K12 COMPUTER SCIENCE FRAMEWORK

Computer Science: Essential Knowledge for All Students

Computer science is a foundational subject for students' education and their future careers and interests. The purpose of the K–12 Computer Science Framework is to define what every student should learn in computer science to prepare them for the emerging demands of the 21st century—not just to major in computer science or secure jobs as software engineers. For example, computer science requires the development of strong computational thinking skills, which can be applied in science, mathematics, and other subjects. To date, many schools have individually adopted a computer science curriculum without the benefit of a shared vision that includes the insights of educators, experts, or employers. The framework offers guidance that can help states even the playing field and provide all students access to this critical opportunity.

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A Framework for K–12 Computer Science

The K–12 Computer Science Framework provides high-level, conceptual guidance for the computer science skills and knowledge students need to build across elementary, middle, and high school. The Association for Computing Machinery, Computer Science Teachers Association, Code.org, Cyber Innovation Center, and the National Math and Science Initiative joined forces with more than 50 writers and advisors within the computer science and education community (K–12 teachers, higher education faculty, and researchers), fourteen states (Arkansas, California, Georgia, Idaho, Indiana, Iowa, Maryland, Massachusetts, Nebraska, Nevada, New Jersey, North Carolina, Utah, and Washington), school districts, technology companies, and other organizations to describe the computer science concepts and practices that are essential to the educational success of all students.

How Can Computer Science Promote Equity?

Computer science can empower individuals to create technologies with broad influence, yet those who create them are often not representative of our society. Women, underrepresented minorities, and people with disabilities are often missing in computer science classes, majors, and occupations. A lack of diverse perspectives constrains the scope of problems being addressed and the ability of new tools and technologies to reach a wide range of people. Computer science skills are critical for success, and as long as there are gaps in access, the skills gap will only get wider. An important part of addressing this lack of diversity is increasing equity and opportunities for all students to learn computer science. The K–12 Computer Science Framework is part of a larger solution to the problem of equity in computer science.

Framework to Standards

The K–12 Computer Science Framework is not a set of standards; rather, it provides an organizing structure and guidance for states and school districts to create their own standards. The concepts and practices of the framework were developed by experts with feedback from a variety of stakeholders in the computer science education community. In addition to informing the development of standards, the framework can provide a common foundation for states to build a coherent plan for promoting computer science consisting of curriculum, instruction, professional development, and assessment.

The framework contains core practices and concepts to guide states in the development of standards. "Create a computational artifact for practical intent, personal expression, or to address a societal issue" is an example of a practice that a student exiting 12th grade is expected to be able to perform. And "People use computing devices to perform a variety of tasks accurately and quickly. Computing devices interpret and follow the instructions they are given literally" is an example of a concept that a student exiting 2nd grade is expected to know.

How Can the Framework Help States?

The K–12 Computer Science Framework can facilitate efforts to expand statewide access to computer science by establishing expectations for students (through standards development and curriculum writing) and developing appropriate supports for teachers (preparation, certification, and professional development). Most states do not have comprehensive K–12 computer science standards or support necessary professional development. A few states, such as Massachusetts, Arkansas, and Indiana, have developed comprehensive K–12 computer science standards that other states can draw from as examples. Other states, such as South Carolina, Virginia, and Washington, are beginning the standards development process. In addition, the framework is one of multiple inputs into the current revision of the 2011 Computer Science Teachers Association standards.