



# Indiana Content Standards for Educators

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## COMPUTER SCIENCE

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Computer science teachers are expected to have a broad and comprehensive understanding of the knowledge and skills needed for this educator license, and to use that knowledge to help students prepare for the challenges and opportunities of the twenty-first century. This requires the ability to identify, comprehend, analyze, synthesize, and evaluate the basic principles, fundamental concepts, and essential content defined in these standards, and to apply that knowledge to the tasks of planning and delivering effective instruction and assessment.

September 2019

# Computer Science Educator Standards

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## **Standard 1: Data and Information**

Computer science teachers have a broad and comprehensive understanding of the collection, storage, presentation, analysis, and interpretation of data.

## **Standard 2: Computing Devices and Systems**

Computer science teachers have a broad and comprehensive understanding of computing devices, their components, the relationship between hardware and software, and basic techniques of troubleshooting.

## **Standard 3: Programs and Algorithms**

Computer science teachers have a broad and comprehensive understanding of computational thinking, algorithms and problem solving, and programming concepts associated with variables, program control, modularity, and program development.

## **Standard 4: Networking and Communication**

Computer science teachers have a broad and comprehensive understanding of the characteristics of computer networks, cybersecurity, and the Internet.

## **Standard 5: Impact and Culture**

Computer science teachers have a broad and comprehensive understanding of the influence of computing technology on culture, societal interactions, and issues associated with safety, law, and ethics.

## **Standard 6: Computer Science Instruction and Assessment**

Computer science teachers have a broad and comprehensive understanding of content-specific curricula, instruction, and assessment in computer science.

# Computer Science Educator Standards

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## Standard 1: Data and Information

**Computer science teachers have a broad and comprehensive understanding of the collection, storage, presentation, analysis, and interpretation of data, including:**

- 1.1** technology and appropriate multimedia resources to conduct research and to support learning across the curriculum
- 1.2** digital tools to locate, search, manipulate, modify, store, and present data for a given purpose
- 1.3** evaluation of the accuracy, relevance, appropriateness, comprehensiveness, and biases that occur in electronic information sources
- 1.4** representation of data in a variety of ways (e.g., binary sequences, numbers, texts, sounds, images), and different visual representations of problems, structures, and data (e.g., graphs, charts, network diagrams, flowcharts)
- 1.5** types of databases (e.g., relational, hierarchical), principles of database design (e.g., tables, SQL), and database administration and management

## Standard 2: Computing Devices and Systems

**Computer science teachers have a broad and comprehensive understanding of computing devices, their components, the relationship between hardware and software, and basic techniques of troubleshooting, including:**

- 2.1** input and output devices
- 2.2** major computer system components and their properties
- 2.3** operating systems and the relationship between hardware and software
- 2.4** characteristics of computers and computing in daily life (e.g., voice mail, downloading video and audio files, Internet of things, wireless Internet, microcontrollers, mobile computing devices)
- 2.5** technology resources (e.g., data collection probes, mobile devices, videos, educational software, virtual and augmented reality, Web tools) for problem solving and to facilitate and support the learning process
- 2.6** productivity tools (e.g., word processing, spreadsheet, presentation software, Web and application-based productive tools) to facilitate learning and to support individual and collaborative writing, communication, and publishing activities
- 2.7** informatics and developing trends in computing (e.g., cyber-physical systems [CPS], network function virtualization [NFV], machine learning and artificial intelligence, smart homes, robotics, cloud computing)
- 2.8** troubleshooting strategies to identify and solve routine hardware and software problems that occur during everyday computer use

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### Standard 3: Programs and Algorithms

**Computer science teachers have a broad and comprehensive understanding of computational thinking, algorithms and problem solving, and programming concepts associated with variables, program control, modularity, and program development, including:**

- 3.1** the use of technology resources to solve problems and communicate thoughts, ideas, or stories in a step-by-step manner
- 3.2** interdisciplinary applications of computational thinking and the use of content-specific models and simulations to support learning and research
- 3.3** algorithmic problem solving to design solutions to problems (e.g., problem statement and exploration, examination of sample instances, design, implementing a solution, testing, evaluation)
- 3.4** characteristics and uses of common algorithms (e.g., searching, sorting)
- 3.5** implementing problem solutions using concepts of procedural and object-oriented programming languages
- 3.6** properties and uses of data types (i.e., integer, float, Boolean, string, and array) and variables
- 3.7** the use of conditionals (e.g., if statements, if else statements) to control program flow
- 3.8** characteristics and applications of loops (i.e., while statements, for statements)
- 3.9** the use of functions and methods to enhance program logic and support code reuse
- 3.10** hierarchy and abstraction in computing, including high-level languages, translation, instruction set, and logic circuits
- 3.11** debugging techniques to test, verify, and refine programs

### Standard 4: Networking and Communication

**Computer science teachers have a broad and comprehensive understanding of the characteristics of computer networks, cybersecurity, and the Internet, including:**

- 4.1** major types of computer networks and network components
- 4.2** use of online resources (e.g., e-mail, online discussions, collaborative Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products
- 4.3** designing, developing, publishing, and presenting products (e.g., videos, podcasts, Web sites, mobile apps) in a collaborative manner that uses technology resources to demonstrate and communicate curriculum concepts
- 4.4** principles of Web site design and Web development tools (e.g., HTML, CSS)
- 4.5** issues related to cybersecurity (e.g., methods for protecting personal information, encryption)
- 4.6** the basic structure and characteristics of the Internet

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### Standard 5: Impact and Culture

**Computer science teachers have a broad and comprehensive understanding of the influence of computing technology on culture, societal interactions, and issues associated with safety, law, and ethics, including:**

- 5.1** the positive and negative impacts of technology (e.g., social networking, cyberbullying, mobile computing and communication, Web technologies, cybersecurity, virtualization) on personal life and society
- 5.2** digital citizenship and the responsible use of technology and information
- 5.3** legal and ethical issues related to computers and networks (e.g., equity of access, security, privacy, copyright, intellectual property)
- 5.4** the influence of technology on careers and global development
- 5.5** the distribution of technological resources in a global economy and issues of equity and access

### Standard 6: Computer Science Instruction and Assessment

**Computer science teachers have a broad and comprehensive understanding of content-specific curricula, instruction, and assessment in computer science, including:**

- 6.1** state and national learning standards related to computer science
- 6.2** instructional strategies related to computer science that meet the needs of diverse student populations
- 6.3** strategies for actively engaging students in using technology to support their own learning and for developing students' problem-solving skills
- 6.4** instructional strategies for teaching concepts and skills related to the programming processes
- 6.5** strategies for facilitating individual and collaborative projects and investigations involving technology and virtual environments
- 6.6** strategies for effectively assessing students' understanding and mastery of skills and concepts related to computer science