develop and expand their skills and knowledge of robotics and related scientific and engineering topics. Course topics may include principles of mechanics, electronics, hydraulics, pneumatics, programmable logic controllers. These courses may emphasize the use of engineering principles to design and build robots, construct and connect sensors, and program robots in the programming language.