Computer Science in K-12 STEM Education
Critical for 21st Century Skills and Knowledge

What is appropriate computer science curriculum at the K-12 level?

In the United States, states and/or local governments generally make K-12 curriculum design decisions. While local, these decisions are influenced by national goals and accountability requirements related to certain federal laws. They also seek to address the workforce and college preparation needs of students, higher education and industry. To assist in these efforts, the Association for Computing Machinery (ACM) and the Computer Science Teachers Association (CSTA) have proposed a four-part, grade-appropriate model curriculum framework that educators can follow to design innovative, rigorous, and engaging computer science curriculum.

The first part is a course of study that teaches basic computer literacy skills in elementary and middle schools (K-8). It is followed by a progression of courses (parts 2 and 3, with the option of a fourth) that go deeper into the breadth and rigor of the field for high school students (9-12).

The high school model curriculum can be taught in a two- or three-course framework. The first course is accessible to all students, whether they are college-bound or intend to enter the workforce immediately after high school. Its goal is to provide all students an introduction to the principles of computer science and its place in the modern world. Concepts such as basic computing components (software), algorithmic problem-solving, computer networks, connections between elements of mathematics and computer science (including binary numbers, logic, sets, and functions), and exposure to careers in computing are part of this introductory course.

The second and/or third course(s) increase in rigor, giving students a deeper understanding of algorithm development, problem solving, programming while using software engineering principles, interface design, the limits of computers, and societal and ethical issues of software engineering. AP Computer Science is an example of a class that would fit the second or third course of a high school curriculum.
After completing any of these courses, students have useful and marketable knowledge and skills. The highest-level courses will impart very specific skills, including the ability to design and implement solutions to problems by writing, running, and debugging computer programs, the ability to use and implement commonly-used algorithms and data structures, and to develop and select appropriate algorithms and data structures to solve problems. While these skills may sound highly technical, they teach core critical thinking skills that young people need to be successful – in computing or any field – in the 21st Century.