





**TO:** P-12 Education Committee

**FROM:** Ken Wagner 

**SUBJECT:** Computer Science and Coding in the K-12 Setting

**DATE:** September 8, 2014

**AUTHORIZATION(S):**   
SUMMARY

**Item for Discussion**

Department staff will present an overview of computer science and programming (“coding”) in the K-12 setting.

**Background Information**

Computer science has been defined by the Computer Science Teachers Association (CSTA) as “the study of computers and algorithmic processes, including their principles, their hardware and software designs, their applications, and their impact on society” (see <http://csta.acm.org/Curriculum/sub/CurrResources.html>). In broader terms, computer science is about developing new ways to use computer devices to solve problems.

According to Code.org, a nonprofit organization committed to increasing access to computer science in the K-12 setting (see <http://code.org>), computer science and programming (“coding”) develops students’ computational and critical thinking skills and shows them how to create, not simply use, new technologies.

This fundamental knowledge is needed to prepare students for the 21st century, regardless of their ultimate field of study or occupation. Many of today’s newly created jobs, including those that offer good compensation packages and a positive work/life balance, are those that involve computer science and coding. In addition, a commitment to computer science and coding in the K-12 setting promises long-term equity benefits, particularly for girls and students of color, who are typically underrepresented in these fields.

## **Using Courses in Computer Science to Meet Diploma Requirements**

New York's current graduation requirements call for 22 units of credit at the commencement level, including three units of credit in both mathematics and science. Although courses in computer science can be used for elective credit, there are provisions in Commissioner's Regulations §100.5 through which courses in computer science may be used to meet the math or science diploma credit requirements.

Section 100.5(b)(7)(iv) of the Commissioner's Regulations allows diploma credit to be granted for specialized courses. A specialized course is a course that meets the requirements of a unit of credit as defined in Section 100.1(a) and the New York State commencement-level learning standards as established by the Commissioner. A specialized course develops the subject in greater depth and/or breadth and/or may be interdisciplinary. After passing the required New York State assessment or approved alternative in mathematics, science, or English language arts, the remaining units of credit required in that discipline may be in specialized courses.

Further, §100.5(b)(7)(iv)(j) states that the State learning standards in technology may be met either through a course in technology education or through an integrated course combining technology with mathematics and/or science. A commencement-level course in technology education may be used as the third unit of credit in science or mathematics, but not both.

The above provisions give flexibility to the districts to use courses in computer science to meet the unit of study requirements for either mathematics or science, including local course offerings or other programs such as AP Computer Science A.

## **Teacher Certification**

According to the 2012-13 BEDS collection, approximately 1,100 teachers identified Computer Studies as their primary teaching responsibility. In contrast, data on teacher certification indicate that only about 115 teachers possess specific Computer Technology or Computer Technology 7-12 certification. This difference indicates that the vast majority of K-12 instruction in computer science and coding is provided by teachers certified in other areas, such as math, business, or the sciences.

## **Computer Science Programs in New York State**

There are over 100 approved Career and Technical Education (CTE) programs in New York State within the Information Technology and STEM career cluster areas that appear to have the potential to offer aspects of computer science, such as coding, including programs with offerings in advanced accounting, computer animation, gaming, and web design.

In addition to the approved CTE programs, New York school districts are beginning to incorporate instruction in coding into existing programs. For example, the

Plainview-Old Bethpage Central School District will offer the Code.org's *Hour of Code* experience to elementary school students this school year. This introduction to computer science is designed to inspire students to continue learning how technology improves real-world relationships, connections, and life. Students learn how the internet works and learn logic and creative problem solving through basic "drag-and-drop" computer programming.

The New York City public schools have begun the Software Engineering Pilot (SEP) which helps middle and high school students learn creative and technical computer skills that will prepare them for jobs in the software engineering field. In the first year of the program (2013-14), SEP served 18 schools and more than 1,400 students in grades 6 and 9 who experienced a full-year curriculum in computer programming, LEGO robotics, electronics, website development, and the creation of applications for mobile devices. Students also participated in a wide range of enrichment opportunities including "hackathons", an end-of-year showcase, and summer learning. During the 2014-15 school year, the program will expand to include grades 7 and 10 and incorporate work-based learning experiences, including internships.

The SEP program also trains and supports teachers from any discipline by providing year-round professional development, curriculum, and materials. Many of the program's 42 teachers have limited or no prior exposure to computer science. In addition, SEP incorporates partnerships with the technology industry, government, nonprofits, and universities to create rich learning experiences and to ensure that students are prepared for a wide range of postsecondary pathways.

### **Recommendation**

It is recommended that the Board direct Department staff to issue a field memo that highlights the flexibility in existing regulations that allows schools and districts to offer courses in computer science and coding that can be used to meet graduation requirements.