

## Computer Science and Mathematics Education

A Position of the National Council of Teachers of Mathematics

### Question

Should mathematics course requirements for high school graduation be satisfied by computer science courses?

#### **NCTM Position**

Ensuring that students complete college- and career-readiness requirements in mathematics is essential. Although knowledge of computer science is also fundamental, a computer science course should be considered as a substitute for a mathematics course graduation requirement only if the substitution does not interfere with a student's ability to complete core readiness requirements in mathematics. For example, in states requiring four years of mathematics courses for high school graduation, such a substitution would be unlikely to adversely affect readiness. Further, courses designated as mathematics courses should include only those designed explicitly to teach mathematics, with clear mathematical learning goals guiding the content, and taught by professionals certified to teach mathematics, while courses addressing computer science content should be labeled and counted as computer science courses and should be taught by professionals certified to teach such content.

Access to computer science can be beneficial to students' future success. Computer science should be incorporated into the curriculum in a way that enhances, rather than limits, students' college and career readiness in mathematics and other disciplines. Although modern definitions of computer science recognize similarities, connections, and intersections between the fields of computer science and mathematics, it is widely agreed, especially by computer scientists and mathematicians, that computer science is not a subfield of mathematics, or vice versa.

When considering whether computer science courses should count toward core mathematics requirements for high school graduation, administrators and policymakers should address a fundamental question: How would a policy of accepting such substitutions affect students' college and career readiness in mathematics? Allowing high school students to fulfill a core mathematics requirement by completing a course that moves them off the path of full mathematical college and career readiness upon high school graduation is unacceptable. "Readiness" is typically defined as full preparation for successful completion of a college or vocational program without the need for remedial, often non-credit bearing, courses. Operationally, in most states, mathematical readiness minimally entails successful completion of a three-course mathematics requirement leading through an updated Algebra 2 or Integrated Mathematics 3 course. Allowing a computer science course to substitute for a mathematics course in states with a graduation requirement of only two mathematics courses (beginning with Algebra 1 or the equivalent) would surely undermine students' mathematics preparation, while doing so in states that require four mathematics courses would be unlikely to have an adverse impact on college and career readiness in mathematics.

Currently, more than 25 states and the District of Columbia allow computer science courses to satisfy either a mathematics or a science course requirement. The number of states allowing computer science to count toward graduation credit in these fields is increasing, and ongoing efforts to expand the core requirements for high school graduation will make it more difficult for students to acquire the mathematical knowledge to be college and career ready unless the number of required mathematics courses protects math readiness even in the case of the substitution of a computer science course for a mathematics course. Although computer science classes have great value for students and may help reinforce some mathematical skills and processes, computer science course options should not be expanded at the expense of mathematics course opportunities that build the required mathematical foundation for college and career readiness.

Furthermore, the content of any course should determine the qualifications of the professional assigned to teach it. If a course is primarily a computer science course, with some connections to mathematical content, it should be considered a computer-science course and taught by a professional who is certified to teach such a course. If, however, a course is primarily and fundamentally a mathematics course with computer science content introduced in support of mathematics learning goals, it should be taught by a mathematics-certified teacher.

## References

*Computer Science and Mathematics Graduation Requirements*. (March 2015). Discussion paper for the Board of Directors developed by the Emerging Issues Committee of the National Council of Teachers of Mathematics.