HB 281

Department of Legislative Services

Maryland General Assembly
2018 Session

FISCAL AND POLICY NOTE
Third Reader - Revised

House Bill 281 (Delegate A. Miller, *et al.*)
Ways and Means Education, Health, and Environmental Affairs

Education - Computer Science - Curriculum and Professional Development (Securing the Future: Computer Science Education for All)

This bill requires, beginning in the 2021-2022 school year, each public high school to offer at least one high-quality computer science course. The bill establishes the Maryland Center for Computing Education to, among other things, provide computer science-related professional development and administer a grant program. The bill also establishes a special fund to support the activities of the center. The Governor must appropriate *at least* $1.0 million in fiscal 2020 and 2021 for the fund. **The bill takes effect June 1, 2018.**

Fiscal Summary

State Effect: General fund expenditures increase by as much as $300,000 in FY 2019 and *at least* $1.0 million in FY 2020 and 2021 for the special fund. Special fund revenues and expenditures increase correspondingly. Future years reflect ongoing expenses for the Maryland State Department of Education (MSDE) beginning in FY 2021. The Governor's proposed FY 2019 budget includes $5.0 million to establish the center. **This bill establishes a mandated appropriation for FY 2020 and 2021.**

($ in millions)	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
SF Revenue	$0.3	$1.0	$1.0	$0	$0
GF Expenditure	$0.3	$1.0	$1.1	$0.1	$0.1
SF Expenditure	$0.3	$1.0	$1.0	$0	$0
Net Effect	($0.3)	($1.0)	($1.1)	($0.1)	($0.1)

Note:() = decrease; GF = general funds; FF = federal funds; SF = special funds; - = indeterminate increase; (-) = indeterminate decrease

Local Effect: Local school system expenditures may increase, potentially significantly, to implement the required curriculum. However, grants and training from the center may reduce the local expenditures necessary to meet the requirements of the bill. **This bill may impose a mandate on a unit of local government.**

Small Business Effect: None.

Analysis

Bill Summary:

Local School Systems

Each local board of education must make efforts to (1) incorporate computer science in each public elementary and middle school and (2) increase enrollment of specified individuals in middle and high school computer science courses.

Maryland Center for Computing Education

The bill establishes the center in the University System of Maryland (USM). The purpose of the center is to expand access to high-quality computer science education in grades preK through 12 by strengthening the skills of educators and increasing the number of computer science teachers in elementary and secondary education.

In carrying out the powers and duties granted under the bill, the center must work in consultation and collaboration with institutions of higher education in the State, including those specified.

The center must develop a Maryland State Computer Science Education Implementation Plan that identifies (1) specific actions, resources, metrics, and benchmarks to create a long-term sustainable pipeline of computer science teachers and (2) activities to obtain and sustain public and private partnerships for funding, mentoring, and internships for teachers. By July 1, 2019, the center must publish the plan on its website.

The center must provide professional development and programs to broaden and sustain the pool of teachers needed to achieve the requirements of the bill and complete specified related tasks.

Competitive Grant Program

The center must administer an open and competitive grant program to support professional development in computer science education. Grant applications from local boards of education and institutions of higher education must receive priority. In addition, applications that address specified areas of importance must receive priority.

Computing Education and Professional Development Fund

The center must administer the Computing Education and Professional Development Fund (CEPDF), a special, nonlapsing fund that may only be used for (1) any activity or program that furthers the purposes specified; (2) grants made by the center; and (3) administrative expenses of the center. The fund comprises money appropriated in the State budget to the fund, interest earnings of the fund, and any other money accepted for the benefit of the fund. Expenditures from CEPDF may be made only in accordance with the State budget.

Current Law: With the advice of the State Superintendent of Schools, the State Board of Education must establish minimum requirements for issuing certificates and diplomas by public and private high schools.

Public High School Diploma Requirements

According to regulations, to be awarded a high school diploma, a student must be enrolled in a Maryland public school system and have earned a minimum of 21 credits in specified subjects as detailed in **Exhibit 1**.

Exhibit 1
Distribution of Credits Required to Graduate High School

Subject	Credits
English	4.0
Fine Arts	1.0
Mathematics[1]	3.0
Physical Education	0.5
Health Education	0.5
Science	3.0
Social Studies	3.0
Technology Education	1.0
World Language *or* American Sign Language *or* Advanced Technology Education[2]	2.0
Electives[2]	3.0

Note: The credits must meet other requirements specified in the Code of Maryland Regulations. Elective programs and instruction must be developed at the discretion of the local school system, be open to enrollment for all students, and focus on in-depth study in required subject areas, exploration, or application and integration of what has been learned. In addition, all students must complete a locally designed high school program of environmental literacy approved by the State Superintendent of Schools.

[1]However, beginning with students entering grade 9 in the 2014-2015 school year, each student must enroll in a mathematics course in each year of high school that the student attends, up to a maximum of four years of attendance, unless, in the fifth or sixth year, a mathematics course is needed to meet a graduation requirement.

[2]Alternatively, a student may successfully complete a State-approved career and technology program for four credits and one credit in an elective.

Source: Code of Maryland Regulations; Department of Legislative Services

According to January 2016 MSDE guidance, each local school system is required to offer a technology education program in grades 9 through 12 that will allow students to meet the technology education graduation requirement and select advanced technology education electives. School systems can either offer students any of the MSDE preapproved engineering design or computer science-based courses listed in **Exhibit 2**, or local school systems can identify additional courses that meet requirements by completing the MSDE curriculum alignment review process for technology education.

Exhibit 2
MSDE Preapproved Courses for Technology Education Graduation Credit

Engineering Design-based Courses	**Computer Science-based Courses**
• International Technology and Engineering Educators Association's Foundations of Technology	• Exploring Computer Science
• Project Lead the Way – Introduction to Engineering Design*	• Foundations of Computer Science*
• Project Lead the Way – Principles of Engineering*	• Advanced Placement Computer Science Principles

*Also a course in a Career and Technology Program of Study. School systems must adhere to Career and Technology Education completer program requirements.

Source: Maryland State Department of Education

In addition, one of the mathematics courses required for graduation may include Advanced Placement (AP) Computer Science and a computer science course that is not AP Computer Science if the local school system determines the course meets the mathematics standards required by regulation.

Background: According to the U.S. Bureau of Labor Statistics, employment of computer and information technology occupations is projected to grow 13% from 2016 to 2026, faster than the average for all occupations. As of May 2016, the median annual wage for computer and information technology occupations was $82,860, which was higher than the median annual wage for all occupations of $37,040.

Computer Science in Maryland Schools

As shown in **Exhibit 3**, 129 high schools offered no computer science courses during the 2016-2017 school year. Some high schools offered more than one computer science

course. It is unknown if all of the computer science courses currently offered meet the requirements of the bill.

Exhibit 3
Computer Science Course Offered and Not Offered in Maryland High Schools
2016-2017 School Year

School System	AP CS	CS Principles	IB CS	Exploring CS	No CS
Allegany	0	0	0	0	4
Anne Arundel	10	0	0	2	7
Baltimore City	5	5	0	0	35
Baltimore	17	0	0	0	16
Calvert	2	0	0	0	4
Caroline	1	0	0	0	1
Carroll	7	0	0	0	4
Cecil	3	0	0	0	2
Charles	7	8	0	0	0
Dorchester	0	0	0	0	2
Frederick	6	0	1	0	4
Garrett	2	0	0	0	0
Harford	8	0	0	0	3
Howard	12	12	0	0	2
Kent	1	0	0	0	0
Montgomery	25	2	0	0	5
Prince George's	7	2	0	1	27
Queen Anne's	1	0	0	0	1
St. Mary's	2	0	0	0	1
Somerset	0	0	0	0	2
Talbot	2	0	0	0	0
Washington	3	0	0	0	6
Wicomico	3	0	0	0	2
Worcester	2	2	0	0	1
Total	**126**	**31**	**1**	**3**	**129**

AP: Advanced Placement CS: Computer Science IB: International Baccalaureate

Note: Montgomery County advises that all comprehensive high schools currently offer computer science.

Source: Maryland State Department of Education

Maryland does not have computer science standards. However, MSDE advises that it has been developing K-12 standards for computer science and will present them to the State board in June 2018. Once the standards are adopted by the State board, supporting documents will be developed, reviewed, and revised by teams of Maryland educators and may also include national computer science models. These documents, such as frameworks, unit plans, outlines, model lessons, and resource lists, will provide guidance for implementing the standards, serving as a guide for school systems as they develop the local curriculum.

MSDE reports that it does not have a computer science educational specialist. Generally, every required content area has a supervisory position housed at MSDE. According to regulations, computer science is a content area in which teachers can become certified.

Computer Science Degrees

In the 2015-2016 academic year, 5,450 individuals graduated from a Maryland four-year institution with a computer science degree: 3,177 bachelor's degrees; 2,182 master's degrees; and 91 doctoral degrees. An additional 275 individuals graduated from a community college with an associate's degree in computer science. Also, community colleges awarded 13 lower division certificates in computer science. According to Code.org, universities in Maryland graduated only one new teacher prepared to teach computer science in 2016.

Proposed Fiscal 2019 Budget

The Governor's proposed fiscal 2019 budget includes $5.0 million to establish the center in USM. The Senate made the $5.0 million contingent on the passage of Senate Bill 300 or House Bill 350, and the House Appropriations Committee has added this bill to the funding contingency. If the contingency is maintained by the House and the Senate concurs, this bill effectuates that funding.

The University of Maryland Baltimore County in collaboration with the University of Maryland, College Park Campus is developing and evaluating professional development activities focused on increasing the expertise of Maryland high school teachers for teaching computer science, with the ultimate goal of increasing the number of rigorous computer science classes offered across the State and the number and diversity of students taking these classes. Computer Science Matters in Maryland is a National Science Foundation-supported effort to increase the availability and quality of high school computer science courses across Maryland.

State Fiscal Effect: General fund expenditures increase in fiscal 2019 to begin staffing the center and by *at least* $1.0 million in fiscal 2020 and 2021 due to the mandate that the

Governor include at least that amount for CEPDF. CEPDF revenues and expenditures increase correspondingly. In addition, general fund expenditures increase by $96,259 in fiscal 2021 to hire a full-time computer science educational specialist at MSDE.

The Center

The Governor must include at least $1.0 million for CEPDF to be administered by the center annually for fiscal 2020 and 2021. As allowed under the bill, it is assumed that a portion of the mandated funds will be used to provide administrative support for the center. USM advises that, of the $5.0 million included in the fiscal 2019 budget for the center, $300,000 will support four new positions. Thus, it is assumed that at least $700,000 of the mandated funding is available for competitive grants and training.

This analysis also assumes staffing is needed in fiscal 2019 for the center to develop the required plan by July 1, 2019. Accordingly, at least some portion of the $300,000 planned for positions is needed in fiscal 2019.

Institutions of Higher Education

Public four-year institutions and Baltimore City Community College can be consulted and collaborated with using existing resources.

Teachers' Retirement Costs

Teachers' retirement costs are paid based on local school system salaries from the second prior fiscal year. If additional teachers are hired to teach computer science in the 2021-2022 school year (fiscal 2022), teachers' retirement expenses, paid by the State, will increase, beginning in fiscal 2024. Any such impact cannot be reliably quantified at this time.

Maryland State Department of Education

General fund expenditures for MSDE increase by $96,259 in fiscal 2021. This estimate assumes that the educational specialist is hired on July 1, 2020, to develop content standards for the high school computer science course that is required by the 2021-2022 school year. The estimate includes a salary, fringe benefits, one-time start-up costs, and ongoing operating expenses related to the hiring of a computer science educational specialist.

Although funding is provided for the center to develop computer science curriculums, MSDE requires an educational specialist to develop content standards for the State Board of Education and to provide ongoing guidance to local school systems about curriculums

that meet the standards developed. This estimate further assumes that costs for training are covered by grants to MSDE or local school systems from the center as part of the funding for the center. To the extent additional training is required, expenditures increase.

	FY 2021
Position	1
Salary and Fringe Benefits	$90,744
One-time and ongoing expenses	5,515
FY 2021 MSDE Expenditures	**$96,259**

Future year expenditures reflect a full salary with annual increases and employee turnover, the elimination of one-time expenses, and ongoing operating expenses.

Local Fiscal Effect: Local school system expenditures may increase, potentially significantly, to offer a computer science course that meets the requirements of the bill at every high school beginning in the 2021-2022 school year.

Grants and training from the center may reduce local expenditures; however, local school systems that do not offer a computer science course that meets the requirements of the bill in every high school may need to hire additional teachers and buy computers and other instructional material. Thus, the bill may impose a mandate on local school systems. Hiring additional teachers to meet the requirement in the 2021-2022 school year (fiscal 2022) also increases the local share of teachers' retirement costs beginning in fiscal 2024.

For illustrative purposes, the statewide first-quartile salary per teacher in the 2020-2021 school year (fiscal 2021) is estimated at $58,850. Assuming local school systems hire a computer science teacher for each of the 129 high schools that do not currently offer a computer science course, local school system expenditures increase by $7.6 million. To the extent that local schools need to purchase additional computers to teach the computer science courses, costs increase further. For informational purposes, a base model computer, such as a Chromebook, costs approximately $250 each. Purchasing 25 computers for each high school without a computer science course costs a total of approximately $806,250. Additional teachers and equipment may also be required to offer the required elementary and middle school level curriculum; however, these costs cannot be reliably estimated. Additional costs to maintain and replace computers are likely. To the extent that current teachers can be retrained by the center, costs are less, as described below. Local school systems and teachers may receive grants and training from the center. These grants and training may reduce or offset local expenditures necessary to meet the requirement of the bill.

Since universities in Maryland only graduated one individual prepared to teach computer science in 2016, it is assumed that there is a shortage of teachers trained to teach computer science courses. Thus, prior to the full implementation of the computer science teacher development pathways and the teacher training and development by the center, local school systems may face challenges hiring qualified teachers to teach the required computer science courses and curriculum in the first few years of implementation. However, the training and pathways supported by the center are anticipated to increase the number of teachers qualified to teach computer science.

Local community colleges can be consulted and collaborated with using existing resources.

Additional Information

Prior Introductions: None.

Cross File: None.

Information Source(s): Howard and Montgomery counties; Maryland State Department of Education; Department of Budget and Management; U.S. Bureau of Labor Statistics; Computer Science Matters in Maryland; Code.org; U.S. Equal Employment Opportunity Commission; Department of Legislative Services

Fiscal Note History: First Reader - February 7, 2018
mm/rhh Third Reader - March 20, 2018
Revised - Amendment(s) - March 20, 2018
Revised - Budget Information - March 20, 2018

Analysis by: Caroline L. Boice

Direct Inquiries to:
(410) 946-5510
(301) 970-5510