**HB 350**

# Department of Legislative Services

Maryland General Assembly
2018 Session

## FISCAL AND POLICY NOTE
**First Reader**

House Bill 350 (The Speaker, *et al.*) (By Request - Administration)
Ways and Means

**Achieving Computer Science Collaborations for Employing Students Statewide (ACCESS) Act of 2018**

This Administration bill requires the State Board of Education to develop and adopt content standards for computer science education for kindergarten through grade 12 by November 30, 2018. By the 2020-2021 school year, every public high school must offer at least one specified computer science course. By the 2022-2023 school year, every public middle and elementary school must offer specified computer science-related curriculum. The bill also establishes a Maryland Center for Computing Education (center) in the University System of Maryland (USM) to (1) provide professional development; (2) administer a grant program; and (3) set diversity goals. **The bill takes effect July 1, 2018.**

## Fiscal Summary

**State Effect:** Beginning in FY 2019, general fund expenditures increase by $5.1 million to establish the center and adopt content standards. The Governor's proposed FY 2019 operating budget includes $5.0 million to establish the center. Revenues are not affected.

| ($ in millions) | FY 2019 | FY 2020 | FY 2021 | FY 2022 | FY 2023 |
|---|---|---|---|---|---|
| Revenues | $0 | $0 | $0 | $0 | $0 |
| GF Expenditure | 5.1 | 5.1 | 5.1 | 5.1 | 5.1 |
| Net Effect | ($5.1) | ($5.1) | ($5.1) | ($5.1) | ($5.1) |

*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 significantly 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:** The Administration has determined that this bill has minimal or no impact on small business (attached). The Department of Legislative Services (DLS) concurs with this assessment.

## Analysis

**Bill Summary:** The Maryland State Department of Education (MSDE) must develop a plan for implementing the curriculum standards, including developing specified strategies, establishing teaching standards, and developing guidelines.

*Education Requirements*

Beginning in the 2020-2021 school year, every public high school must offer at least one computer science course that is designed to prepare students for careers and college.

Beginning in the 2022-2023 school year, every public middle school must offer computer science education.

Also beginning in the 2022-2023 school year, every public elementary school must offer a curriculum that requires computational thinking.

*Maryland Center for Computing Education*

The center must (1) provide professional development in computer science education to teachers, administrators, and other professionals; (2) administer a grant program for local education agencies and nonprofit entities that seek to provide professional development in computer science education; and (3) set measurable goals for increasing the gender, racial, disability status, socioeconomic, and geographic diversity of Maryland students who pursue computer science careers after high school or college. The Governor must appoint an executive director of the center. The executive director must ensure the requirements of the center are carried out, develop a plan to appropriately carry out the duties of the center, develop specified working relationships, and deliver an annual report.

The Maryland Center for Computing Education Advisory Board advises the executive director of the center on the operations and activities of the center. The advisory board consists of voting members appointed by the executive director, in consultation with the Governor, and specified *ex officio* members.

Advisory board members may not receive compensation but are entitled to reimbursement for expenses under the standard State travel regulations.

**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 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 Courses Offered and Not Offered in Maryland High Schools**
**2016-2017 School Year**

| School System | AP Computer Science | Computer Science Principles | IB Computer Science | Exploring Computer Science | No Computer Science |
|---|---|---|---|---|---|
| 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** |

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 Maryland Center for Computing Education in USM.

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 Expenditures:** Beginning in fiscal 2019, general fund expenditures increase by an estimated $5.1 million both to establish the center and for MSDE to hire a full-time computer science educational specialist. This estimate is based on the assumptions and information discussed below.

*Maryland Center for Computing Education*

The Governor's proposed fiscal 2019 budget includes $5.0 million to establish the center at USM. USM advises that the $5.0 million will be spent as follows: four full-time

positions ($300,000); curriculum and training resources development ($200,000); teacher training ($3.0 million); mentoring and outreach ($1.0 million); and grants to universities to establish teacher pathways ($500,000). More specifically, USM advises that a director, program coordinator, assistant coordinator, and administrative support staff will be required. The $200,000 in resource development will be spent on curriculum and training materials and delivery in support of new K-12 standards. The $3.0 million in teacher training will support local school systems through direct training and grants to local school systems. The $1.0 million in mentoring and outreach is for program development and stipends. The $500,000 in university grants is for universities to establish pathways to develop computer science teachers.

| | **FY 2019** |
|---|---|
| Positions | 4 |
| Salaries and Fringe Benefits | $300,000 |
| Resource Development | 200,000 |
| Teacher Training/Local Grants | 3,000,000 |
| Mentoring/Outreach | 1,000,000 |
| University Grants-Teacher Pathways | 500,000 |
| **FY 2019 Center Expenditures** | **$5,000,000** |

Future year expenditures reflect level funding of $5.0 million annually for the center. To the extent more or less funding is provided to the center, general fund expenditures are likewise more or less. Additional funding may be provided for annual salary increases and other operating expenses.

DLS advises that the *center* can likely accomplish the requirements of the bill for less than $5.0 million; however, to the extent that general fund expenditures for the center are less than $5.0 million, local school system expenditures and higher education expenditures may increase significantly. Absent sufficient center funds, local school system expenditures increase to develop curriculum and training materials and provide training for teachers. Likewise, higher education expenditures may increase to establish pathways for computer science teachers.

Expenditures in fiscal 2024 and beyond may be less due to the initiatives in the bill being fully implemented. However, any such future reductions cannot be reliably estimated.

*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 2020-2021 school year (fiscal 2021), teachers' retirement expenses paid by the State

increase beginning in fiscal 2023. Any such impact cannot be reliably quantified at this time.

*Maryland State Department of Education*

This estimate assumes that the educational specialist at MSDE is hired on July 1, 2018, which reflects the November 30, 2018 required deadline for adopting computer science content standards. Although funding is provided for the center to develop computer science curriculums, MSDE requires an educational specialist to develop content standards and to provide ongoing guidance to local school systems about curriculums that meet the standards developed.

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. 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 $3.0 million teacher training funding.

| | **FY 2019** |
|---|---|
| Position | 1 |
| Salary and Fringe Benefits | $87,749 |
| One time and ongoing expenses | 5,515 |
| **FY 2019 MSDE Expenditures** | **$93,264** |

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 implement the required curriculum in all high schools, middle schools, and elementary schools by the required dates. In particular, offering at least one computer science course that meets the requirements of the bill at every high school may increase costs significantly.

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 2020-2021 school year (fiscal 2021) also increases the local share of teachers' retirement costs beginning in fiscal 2023.

*For illustrative purposes,* the statewide first-quartile salary per teacher in the 2020-2021 school year (fiscal 2021) is estimated at $57,696. 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 $7.4 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 significantly reduce or offset local expenditures necessary to meet the requirements of the bill. To the extent that $5.0 million annually is not provided for the center to implement the bill, local school system expenditures increase significantly to provide teacher training and develop curriculum.

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.

## Additional Information

**Prior Introductions:** None.

**Cross File:** SB 300 (The President, *et al.*) (By Request - Administration) - Education, Health, and Environmental Affairs.

**Information Source(s):** Montgomery County; Maryland State Department of Education; University System of Maryland; 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 6, 2018
md/rhh

Analysis by: Caroline L. Boice

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

## ANALYSIS OF ECONOMIC IMPACT ON SMALL BUSINESSES

TITLE OF BILL: **Achieving Computer Science Collaborations for Employing Students Statewide (ACCESS) Act of 2018**

BILL NUMBER: SB0300/HB0350

PREPARED BY: Melissa Ross

PART A. ECONOMIC IMPACT RATING

This agency estimates that the proposed bill:

_**X**_ WILL HAVE MINIMAL OR NO ECONOMIC IMPACT ON MARYLAND SMALL BUSINESS

**OR**

___ WILL HAVE MEANINGFUL ECONOMIC IMPACT ON MARYLAND SMALL BUSINESSES

PART B. ECONOMIC IMPACT ANALYSIS