2017 Computer Science Standards of Learning

Middle School Computer Science Elective (MSCE) Standards

The standards below outline the content for a flexible elective course with optional modules for 6-week, 9-week, 18-week, or 36-week implementations. These standards build on the concepts of computer science developed in prior grade levels and in the integrated standards for middle school students. Teachers are encouraged to select programming languages and environments, problems, challenges, and activities that are appropriate for their students to successfully meet the objectives of the standards.

The content for the initial 6-week module has an emphasis on computer programming. Students will review and build on skills developed throughout elementary school. Teachers may choose a block-based or text-based programming environment based on the prior experience of the students and the selected problems. For a 9-week module, students will study the history of computers and computer science, with a focus on the impact of Virginians. In the 18-week module, students will build additional programming skills within the framework of computer science principles. For an 18-week module, students will complete one or more projects to include programming, hardware and software integration, and collaboration.

Programmable computing tools will be used to facilitate design, analysis, and implementation of computer programs. Students for exploring and creating computer programs, facilitating reasoning and problem solving, and verifying solutions should use these tools.

6-week Core Module

Algorithms and Programming

MSCSE.1   The student will design and iteratively develop programs that combine control structures, including loops and conditionals.

MSCSE.2   The student will investigate variables and data types, including simple operations on strings.

MSCSE.3   The student will implement a program that accepts input values, stores them in appropriately named variables, and produces output.

MSCSE.4   The student will document programs in order to make them easier to trace, test, and debug.

Additional Content for 9-week Module

Impacts of Computing

MSCSE.5   The student will discuss issues of bias and accessibility in the design of existing technologies.

MSCSE.6   The student will describe and explain the history of computer science, including naming significant historical figures and describing their impact on the field.

Additional Content for 18-week Module

Algorithms and Programming

MSCSE.7   The student will use flowcharts and/or pseudo code to address complex problems as algorithms.

MSCSE.8   The student will incorporate existing code, media, and libraries into original programs, and give attribution.

MSCSE.9   The student will systematically test and refine programs using a range of test cases.

Networks and the Internet

MSCSE.10   The student will model the role of protocols in transmitting data across networks and the Internet.

Cybersecurity

MSCSE.11   The student will apply multiple methods of encryption to model the secure transmission of information.

MSCSE.12   The student will explain how physical and digital security measures protect electronic information.

Data and Analysis

MSCSE.13   The student will collect data using computational tools and transform the data to make it more useful and reliable.

MSCSE.14   The student will refine computational models based on the data they have generated.

MSCSE.15   The student will represent data using multiple encoding schemes.

Impacts of Computing

MSCSE.16   The student will discuss issues of bias and accessibility in the design of existing technologies.

MSCSE.17   The student will compare tradeoffs associated with computing technologies that affect people's everyday activities and career options.

MSCSE.18   The student will collaborate with many contributors through strategies such as crowdsourcing or surveys when creating a computational artifact or visualization.

MSCSE.19   The student will describe tradeoffs between allowing information to be public and keeping information private and secure.

Computing Systems

MSCSE.20   The student will systematically identify and correct problems with computing devices and their components.

MSCSE.21   The student will explore the relationship between hardware and software using he Internet of Things.

36-week Module

Algorithms and Programming

MSCSE.22   The student will work in a team to distribute tasks; maintain a timeline; and use iterative design to solve problems, including peer review and feedback.

MSCSE.23   The student will decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.

MSCSE.24   The student will create procedures with parameters to organize code and make it easier to reuse.

Computing Systems

MSCSE.25   The student will recommend improvements to the design of computing devices, based on an analysis of how users interact with the devices.

MSCSE.26   The student will design projects that combine hardware and software components to collect and exchange data.