Implementing K-12 Computer Science

Introduction
Computer science, and computational thinking skills, are a large part of the educational endeavor in all STEM fields. To address the unique skills required by 21st Century industries it is believed that students must be provided a foundation in technological literacy as well as explicit instruction and integration of computational thinking practices.

Definitions
For the purpose of this paper, computer science shall be defined as computer science is defined as “the study of computers and algorithmic processes, including their principles, their hardware and software designs, their implementation, and their impact on society” (as cited in K-12 Computer Science Framework, p 13).

Computational thinking shall be defined as “the thought processes involved in expressing solutions as computational steps or algorithms that can be carried out by a computer” (as cited in K-12 Computer Science Framework, p 68).

Addressing Technological Literacy / Proficiency
Technological literacy incorporates basic skills in computer usage as well a working knowledge of computer systems. Literacy is measurable through demonstration of basic computer usage skills.

Technological literacy for students graduating from an accredited Kansas K-12 classroom looks like;

- Basic hardware/software skills such as turning a computer on and starting an application
- Basic keyboarding skills according to grade level
- Use of search engines
- Selection of software based on task to be performed
- Use of productivity software to write, present, save, and tabulate information
- Digital citizenship as related to appropriate and responsible use of technology

Addressing Computational Thinking
Explicit Integration into Content Areas (K-5)
Computational thinking should be integrated into education at all levels, particularly in early grades. An understanding of algorithms and of coding techniques is helpful in all disciplines as it allows students to create models of and to run simulations of the phenomena they are experiencing. At the K-5 grade band teachers are encouraged to support students in using systems thinking such as exploring cause/effect relationships and their relation to inputs/outputs. (Specific examples on integration may be found in the supplemental appendix)
Explicit Integration into Content Areas (6-8)
In middle school, teachers are encouraged to build upon students’ foundational understandings and explicitly incorporate language to support students’ diverse sense-making through computational practices. Students will shift from making models of understanding to making models for understanding of diverse concepts and relationships.

Explicit Integration into Content Areas (9-12)
Students at the high school level should implement their computational skills to extend prior knowledge. For example, in physics, chemistry, and biology, the ability to wield abstraction in creating models is key to simplify and understand complex system relationships and make predictions about their potential impacts. Similarly, computer science and higher-level mathematics maintain many parallels and similarities. Thus, mathematics educators in 6-12 should seek to integrate mathematics and computer science standards into their learning activities and objectives. Students demonstrate the benefits of computational thinking through tasks relevant to their Individual Plan of Studies (IPS).

Recommendations
Due to the topical and activity overlaps involved, KSDE recommends district leadership considers ways explicitly integrate pathways for student success. This consideration may include allowing students to count one of the following courses, taught by an appropriately endorsed teacher, as a required core class in either mathematics or science for the purpose of satisfying minimum graduation requirements. This would mean that the course would incorporate standards from both content areas to add a relevant lens and deeper understanding of concepts. This course, however, should not be allowed to take the place of college admissions requirements as outlined by the Kansas Board of Regents.

Courses for potential integration include:
- Computer Science A Advanced Placement, CSA
- Computer Science Principles Advanced Placement, CSP
- IB Computer Science
- Programming
- Advanced Programming

Integration Support
Specific tools and strategies for implementation may be found in the appendix.