SB980_AmberMatthew_fav.pdf
Uploaded by: Amber Matthew
Position: FAV

Thank you, Chair Senator Feldman, Vice Chair Senator Kagan, and members of the Education, Energy, and Environment Committee for the opportunity to support Senate Bill 980.

My name is Amber Matthew, founder of STAR Learning Lab, a STEM-based tutoring company. I was born and raised in Baltimore, Maryland. No matter where my studies or career have taken me, I have always returned home to Maryland. I am a Software Engineer working in Robotics Process Automation and I support various STEM-based programs by working with various organizations such as the STEM Center of Excellence, Baltimore Robotics Center, and Baltimore City Schools. Through these organizations I coordinate competitions/events/fundraisers and train Baltimore City School teachers and volunteers to Coach/lead Elementary, Middle, & High School Robotics teams in the areas of Computer Programming, Engineering Design Process, and Computational Thinking.

I am a product of a Baltimore-based STEM program, more specifically a product of Competitive Robotics. I am a 2012 graduate of Western High School and a proud RoboDove. Picture this, a quiet timid girl who was often mistaken for a mute or sat towards the back of the classroom to avoid detection for the fear of being called on by the teacher. Speaking in front of an audience like this would terrify her. That girl was me.

My freshman year of High School after encouragement from my mother I joined the Robotics Club. Through the four years of being on the team I became the team's Driver, Programmer, Builder, and progressed to Team Captain in which I was able to lead the team to a total of four World Championships. Because of my involvement in Robotics, I found a passion in programming which led me to pursue a degree in Software Engineering. Through college I faced the challenges of being fairly "new" to the tech world compared to students who were exposed to STEM at an earlier age and had knowledge beyond my four years of Robotics experiences, I often felt that I was catching up to my peers. However, I carried the experiences from my time in Competitive Robotics to serve as a starting foundation for me to propel forward. Where am I now? I have traveled near and far to work on projects for top Banks, Insurance companies and Government Agencies.

Not only did Robotics teach me the technical skills involved in designing, building and programming a robot, but it also taught me the soft skills in leadership, problem-solving, teamwork, critical thinking, and it helped me find my voice. How could this experience have been changed? Being involved in a program such as this at an earlier age could have put me at an edge that so many of my peers had because they were involved in these programs at an Elementary/Middle School level.

SB980_Kariuki_fav.pdf
Uploaded by: Deborah Kariuki
Position: FAV

Ten Policy Ideas to Make Computer Science Foundational to K–12 Education

Computing is a foundational part of daily life and nearly all occupations — from automated farm machinery to using artificial intelligence for medical diagnostics. All students must be exposed to computer science during their K-12 schooling. Computer science teaches students to be more than just users of technology; it teaches them to be creators of technology by developing critical thinking and problem-solving skills. Computer science allows students to access the highest-paying and fastest-growing jobs in America.

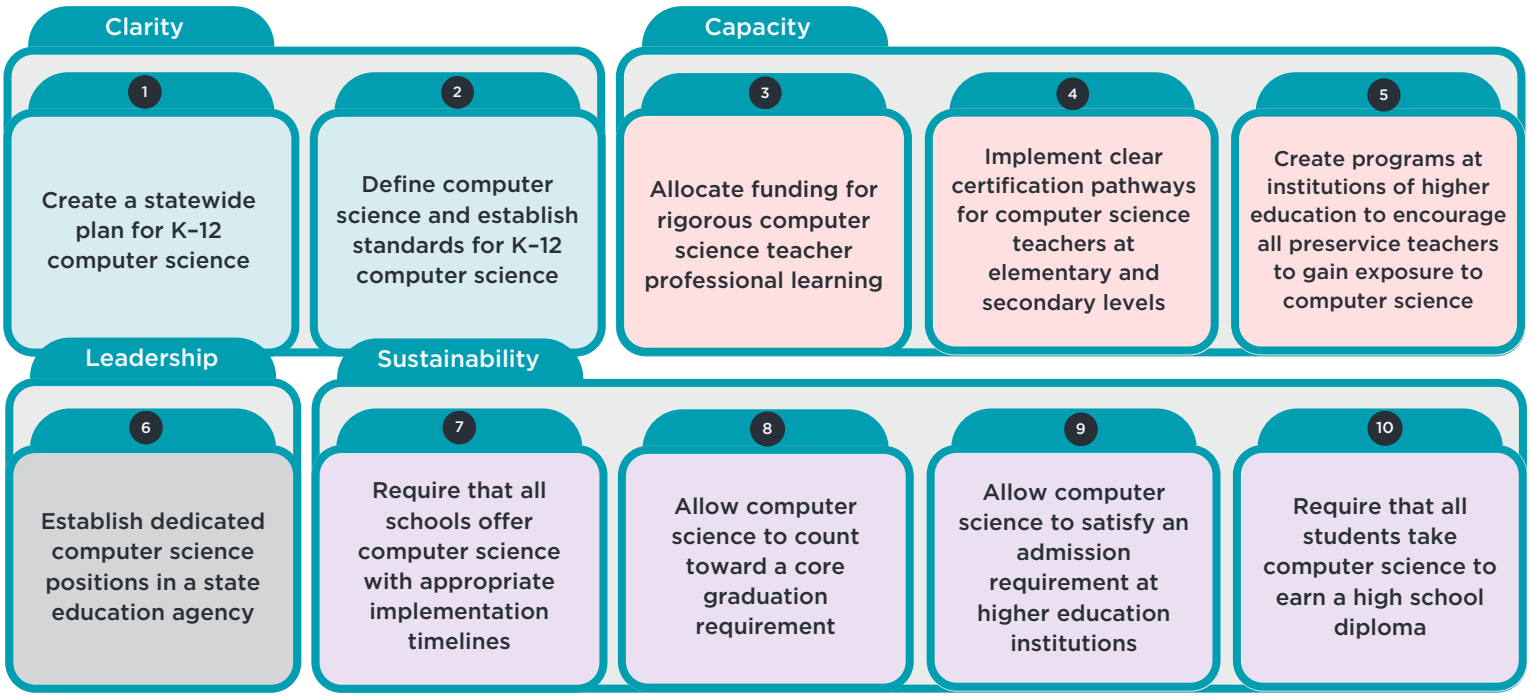
Only 53% of high schools offer a computer science course for students. There are particularly large disparities in access to computer science courses for small schools, low-income communities, Native American/Alaskan students, and Black/African-American students.

While nearly half of our high schools are not teaching computer science, substantial progress has occurred in the last several years. States have recognized the need for change; every state has passed policies encouraging computer science growth and adoption in their school system. However, there is more work to be done.

States must continue investing in a broad policy framework that expands K-12 computer science. The ten recommendations listed below are designed to build and sustain a comprehensive system of teaching and learning computer science. These policies are built on five principles: **Equity and Diversity, Clarity, Capacity, Leadership, and Sustainability.**

Adopting these policies does not guarantee student success in computer science. We need great teachers and school leaders invested in ensuring all students have positive experiences in computer science. Policies must also be continually revisited and adjusted to meet student and teacher needs.

10 ideas to make computer science foundational to K–12 education:



These policies are designed to provide a framework and a strong starting position for states, although they may need to be modified to best fit individual state needs. Articulated below are strategies to ensure these policies are implemented successfully. State officials should bring together key stakeholders from the state and local education agencies, representatives from the state's executive branch, local computer science teacher leaders, national groups with expertise in computer science education, and industry leaders and legislators to discuss these ideas and identify how to implement these policies best.

Equity and Diversity

Access to and equity within rigorous and engaging computer science courses should be top priorities for policymakers and incorporated into all ten policies. Data clearly shows students from communities historically underrepresented in computer science, including small schools, low-income students, Native American/Alaskan students, and Black/African American students, have lower rates of access to computer science courses. Even when all students have access, there are still disparities in participation, particularly among female students. If we do not address these disparities in access and participation, we will continue to exclude entire populations from this fast-growing field and lose their valuable contributions.

Equitable access and participation should be intentionally addressed in each of the ten policy ideas, with the goal that computer science classrooms reflect the student population. Prioritizing equity requires policymakers to give specific attention to underserved populations and under-resourced schools. Policy proposals should target Title I schools or other under-resourced schools, including small schools, urban schools, and rural schools. In drafting and proposing equitable policies seeking representative computer science participation, states should include specific language focusing on female students and groups underrepresented in computer science.

For example, in 2021, Mississippi published its state plan in which one of their state goals is: "Increase the percentage of underrepresented groups enrolled in computer science at the high school level (Grades 9-12) by 75% and increase elementary and middle school exposure to computer science to 100%." They identify several strategies to achieve greater diversity in Mississippi classrooms, including teacher professional development and focusing on bringing diverse speakers to classrooms.

Colorado is another example; since 2020, the Department of Education has administered a grant program with the specific goal: "to increase enrollment, and/or participation, of traditionally underrepresented students in computer science education activities." Proactively building equity into legislation and other policy proposals ensures access for students who may otherwise never experience computer science.

Comprehensive data must be collected and reported to achieve the goal of computer science classrooms accurately reflecting the student population. Many states have developed robust data processes and use this data to continue working on equitable access. For example, Alabama requires all schools to report their computer science courses and enrolled student demographics. Additionally, the state publishes a public report which details the data and enables a targeted approach for schools that need more significant support for all students to take computer science.

Prioritizing equity and diversity is necessary for ensuring that all students have the opportunity to take computer science during their K-12 education.

Clarity

Create a State Plan for K–12 Computer Science
Computer science courses have historically not been integral to a state's education priorities.

Making computer science a foundational part of a state's education system may mean adding a new subject to most schools. States will need to create roadmaps to address policy and implementation issues to integrate computer science into their existing system.

The plan should articulate the goals for computer science, strategies for accomplishing the goals, and timelines for carrying out the strategies. The plan should also be revisited and updated regularly. Equitable access to K–12 computer science must be the heart of a state's plan. The policies that should be part of a plan should include, at a minimum, comprehensive K–12 standards, a roadmap to enable all schools in the state to offer computer science courses, funding sources for professional learning, and a detailed runway to enable a high school graduation requirement.

Define Computer Science and Establish K–12 Computer Science Standards
High-quality standards create shared expectations for all teachers and students and help prepare students for success in various postsecondary opportunities. Standards are also crucial for defining the difference between computer science and digital literacy.

While digital literacy is also necessary for our students, it is important to distinguish that computer science is about creating technology rather than just using technology. States should develop discrete standards for computer science education guided by the concepts, practices, and recommendations in the K–12 Computer Science Framework. As new technologies emerge and the field of computer science grows, states should work to ensure their standards reflect the changing field.

Clarity around the definition of computer science shared goals and strategies strengthen state efforts to expand access and participation in computer science.

Capacity

Allocate Funding for Rigorous Computer Science Teacher Professional Learning

As computer science is a newer subject for many schools, there is a need to fund professional learning and provide continual support for teachers. States should provide resources to prepare in-service teachers from diverse backgrounds to teach K–12 computer science. Funding priority should be given to districts where a demonstrable effort will be made to engage underrepresented groups.

Implement Clear Certification Pathways for Computer Science Teachers

The expansion of K–12 computer science education is hampered by the lack of qualified computer science teachers which enables disparities in access to persist. By creating clear and navigable professional paths tied to content knowledge for computer science teachers, we can grow their ranks and increase equitable access. Existing incentives for teacher endorsements in other high-need STEM fields should be replicated for computer science teacher endorsements. Certification programs should be flexible and use innovative approaches such as micro-credentials to reduce barriers for interested teachers. Existing computer science teachers should be waived into any new system of endorsements. In addition, computer science professionals should be encouraged to become teachers through expedited certification processes, ensuring that a transition to the classroom is as seamless as possible.

Create Programs to Encourage all Preservice Teachers to Gain Exposure to Computer Science

A computer science module or entire course during preservice teacher programs provides a foundational background for teachers to meet the needs of their students, regardless of grade or subject matter. Additionally, preservice programs should create specific pathways for preservice teachers interested in further pursuing computer science to gain certification.

States should create funding incentives for preservice education programs to create and sustain pathways in computer science education. For preservice teachers who do not attend an institution with a computer science pathway, states should create a scholarship program for them to take computer science courses. In addition, to address equity concerns, states should fund partnership opportunities between local school districts and schools of education to create direct pathways for teachers into high-need school districts.

School capacity for offering computer science courses depends on the availability of qualified teachers. It is thus reliant upon state-level resources to prepare preservice and in-service computer science teachers, focusing on ensuring a diverse computer science teaching pool.

Leadership

Establish Dedicated Computer Science Positions in State and Local Education Agencies

Computer science must have a dedicated position at the state education agency as with other subjects. As schools add and expand computer science offerings, they will benefit from the ability to receive support and direction from the state agency. This position would promote the expansion of computer science in the state through new policies such as professional learning of teachers, district engagement and capacity building, and community events. This position would also monitor any disparities in student access and participation. Creating a statewide computer science leadership position will signal to schools that computer science is a vital course offering needed at all levels of education and hopefully encourage local education agencies to create similar positions. As states and districts start to have more robust programs, more than one position is often needed, particularly given the difference between elementary and secondary computer science.

Leadership is also crucial within school buildings. The more leaders champion computer science education, the more students receive high-quality instruction.

Sustainability

Require All Schools to Offer Computer Science

Given the important role computer science plays in our economy and the world, ensuring all students have access to computer science in K–12 is critical. Only about half of U.S. high schools offer computer science, and there is no comprehensive data about elementary and middle school offerings. This policy should have appropriate multi-year runways, which may differ for elementary and secondary schools. States should also build flexible options, with particular attention paid to small schools, as they often face additional barriers when expanding course offerings. When necessary, states may allow schools to use virtual options; however, all schools should aim to offer in-person computer science experiences. Schools must work to ensure their computer science offerings are truly available for all students: at the middle and high school levels, courses without prerequisites should be available, and at the elementary level, computer science should not be just extracurricular for particular student groups.

Allow Computer Science to Count Towards a Core Graduation Requirement

Currently, all states have clear, publicly accessible policies allowing computer science courses to satisfy existing core high school graduation requirements. This policy has allowed students to fit computer science courses into their busy class schedules while still staying on track for graduation. States should continue to have flexible options available for students to take advantage of computer science opportunities.

Allow Computer Science to Satisfy an Admission Requirement at Higher Education Institutions

College and university admission policies must align with high school graduation requirements. If a computer science course can count toward high school graduation but does not meet higher education entrance requirements, students may be discouraged from taking computer science during their secondary education. We know that earlier exposure to computer science is crucial for young women and underrepresented ethnic and racial groups. State leaders should work with higher education institutions to ensure credit and articulation policies align with secondary school graduation requirements.

Require That All Students Take Computer Science to Earn a High School Diploma

Requiring all schools to offer computer science and provide access to all students is a critical step. However, several years of data from 40+ states have shown that gaps in participation persist even when every student has access to computer science. In states where every school offers computer science but is not a graduation requirement, fewer than 40% of female students are enrolled in computer science courses. Requiring all students to take computer science closes the gender and racial gaps in K-12 computer science participation. This policy should have at least a five-year year runway for districts, teachers, and students to prepare for the new requirement, and state agencies should provide school districts with a list of courses that can fulfill this requirement. Virtual courses should be allowed, but there should be a concerted effort to provide all students with the opportunity to take in-person classes. As with all policies, the state agency should monitor student data to ensure equitable student outcomes.

Creating space for computer science in schools by requiring schools to offer or requiring all students to take computer science ensures the sustainability of computer science initiatives.

The Code.org Advocacy Coalition

The global movement to ensure every student at every school has the opportunity to take computer science continues to grow at an unprecedented rate. The Code.org Advocacy Coalition works to expand further, support, and sustain this movement.

Who We Are

Bringing together more than 100 industry, nonprofit, and advocacy organizations; the Code.org Advocacy Coalition works to build and support a movement in developing and implementing policies to make computer science a foundational part of the K–12 education system.

What We Do

Advocate for computer science education
We engage coalition members in all states to help build support for and take action on K–12 computer science initiatives.

Leverage resources
The Coalition provides a forum for members to share common challenges and collaborate on solutions. Internal and external resources, including research, data, and media engagement, are all shared between Coalition members to amplify the magnitude of our individual organizations' impact.

Build networks
Coalition members learn from each other and work together to advance key priorities. The diverse set of organizations that make up the Code.org Advocacy Coalition bring their specialized expertise, constituencies, and strategies to mobilize efforts around computer science education.

How We Do It

Every month, the Coalition convenes on a call to discuss federal and state policy updates, strategies for advancing policy in states with active legislation and/or initiatives, and coordinating on-the-ground efforts to advocate for the Coalition's policy priorities. The Coalition also sends monthly updates focused on policy developments and spotlights key activities and organizations.

Results

Since the start of the Code.org Advocacy Coalition, states have collectively passed over 300 policies, including over $300 million in state funding allocated toward these efforts.

Learn More

Visit **advocacy.code.org** to learn more about the Code.org Advocacy Coalition, find a complete list of Coalition members, and the current state of computer science across the U.S.

C O D E Advocacy Coalition

SB0980 Testimony.pdf
Uploaded by: Ed Mullin
Position: FAV

Thank you, Chair Senator Feldman, Vice Chair Senator Kagan, and members of the Education, Energy, and Environment Committee for the opportunity to support Senate Bill 980.

My name is Ed Mullin. I am a Executive Director for the non-profit Baltimore Robotics Center. I am a Maryland citizen and technology professional. I have run software development teams at companies like Becton Dickinson, UPS and PHH/Element. I am colleagues with many CIO's and CTO's in the Greater Baltimore area. In my role as Executive Director of the Baltimore Robotics Center, I have seen the impact of STEM education as a pathway for youth from underserved communities to lucrative careers in computer science, engineering and cyber.

Competitive Robotics in Baltimore City Public Schools has been very successful. There are more than **700 City Schools students on more than 140 teams from 70-plus schools** in the competitive robotics program this year - a near 40% increase over last year. And at this year's Maryland State Robotics Championships, 46 teams were from City Schools! On the Elementary /Middle school level the BCPSS teams took home almost all the awards and qualifications to the World Championships in Dallas.

The Competitive Robotics program in Baltimore City Schools is over 15 years old and has many successful alumni working at organizations like NSA, SSA, Becton Dickinson, Stanley Black and Decker, NASA and Blue Origin. Colleges know this program well and they reward top players with admission and scholarships. In short, this league has a history of leading to generational wealth for students from underserved communities in Baltimore and other areas around Maryland.

More funding for Computer Science education and competitive robotics will lead to more successful students, more STEM employees and ultimately to more Maryland tax revenues.

This is truly the sport where everyone can go pro.

SB980_Eric_Brockman_Chairman_FOCUS.pdf
Uploaded by: Eric Brockman
Position: FAV

Testimony in Strong Support of Senate Bill 980
By Min. Eric Brokman

Chairman Senator Feldman, Vice Chairman Senator Kagan, and esteemed members of the Education, Energy and Environment Committee,

I stand before you today in fervent support of Senate Bill 980. This crucial piece of legislation goes beyond simply expanding computer science education in our schools; it's a necessary step towards safeguarding our national security.

While I applaud the existing requirement for all high schools to offer computer science courses, we must acknowledge the ever-evolving threat landscape. Cyberattacks are no longer the sole domain of mischievous teenagers ("script-kiddies"). Our adversaries, including state actors, possess sophisticated capabilities, constantly seeking to infiltrate critical infrastructure, steal sensitive data, and disrupt essential services.

The lack of a skilled cybersecurity workforce leaves us dangerously exposed. A recent report by the Cyber Maryland Program, headed up by TEDCO, the Daily Record, September 25th, 2023, highlights Maryland's 30,000 unfilled jobs in the field of cybersecurity, jeopardizing our nation's ability to defend itself in cyberspace.

With over 38 years of experience in the IT field, including 15 years as a cybersecurity subject matter expert, I've witnessed the growing demand for skilled professionals firsthand. My experience supporting government agencies like the Department of Energy, DoD, and State Department, coupled with leading Focus on Communities United for Success, a 501c3 non-profit IT workforce development program in Baltimore, underscores the significant gap between the need and current supply of cyber professionals. The passage of Senate Bill 980 is crucial to address this critical need.

While I applaud the existing requirement for all high schools to offer computer science courses, we must acknowledge the ever-evolving threat landscape. Cyberattacks are no longer the sole domain of mischievous teenagers ("script-kiddies"). Our adversaries, including state actors, possess sophisticated capabilities, constantly seeking to infiltrate critical infrastructure, steal sensitive data, and disrupt essential services. According to **Center for Security and Emerging Technology (CSET), China created a national cybersecurity center to train its young citizens in the cyber field starting at a very early age.**

The lack of a skilled cybersecurity workforce leaves us dangerously exposed. A recent study by **International Information System Security Certification Consortium (ISC)^2 2023 Cybersecurity Workforce Study:** This study, conducted by a leading cybersecurity organization, estimates a global cybersecurity workforce gap of **nearly 4 million** professionals in 2023. While an increase from previous years, this report shines a light on the widening gap between demand and supply.

Highlights a global shortage of cybersecurity professionals, jeopardizing our nation's ability to defend itself in cyberspace.

Senate Bill 980 offers a powerful solution. By:

- **Mandating efforts to increase enrollment in computer science courses, particularly among underrepresented groups,**
- **Requiring developmentally appropriate computer science instruction in elementary and middle schools,**
- **Aligning this instruction with state standards that emphasize cybersecurity best practices,**

We plant the seeds for a future generation equipped to confront these digital threats.

This isn't just about education; it's about national security. Every line of code written by a skilled American cyber professional strengthens our national defense. Passing Senate Bill 980 is not merely beneficial, it's imperative.

Thank you for your time and consideration.

By Min. Eric Brockman
Founder/Chairman
www.focusorg.org

SB980_STEMCoE_fav.pdf
Uploaded by: Eric Davis
Position: FAV

Thank you, Chair Senator Feldman, Vice Chair Senator Kagan, and members of the Education, Energy, and Environment Committee for the opportunity to support Senate Bill 980.

My name is Eric Davis. I was born and raised in Baltimore, Maryland, I currently reside in Reisterstown, Baltimore County, Maryland with my wife of 36+ years. I served in the US Army in several Military Occupational Specialties in Communications. I am a retired IT Manager from UPS and, currently, the Executive Director of the non-profit, STEM Center of Excellence Inc. (STEM CoE).

In 1978, at the age of sixteen, I entered University of Maryland, College Park in the Mechanical Engineering program. I was immediately placed in an Algebra class and pre-Engineering courses because my transcripts reflected a lack of prerequisites that are common for a high school graduate. I soon learned how far behind I was, academically, when compared to most first-year students entering the School of Engineering. Coupled with my age, I was in no way prepared for success in the Mechanical Engineering program. I lived on academic probation through my senior year when I finally gave up my dream. I realized my definition of success as a "C" student would get me nothing more than a college degree. If only I had been better prepared. I earned a B.S. in Marketing from University of Baltimore in 1997

UPS hired me, as a Systems Analyst, to develop software requirements for web-based services offered on UPS.COM. During my interview, the interviewer asked why I did not want to continue as a Software Developer. My answer, in my head of course, was that Requirements do not break on the weekend, software does. My point is that, had I not taught myself computer programming and had I not earned a marketing degree from University of Baltimore, nineteen years later after starting at University of Maryland, I would not have had the pathway to UPS as an option. It was the experience in Computer Science that got me into the door at UPS.

Since 2014, I have been volunteering at Robotics Competitions serving as judge, judge advisor, referee, and tech support because I saw the need to encourage students to pursue these pathways. I saw the need for students to know that someone who looked like me and heard my story of failures and roadblocks could still become successful with just a little help. Now I run STEM Gyms in Baltimore to host students participating in Robotics, AI, Drone, and soon underwater robotics competition. I have seen transformations take place when a second-grade student selects a code block that says drive 20 millimeters; adds the 2nd code block, turn right for 90 degrees; and then pushes the start button. The eyes light up, smiles break across the face, and the student has just written code to operate a virtual robot. If it were not for time, each student would still be at the computer adding on to the code. In computer programming there is the saying, "I hate to code; I hate to code. Oh wait, it works. I love to code." Learning computer science in elementary school and continuing the experience through high school opens countless pathways to success for our students of Maryland.

Requiring Computer Science in Elementary and Middle school is an initiative-taking approach to crime reduction by providing students with applicable skills to use outside of the classroom in engaging hands-on experiences like robotics, AI learning, and cybersecurity. Empowering students with the knowledge of Computer Science, Computational Thinking skills, and Critical Thinking skills, we are diverting youth attention from potential criminal behavior to stimulating, rewarding, and fun STEM-learning competitions. Computer Science is altering life trajectories. The sooner we give options, the better Maryland we have.

It is the repetition of affirmation that leads to belief. Once that belief becomes a deep conviction, things begin to happen. I urge you to approve Senate Bill 0980 and watch things begin to happen, for the better of Maryland.

In the article Computer science education and K-12 students' computational thinking: A systematic review, from Science Direct.com:
https://www.sciencedirect.com/science/article/abs/pii/S0883035522000866

The highlights state:

- This systematic review examined how CS education was implemented in schools and its efficacy for developing students' computational thinking (CT).
- Although educational interventions have not always been successful in CS education, this review provides strong evidence that overall, CS education promotes the development of students' CT in the K-12 setting while improving their creative and critical thinking skills.
- When integrated into other subjects, CS education increases students' motivation, commitment, participation, and interest in the subject matter.
- We recommend early access to CS education, various innovative instructional approaches to CS education and appropriate support and guidance for student learning. Also, there is a need for professional development opportunities for CS educators.

Letter of Support for SB980.pdf
Uploaded by: Gary Simmons
Position: FAV

GARY SIMMONS
Legislative District 12B
Anne Arundel County

Judiciary Committee
Subcommittees
Criminal Law and Procedure
Family and Juvenile Law

The Maryland House of Delegates
6 Bladen Street, Room 152
Annapolis, Maryland 21401
410-841-3581 · 301-858-3581
800-492-7122 *Ext.* 3581
Gary.Simmons@house.state.md.us

THE MARYLAND HOUSE OF DELEGATES
ANNAPOLIS, MARYLAND 21401

March 5, 2024

Education, Energy, and the Environment Committee
RE: Strong Support for SB980 - Enhancing Computer Science Education in Public Schools

Dear Chairman and Members of the Committee,

I am writing to express my strong support for SB980, which advocates for improving computer science education in public schools across our state. As a concerned citizen deeply invested in our students' future and our workforce's competitiveness, SB980 is a crucial step towards equipping our youth with essential skills for the 21st century.

The provision within SB980 that mandates public high schools to actively promote and increase the enrollment of students in computer science courses is a commendable initiative. By encouraging inclusivity and breaking down barriers to entry, we can ensure that students from diverse backgrounds and communities have equal opportunities to explore and benefit from the vast potential of computer science education.

The call for the State Board of Education to update computer science content standards is particularly timely and essential. Our educational curriculum must evolve accordingly in an era of technological advancements rapidly transforming our society. By incorporating the latest information and industry-relevant content, our students will be better prepared to navigate the challenges and opportunities the digital landscape presents.

Furthermore, the mandate for county boards of education to provide developmentally appropriate computer science instruction in public elementary and middle schools is a forward-thinking approach. Early exposure to computer science concepts will cultivate a foundational understanding and ignite curiosity and interest among young minds. This proactive approach aligns with the broader goal of fostering a generation of digitally literate individuals capable of contributing meaningfully to an increasingly technology-driven world.

I urge you to support and advocate for the passage of SB980, recognizing its potential to shape a more technologically literate and competitive generation of students. By equipping students with comprehensive computer science education, we are investing in the future workforce and ensuring that our state remains competitive globally. I appreciate your dedication to advancing education in our state and I trust that you will consider the long-term benefits this bill will bring our students and our community.

Sincerely,

Delegate Gary Simmons

Janet_Testimony.pdf
Uploaded by: Janet Shufor Bih epse Fofang
Position: FAV

Thank you, Chair Senator Feldman, Vice Chair Senator Kagan, and members of the Education, Energy, and Environment Committee for the opportunity to support Senate Bill 980.

My name is Janet Bih Fofang, I am a recent Ph.D. graduate in the field of Learning Sciences from the University of Maryland, specializing in the study of Computational Thinking in early-grade classrooms. During my graduate studies, I spent four years developing and implementing computational thinking integration into DCPS elementary-grade mathematics classrooms. I have seen firsthand the transformative impact that such initiatives can have on young learners. I am advocating that computational thinking skills are important skills every young learner must possess, the same as reading, writing, and math. These skills must be developed early on if we intend to train learners to navigate the digital world

In my doctoral research, titled "Computational Thinking in Early Grade Classrooms: How young learners interact with physical devices to ground their understanding of computational thinking"; I explored how children in early grades engage with computational thinking concepts through hands-on experiences with tangible devices, including robots. Through this research, I have gained valuable insights into the cognitive processes and learning behaviors of young learners as they develop computational thinking skills.

When integrated early into curricula, Computer Science and Robotics in elementary school can help address the growing demand for STEM skills in the workforce and ensure that Maryland's students are prepared to thrive in the 21st-century economy. By providing access to Computer Science and Robotics education at an early age, we can empower all students, regardless of background or socioeconomic status, to develop the critical thinking, creativity, and problem-solving skills needed to succeed in an increasingly technology-driven world.

I urge you to support legislation that promotes the integration of early-grade Computer Science and Robotics programs in Maryland elementary schools. By investing in the education of our youngest learners and providing them with the tools and resources they need to excel in the digital age, we can ensure a brighter future for all Marylanders.

Thank you for your attention to this important issue.

Sincerely,

Janet Shufor Bih epse Fofang.

Jen Manly_SB980.pdf
Uploaded by: Jennifer Manly
Position: FAV

Jennifer Manly
Written Testimony - SB980
3/6/2024

I took my first computer science class as a senior in high school, and only because I had to. I attended Thomas Jefferson High School for Science and Technology, and was required to take an introductory computer science course as part of our special advanced diploma. I loved it, and I was good at it.

I want to be clear that I never would have taken that course were it not required. Why? Because I believed that computer science wasn't something I'd be good at, despite all of the signs being there if I look back. As a child, I loved logic puzzles and math games. I enjoyed solving problems as a member of an Odyssey of the Mind team. And still, I didn't see computer science as something that was for me because I didn't realize that computer science was something girls did.

My name is Jen Manly and I've been a computer science teacher for over eight years now. I started teaching middle school computer science at Old Mill Middle School South, then taught high school CS at Paint Branch High School, and now teach introductory computer science at the University of Maryland as an adjunct. My full time role is with the Computer Science Teachers Association where I serve as our Membership Experience Manager. In that role, I work with over 20,000 computer science teachers from all over the world.

Over the past 8.5 years, I have worked within my own schools to increase access to computer science courses. If you're not familiar, Old Mill Middle School South is a STEM magnet middle school. It's actually a school within a school, where approximately 30% of the students are in the STEM program while the other students are not. Computer science was a subject that was required of every STEM student in every grade level but was not offered to students not in the magnet program.

During my time at Old Mill, I advocated and was successful in offering a robotics course option for eighth grade students. When I taught that course, I had students of varying ability levels, varying special education statuses, and English Language Learners. When we opened up the course beyond just the STEM program, we saw an increase in racial and gender diversity on top of a wider range of special education statuses. The bottom line is that many students were successful in and enjoyed that course, and deserved access to it.

When I arrived at Paint Branch, we only offered Foundations of Computer Science. FOCS is an introductory course offered at many middle schools in Montgomery County Public Schools. In one year, we grew from two sections of FOCS (60 students) to nine sections of three different CS courses (approximately 270 students), including AP Computer Science A and AP Computer Science Principles. The demographics of our courses matched the demographics of the school, which has over 82% Black and Latinx students.

Growth of our program in a way that matched school demographics required actively recruiting students. We visited math classes of all levels, scheduled 1:1 meetings with students to answer questions, tabled at school-wide events, and intentionally met with counselors to help them advise students on which computer science course to take. I was able to dedicate time to this endeavor because I had a hybrid role with the University of Maryland which provided me with additional planning time for program growth.

Research data suggest that while improvements have been made in reaching women and underrepresented groups at the upper high school level, it has made little impact on the number of women intending to pursue computer science as a career. Multiple independent research papers have suggested that attracting and retaining women and underrepresented groups in technology begins much earlier, in upper elementary and middle school. If our goal is true opportunity for all students to succeed in computer science, providing access is not enough; we need to intentionally work to ensure representation of all groups in high school level CS courses.

Equity in computer science coursework begins with equity in access. The research consistently concludes that early experience with programming correlates with choosing to take a computer science course or declaring a computer science major at the collegiate level. Counselors and educators should be trained to share computer science coursework as a potential course offering to all students.

Closing the gender and race gap in tech begins with closing the gender and race gap in computer science education. Despite the fact that women make up only 26% of the computing workforce (NCWIT, 2019), with only 9% of the computing workforce being made up of women of color, changes to pedagogical approaches to computer science at the secondary level could significantly impact collegiate enrollment of women in CS. With the projection of a decrease in the number of true computer programmer roles while dynamic, collaborative roles within computing are on the rise, there is no better time to develop multi-faceted computer science curriculum to better meet the needs of girls and our work force.

This bill is so important because if we care about diversity in tech, we have to care about representation in high school CS courses. We have to care about offering a full CS pathway at the elementary and middle school levels. If we believe that every child deserves the opportunity to learn computer science - to figure out if it is for them - we have to intentionally work towards representation. It’s not enough to simply put up fliers or offer the coursework. Students, particularly from underrepresented groups, may not know that it’s for them because they haven’t seen someone like them in tech.

It’s also worth noting that ultimately, learning computer science isn’t just about learning how to code. It’s about practicing problem solving, building tenacity, and learning how to logically and

creatively approach challenges. In fact, before I became a computer science teacher, I wanted to be a lawyer, and I continued to take computer science coursework in college because I found it made me better at writing my political science papers. Learning computer science taught me how to think and it taught me how to persist, skills that will serve our students at every level even if they go on to pursue a completely unrelated career.

Maryland computer science teachers have been teaching about Artificial Intelligence and Cybersecurity for years, but with the public release of ChatGPT and other generative AI, it is critical that Maryland's Computer Science standards address and account for these emerging topics. As students have growing access to AI, inclusion of critical curriculum that equips students with the ability to use these tools responsibly is vital. Our students are preparing for a world in which tech touches every area of their lives, and understanding both AI and cybersecurity on a deeper level will help them to be conscious consumers whether they pursue a career in technology or not.

From a national level, Maryland is a leader in Computer Science Education. The commitment that this body made to Maryland's students by requiring high school computer science is incredible, and should be celebrated. And now, you have the opportunity to continue to push Maryland forward as a leader in CS Ed through Senate Bill 980. The commitment this bill makes to ensuring that all students are offered equitable access to coursework is important, and will serve as a model for other states in the future. The emphasis on growing elementary and middle school computer science will directly impact enrollment in computer science coursework at the high school level as well as the diversity of computer science majors at universities in Maryland. The ripple effects of this bill will be felt for decades.

SB980_Benson_fav.pdf
Uploaded by: Kathy Benson
Position: FAV

Expand Access to K-8 Computer Science Education in Maryland

Computer science is a necessary foundational subject for all Kindergarten to 12th-grade students that develops students' computational and critical thinking skills and teaches them how to create—not just use—new technologies. Given the rapid pace of technological advancement and artificial intelligence, the importance of a foundational understanding of computer science for all students is critical. However, for K-8 students in Maryland, access to computer science courses is limited. Every Maryland student must be equipped with the knowledge and skills to harness the power of computer science.

In 2019, House Bill 281 mandated that all high schools offer at least one high-quality computer science course. Since its implementation, Maryland has expanded access to courses, narrowing socially, culturally, and economically diverse enrollment gaps. Today, 99% of Maryland high schools offer computer science. However, while high schools have seen significant progress, HB 281 asked school systems to "make efforts" to provide computer science instruction in grades K-8. While these voluntary efforts have moved us forward, just one-quarter of Maryland public elementary schools deliver at least ten hours of computer science instruction annually.

Maryland must expand K–8 computer science education to prepare students and broaden equitable participation. We call on our Maryland leaders to pass Senate Bill SB 980 to extend the high school computer science requirement to require instruction in computer science education from Kindergarten to 8th grade.

The significance of early exposure to computer science cannot be overstated. Research has shown that introducing computer science in the early years has a profound and lasting impact on a student's creative thinking, mathematical skills, metacognitive skills, reasoning skills, spatial skills, student achievement[1], executive functioning[2], and literacy[3]. By providing this foundation, we are setting the stage for lifelong learning.

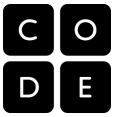
The post-pandemic landscape has unveiled glaring inequities in education along racial and economic lines. Early access to computer science education is essential to combat disparities[4][5]. An early investment in comprehensive computer science education can level the playing field, ensuring that every student, regardless of their background, has access to the skills and knowledge needed to thrive in the 21st-century workforce.

We, the undersigned, urge you to take bold action to support this critical initiative. Together, we can make a lasting impact on the lives of all Maryland public school students.

---

[1] The Cognitive Benefits of Learning Computer Programming: A Meta-Analysis of Transfer Effects
[2] Coding in Primary Grades Boosts Children's Executive Functions
[3] Supporting Literacy with Coding
[4] Career ambitions 'already limited by age of seven'
[5] U.S. Students' Computer Science Participation Lags Interest

Supported by:



Electronic Signatures from:

Ronald Averill
Josh Barnes
Kathy Benson, Program Manager, Tequity4All, Resident District 10
Joanna Benporat
Bethany Berkowitz, Technology Resource Teacher, Baltimore County Public Schools
GingerBerry
Michael Brown
Debra Bruch, Teacher, Anne Arundel County Public Schools
Nora Burkhauser, Magnet Program Teacher, Montgomery County Public Schools
Kelly Barger
Dr. Dwight Carr
Stephanie Carl-Krisulevicz, The Salisbury School
David Chiles, CEO of LET'S GO Boys and Girls
Adam Corpora
Monica Chuppetta, Instructional Technology Teacher, Howard County Public Schools
Tia Daher
Laura Davis, Instructional Technology Teacher, Howard County Public Schools
Carries Dawes, Instructional Technology Teacher, Howard County Public Schools
Debbie Dininno, Regional Manager, LET'S GO Boys and Girls
Zafar Daud, Coding and Robotics Academy
Nitya Durgam
Sharae Felder, Instructional Manager, Code in the Schools
David Floyd, Instructional Technology Teacher, Howard County Public Schools
Serena Garcia
Rachel Gelinas, Instructional Technology Teacher, Howard County Public Schools

Christina Hataway, Instructional Technology Teacher, Howard County Public Schools
Alaina Hazlett
TY-RIEK HENRY
Mike Hinkey, Hinkey Consulting
Anita Kassof, Executive Director, Baltimore Museum of Industry
Heather LaDuca
Velma Latson
Micah Levine, Instructional Technology Teacher, Howard County Public Schools
Ashley Lillard
Zografa Lott
Jacquelyn Matanin, Instructional Technology Teacher, Howard County Public Schools
Norman McGaughey, Coordinator for Career & Technology Education, Frederick County Public Schools
Sarah Melvin, Instructional Technology Teacher, Howard County Public Schools
Jehana Muhsin
Katie Murtaugh
Abena Njeeri
Keri Payne, Makerspace Teacher, Worcester County Public Schools
Kimberley Row, Library Media Specialist, Montgomery County Public Schools
Charlene Saint-Jean, Library Media Specialist, Prince George's County Public Schools
Edmond Saint-Jean, Music Teacher, Prince George's County Public Schools
Kelly Schulz, Maryland Tech Council
Justin Serota, Computer Science Supervisor, Anne Arundel County Public Schools
Brittany Simmons, Library Media Specialist, Caroline County Public Schools
Elizabeth Stover, Instructional Technology Teacher, Howard County Public Schools
Diane Stulz, Coordinator of Instruction, Worcester County Public Schools
Olivia Suh
Kim Suter, Program Director, Code in the Schools
Clair Wise, Facilitator, Maryland Center for Computing Education
Sherry Wood

SB980_Benson_fav2.pdf
Uploaded by: Kathy Benson
Position: FAV

Testimony Presented to the
Senate Education, Energy, and the Environment Committee

SB 0980 (EDUCATION - COMPUTER SCIENCE - CONTENT STANDARDS AND REQUIREMENTS)

Kathy Benson

Position: Support
March 6, 2024

Thank you, Chair Senator Feldman, Vice Chair Senator Kagan, and members of the Education, Energy, and Environment Committee for the opportunity to support Senate Bill 980. My name is Kathy Benson. I am a program manager for the non-profit Tequity4all. I have lived and worked in Maryland for my entire life. I am a former software engineer turned elementary school teacher. I've teamed up with the Maryland Center for Computing Education and the Maryland State Department of Education to push computer science education into the spotlight.

What is the vision?
Imagine Maryland, where there is:

- Equitable Computing Education. Throughout their schooling, all students receive standards-aligned, high-quality, and hands-on instruction in computer science (CS) and computational thinking (CT).
- Broader Participation in Computing: All students understand the basics of CS and see themselves as able to use and apply it in a wide range of fields and disciplines.
- Workforce Development: More students develop confidence in their abilities and pursue higher-level CS courses; these students reflect the population's demographics and are poised to fill high-wage jobs.

How do we get there?
Maryland is already a national leader in computing education at the secondary level. Building upon the accomplishments of the Maryland State Department of Education (MSDE) and the Maryland Center for Computing Education (MCCE), Maryland is poised to advance computing education across P-20 education. Moving forward, Maryland should:

- Maintain the requirement that high schools offer at least one high-quality CS course and continue to strive for enrollment demographics commensurate with the school's demographics.
- Maintain existing state funding to MCCE of at least $1M annually. (Most of this funding supports secondary CS instruction and incorporates CS into pre-service teacher programs at Institutions of Higher Education.)
- Require that all Kindergarten through 8th-grade students receive developmentally

appropriate CS education.
- Increase funding to allow school systems to meet the new K-8 requirement in every public K-8 school within five years.
- Align K-12 CS instruction to broaden participation in CS and CS-related pathways to satisfy the Blueprint for Maryland's Future - Pillar 3: College and Career Readiness.

Where are we now?

In the percentage of high schools offering a high-quality CS course, Maryland is leading the nation. Despite our accomplishments, we have more work to do. Only 37% of 2022 Maryland high school graduates have taken at least one high-quality CS course[1]. More than offering CS courses is required; we want to increase enrollment. At the same time, Maryland has increased the diversity of enrolled students, but we have yet to match the state's demographics.[14] To broaden participation in computing, we need to retain the language which states, "in each public elementary and middle school in the county; and (2) Increase the enrollment in middle and high school computer science courses of: (i) Female students; (ii) Students with disabilities; and (iii) Students of ethnic, racial, and other demographic groups that are underrepresented in the field of computer science as identified by the U.S. Equal Employment Opportunity Commission."[2] Maryland is seen as a leader in doing this important work, and this legal language has been shared with other states as a way to specify students who have been historically marginalized.

For all students to be better informed and opt into additional CS courses in high school, we need to advance CS in K-8. Maryland has already begun preparing to advance CS education K-8.

- Maryland has K-12 CS standards.[3] (These standards include Cyber and were adopted in 2018).
- Every school system has a Strategic CSforALL Planning Tool (SCRIPT) plan for CS education K-12.[4]
- MCCE has provided professional development for at least one teacher in 47% of all elementary schools in Maryland.
- MCCE has trained over 100 Maryland Elementary School Ambassadors across almost every Maryland school system to be advocates, mentors, and trainers.
- MSDE with MCCE has developed a nationally used toolkit that includes a lesson repository, annotated standards, skill progressions, and a unit evaluation tool.

What are the next steps?

Maryland school systems are already implementing computing education models of instruction

---

[1] Garvin, M. & Koerner, M. (2021). Dashboards: Participation in Maryland high quality computing courses and post-graduation outcomes.

[2] Maryland Code, Education, § 4-111.4

[3] Maryland State Department of Education. (2018). Maryland's K-12 Computer Science Standards.

[4] DeLyser, L. & Wright, L. 2019. A systems change approach to CS education: Creating rubrics for school system implementation. In Proceedings of the 2019 *ACM Conference on Innovation and Technology in Computer Science Education*. ACM, 492–498.

in some elementary schools. Some school systems incorporate lessons in their related arts rotation with School Library Media Specialists, Technology Teachers, or STEM teachers. Others have integrated lessons into the content areas (i.e. English Language Arts, Mathematics, Science, or Social Studies). Research has shown that the effectiveness of short-term in-school educational robotics instruction was significant for primary students' measured outcomes.[5] Our vision for schools involves a framework that builds on a foundation of computation thinking, extends it to blend computer science and engineering, especially through roboticis, and culminates in rich problem-based learning.

Over the next five years, we propose to build upon the successes from the last five years of the elementary CS ambassador program and state-level workshops, which have provided state-level professional development to at least one elementary school teacher from 47% of the Maryland public elementary schools.[6] We will provide evidence-based practices and data from the current implementations to the decision-makers at the other school systems to select how they intend to implement CS in each grade level. We will continue to support each school system to bring CS in each grade level to full-scale implementation and alignment with the Maryland K-12 CS Standards.

So What?

Computing occupations are the best-paying, fastest-growing, most extensive source of all new wages in the U.S.[7] According to the United States Bureau of Labor Statistics, "Overall employment in computer and information technology occupations is projected to grow much faster than the average for all occupations from 2022 to 2032. On average, about 377,500 openings are projected each year in these occupations due to employment growth and the need to replace workers who leave the occupations permanently. The median annual wage for this group was $100,530 in May 2022, which was higher than the median annual wage for all occupations of $46,310." CS knowledge and skills pay off both for those who specialize in CS and those who do not.[8] Artificial Intelligence and Machine Learning jobs will grow by 40%.[9] There are over 30,000 job openings in Cyber per year in Maryland. These Cyber jobs are at all levels of responsibility and across all business sectors.[10] CS education promotes prosperity and equity.

There is more than just an economic imperative for this work. We can not overstate the significance of early exposure to CS. Research has shown that introducing CS in the early years

---

[5] Zhang, Y., Luo, R., Zhu, Y., & Yin, Y. (2021). Educational robots improve K-12 students' computational thinking and STEM attitudes: Systematic review. *Journal of Educational Computing Research*, *59*(7), 1450-1481.

[6] Garvin, M. (2023). Securing the Future of Maryland: Computer Science for All Annual Report 2022-2023. Maryland Center for Computing Education.

[7] Code.org. (2024). Computing occupations are now the #1 source of new wages in America.

[8] Vegas, E., Hansen, M., & Fowler, B. (2021). Building Skills for Life: How to expand and improve computer science education around the world.

[9] Di Battista, A., Grayling, S., & Hasselaar, E. (2023). Future of Jobs Report 2023. World Economic Forum, Geneva, Switzerland.

[10] Cyber Seek U.S. (2024). Cyber Seek Interactive Map.

has a profound and lasting impact on a student's creative thinking, mathematical skills[11], metacognitive skills, reasoning skills, spatial skills, student achievement[7], executive functioning[12], and literacy[13]. Early childhood CS learning opportunities, especially with robotics, are essential to building the foundational knowledge needed by all students.[14] By providing this foundation, we are setting the stage for lifelong learning.

The post-pandemic landscape has unveiled glaring inequities in education along racial and economic lines. Early access to CS education is essential to combat disparities.[15] [16] By investing in early and comprehensive CS education; we can level the playing field, ensuring that every student, regardless of their background, has access to the skills and knowledge needed to thrive in the 21st-century workforce.

There is also a civic responsibility to provide high-quality CS education. Emerging technologies such as artificial intelligence, cybersecurity, and quantum computing have ethical implications. A firm foundation early on will pave the way for students to apply computing ethically, practice cybersecurity, and be empowered to innovate. An informed citizenry is a must. The current reality is that technology permeates all aspects of society.. Our responsibility is to ensure that all students are literate in technology in the same way that they are literate in reading, writing, and mathematics.

[11] Scherer, R., Siddiq, F., & Sánchez Viveros, B. (2019). The cognitive benefits of learning computer programming: A meta-analysis of transfer effects. *Journal of Educational Psychology*, *111*(5), 764.
[12] Arfé, B., Vardanega, T., Montuori, C., & Lavanga, M. (2019). Coding in primary grades boosts children's executive functions. *Frontiers in psychology*, *10*, 2713.
[13] Strawhacker, A. (2021). Supporting Literacy with Coding.
[14] Simonsmeier, B. A., Kampmann, K., Staub, J., & Scherer, R. (2023). The Effects of Programming Interventions in Early Childhood: A Systematic Review and Meta-Analysis.
[15] Coughlin, S. (2019). Career ambitions 'already limited by age of seven'. BBC News.
[16] Marken, S & Crabtree, A. (2021). U.S. Students' Computer Science Participation Lags Interest. Gallup.

Advocacy Update Senator Hester .pptx.pdf
Uploaded by: Katie Fry Hester
Position: FAV

Advocacy Update

Senator Hester

Introductions

- **Kathy Benson**: software developer, computer science teacher, CS professional developer for MCCE, spearheading advocacy for advancing K-8 CS in Maryland.
- **Megean Garvin:** Director of Research and Assessment, Engineering and Computing Education Program (ECEP)
- **Elissa Hozore**: Computer Science Specialist at the Maryland State Department of Education
- **Kim Mentzel:** Director of Aerospace and Cybersecurity at the Maryland Department of Commerce

What?

Computer Science Education

Exposure

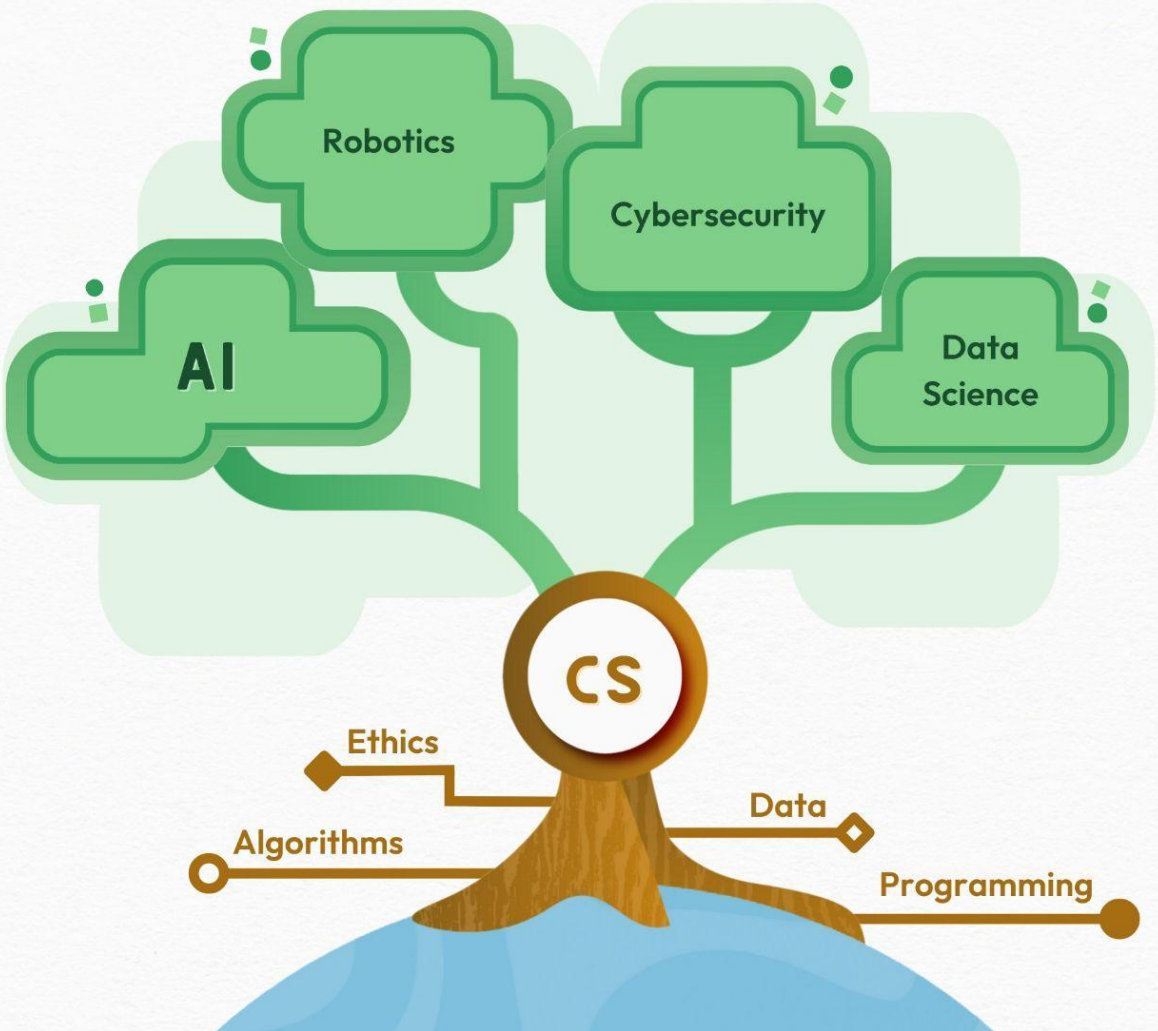
Education

Employment

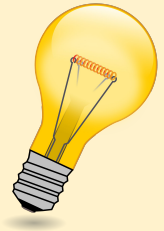
Pipeline

Teach AI

In an age of **AI**, **CS** isn't just mandatory, it is **foundational**



What is your vision for Computer Science in Maryland?

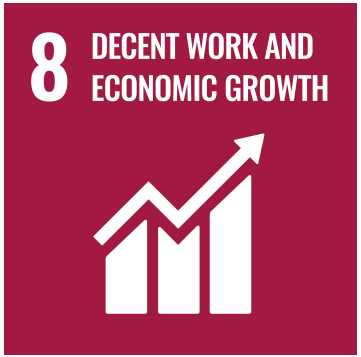


Why?

Computer Science Education

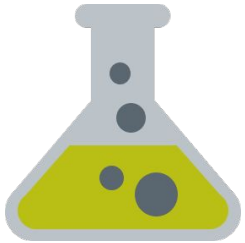
Imperative for Computing Education

- Economic
- Educational
- Civic



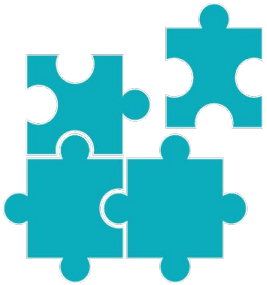
Studies show: Children who study computer science...

perform better in other subjects

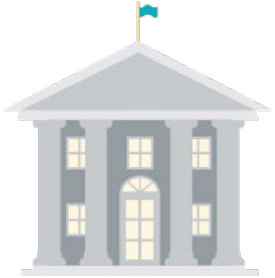


develop better executive functioning

excel at problem solving

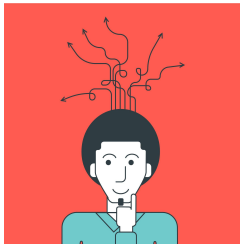


are 17% more likely to pursue a college degree

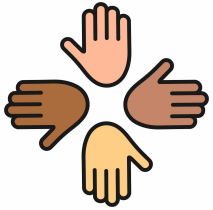


do better on tests of creativity, mathematical skills, metacognition, spatial skills, and reasoning skills.

develop enhanced emotional intelligence / perseverance



Diversity



Underrepresented students who experience computer science early are more likely to enroll in subsequent computer science courses.

We need to offer computer science in elementary and middle schools to build student interest and confidence before traditionally underserved populations begin to self-select out of the subject.

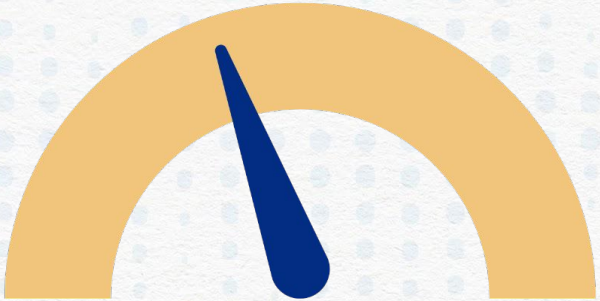
Economic

Imperative

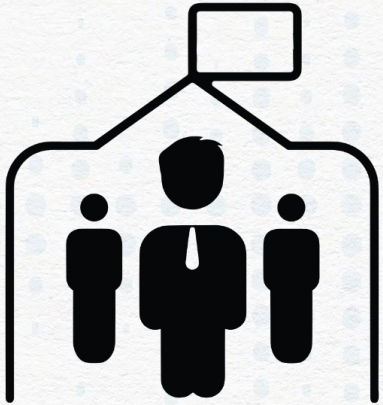

Computing occupations are the best-paying, fastest-growing, largest source of all new wages in the U.S.

Artificial Intelligence

AI and Machine Learning Jobs are Growing



AI or machine learning jobs will grow by 40%.



Over 1 million new jobs are expected by 2027.

Source: World Economic Forum

Cybersecurity

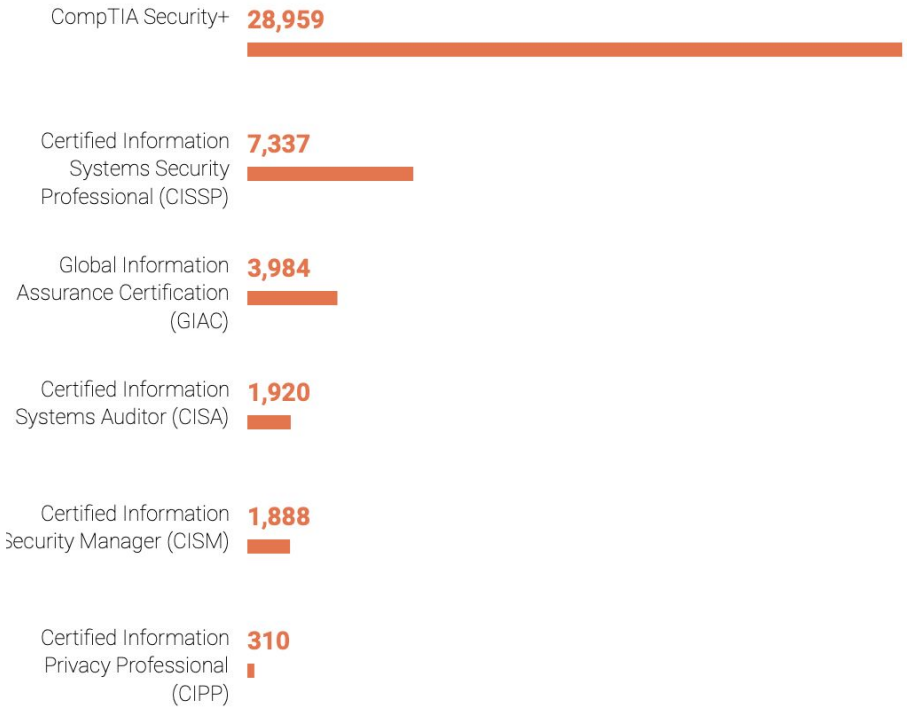
Global cyber attacks have put a new spotlight on cybersecurity.

Cyber Maryland by the Numbers

30,000

There are over 30,000 job openings in Cyber a year in Maryland. These jobs are at all levels of responsibility and across all business sectors.

Cyber Open Jobs In MD



Where are we now?

Status and Accomplishments

MD HS Cyber Courses 2022

Course	LEAs	Schools
Cybersecurity Essentials - CTE	5	22
Cyber OPs	1	6
Cybersecurity - CTE	3	4
Cybersecurity	1	1
Cyber Crime	1	1
PLTW Cybersecurity	1	1

18% of High Schools offer a Cybersecurity Course and 91% offer a Gateway to Cyber Course

U.S. Cyber Range

Agreements in place to have access and utilize the U.S. Cyber Range:

- 14 LEAs
- 11 community colleges

MCCE partnered with Teach Cyber and the Maryland Institute for Innovative Computing (MIIC) at the University of Maryland, Baltimore County to provide educators with PD and train them on how to use the range with their students.

Poised to Advance to the Next Level (Part 1 of 2)

- All:
  - MD has K-12 CS standards that include cyber.[1]
  - MD has met nine out of 10 of Code.org's Policy benchmarks.[2]
  - Every school system has a strategic plan for CS education K-12.
- ES:
  - MCCE has provided PD for at least one teacher in 47% of all ES schools in MD.
  - MD is the state with the third highest number of elementary schools earning the CS100 award for delivering at least 10 hours of CS instruction per year.
  - 100 Maryland Elementary School Computer Science Ambassadors have been trained, representing almost every school system in the state.
  - ECSNet, a CS lesson repository, houses over 1,000 lessons. In addition, our toolkit including annotations, progressions, evaluation tool, lesson bank, etc. are used by educators from Maryland and beyond.

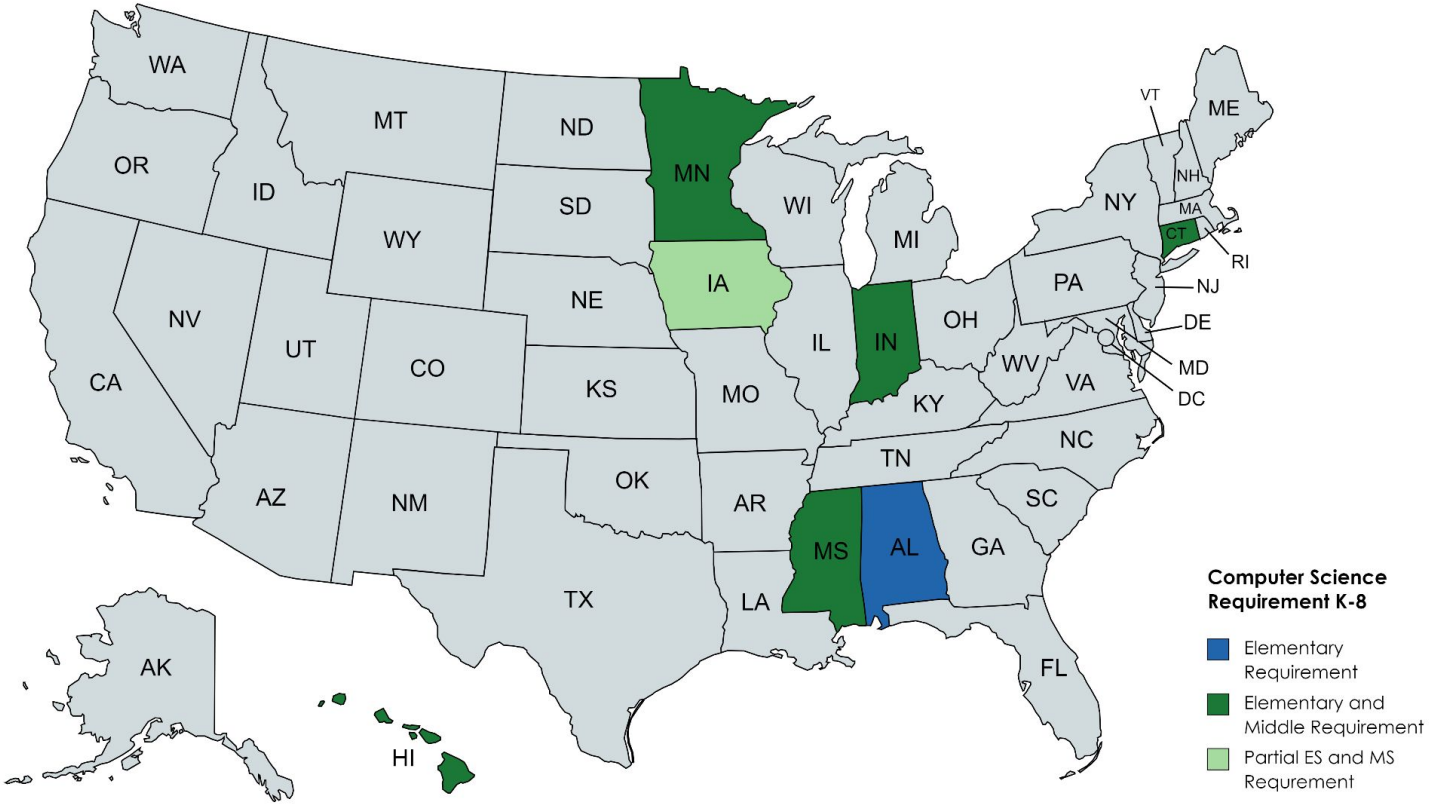
Poised to Advance to the Next Level (Part 2 of 2)

- MS:
  - Middle Schools have incorporated computer learning into their programs to provide a well-rounded education under ESSA.
- HS:
  - MD has experienced steady growth in offerings resulting in 99% of HS offering CS (tied for 1st in the nation)
  - MD has also seen steady progress in closing gender, racial/ethnicity, and subgroup disparities enrolled in CS coursework.
  - MD has Increased the number and diversity of HS students who pass AP CS courses.
- Pre-Service Teacher Preparation:
  - 18 IHE programs provide long-term solutions to prepare pre-service teachers at all levels of K-12 instruction to enter Maryland public school classrooms with CS knowledge and skills. Maryland IHEs have used their grant funds to develop their expertise in supporting CS for Multilingual Learners, Special Education students, and CT/CS integration.

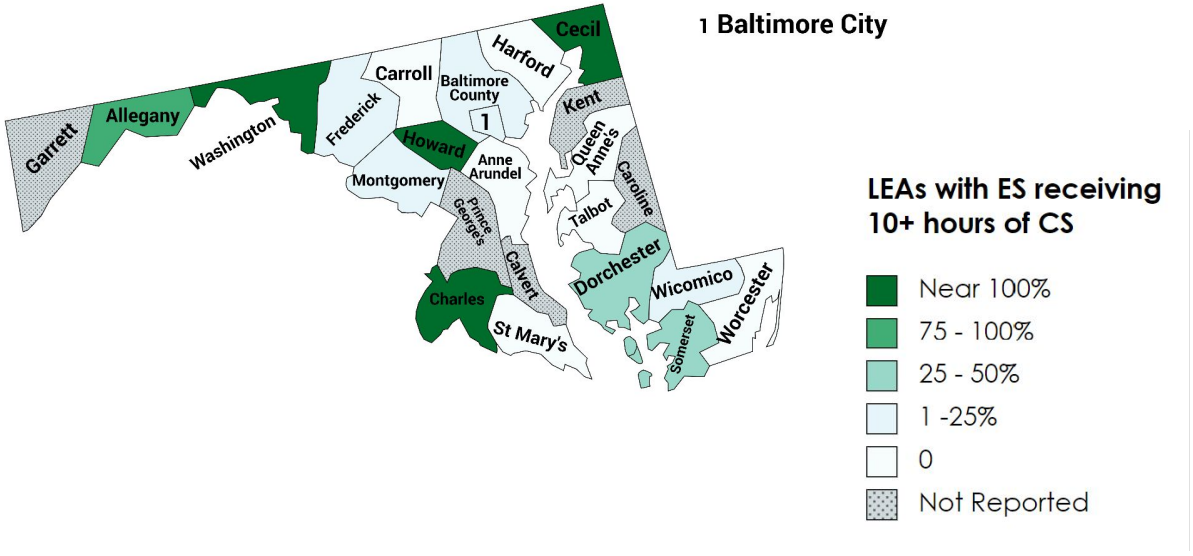
Where are we going?

Next Steps for Advancing CS in Maryland

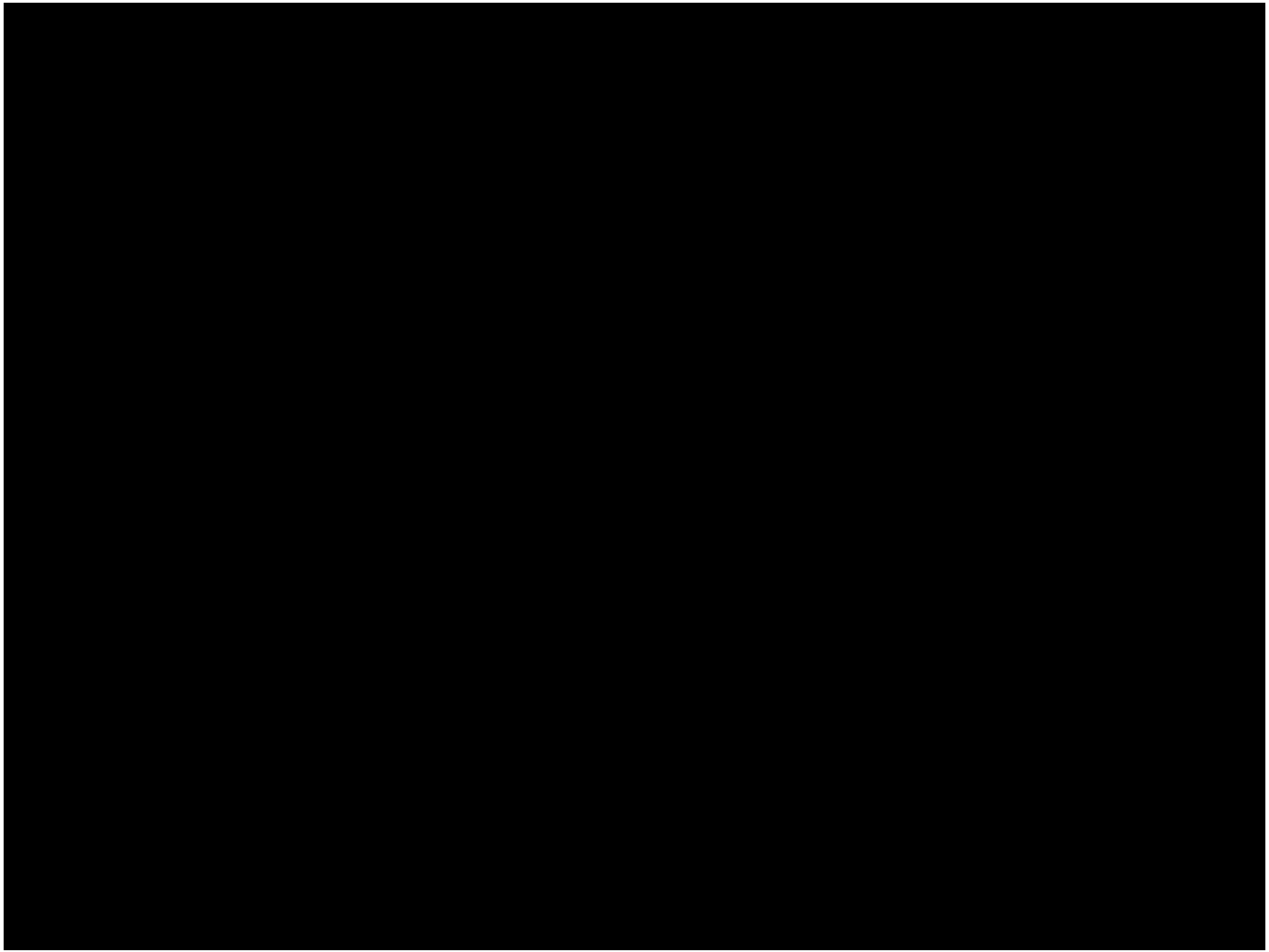
States with existing K-8 Mandates



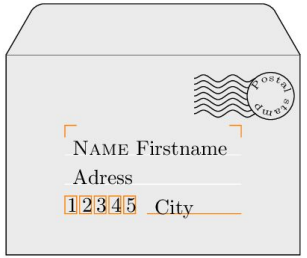
MD Counties with % of ES Students receiving 10+ hours of CS per Year



What does CS and Robotics look like in action?



Letter of Support



We call on our Maryland leaders to:

- Extend the high school computer science requirement to require developmentally appropriate computer science education from Kindergarten to 8th grade.
- Maintain existing secondary funding and increase funding to meet the K-8 requirement in every public K-8 school within five years.
- Align K-8 computer science instruction to feed and broaden secondary participation in computer science and computer science-related pathways to support the Blueprint for Maryland's Future - Pillar 3: College and Career Readiness.

Advocacy Vision

We have outgrown HB281 from 2018 (Securing the Future: Computer Science Education for All) as it stands:

Link

K-8 Computer Science education feeds and broadens participation in computing pathways, proposed:

Link

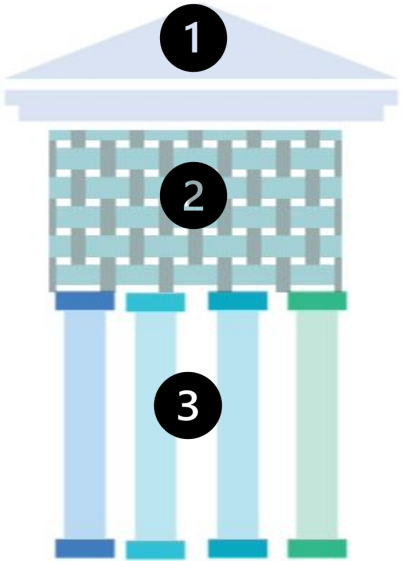
How should policy be changed?

How do we get there?

Strategy

K-5 Hands-on (Robotics/Physical Computing)

- CS/CT/Engineering Synergy (explanation)



1	**21st Century Skills** Including **Design Thinking** Through PBL Capstone
2	**CS Standards** and **Engineering Design Process** woven together through Robotics/Physical Computing
3	Foundation of **Computational Thinking** Pillars **Decomposition** **Pattern Recognition** **Algorithms** **Abstraction**

What would you like to see in the approach to computing education P-8?

Asks

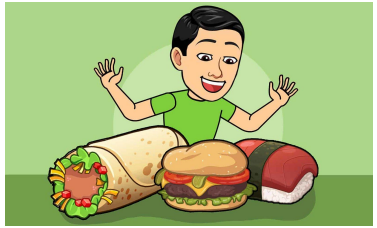
- Support this effort.

What computer science **IS**

- A theory and practice that allows you to program a device to do what you want it to do.
- Using a tool to help you tell a story or make something happen with technology.
- A discipline that emphasizes persistence in problem-solving - a skill that is applicable across disciplines, driving job growth and innovation across all sectors of the workforce.
- A skill that teaches students how to use computers to create, not just consume information.

Maryland Computer Science Standards Annotations

What computer science **IS NOT**



- Teaching students to type or use a mouse
- Learning productivity tools, such as Microsoft Word or Google Slides
- Helping students achieve general computer literacy
- Playing video games
- Learning how to build or repair a computer

The Computational Thinkers

concepts

Logic
Predicting & analysing

Evaluation
Making judgements

Algorithms
Making steps & rules

Patterns
Spotting & using similarities

Decomposition
Breaking down into parts

Abstraction
Removing unnecessary detail

approaches

Tinkering
Changing things to see what happens

Creating
Designing & making

Debugging
Finding & fixing errors

Persevering
Keeping going

Collaborating
Working together

We're all computational thinkers here!

When you think about it, whether we're parents, pupils or teachers – we're all natural computer scientists, capable of computational thinking.

Our brains, like computers, process, debug and make simple algorithms every day!

CAS Barefoot
Supported by BT

The value of a computer science education

$.58M
lifetime earnings of a high school graduate*

$1.19M
lifetime earnings of a college graduate*

$1.67M
lifetime earnings of a computer science major*

A computer science major can earn **40% more** than the college average.

*Net present value today

Source: Brookings

Maryland by the Numbers

16,965

In 2023, MD averaged 16,965 open computing jobs each month

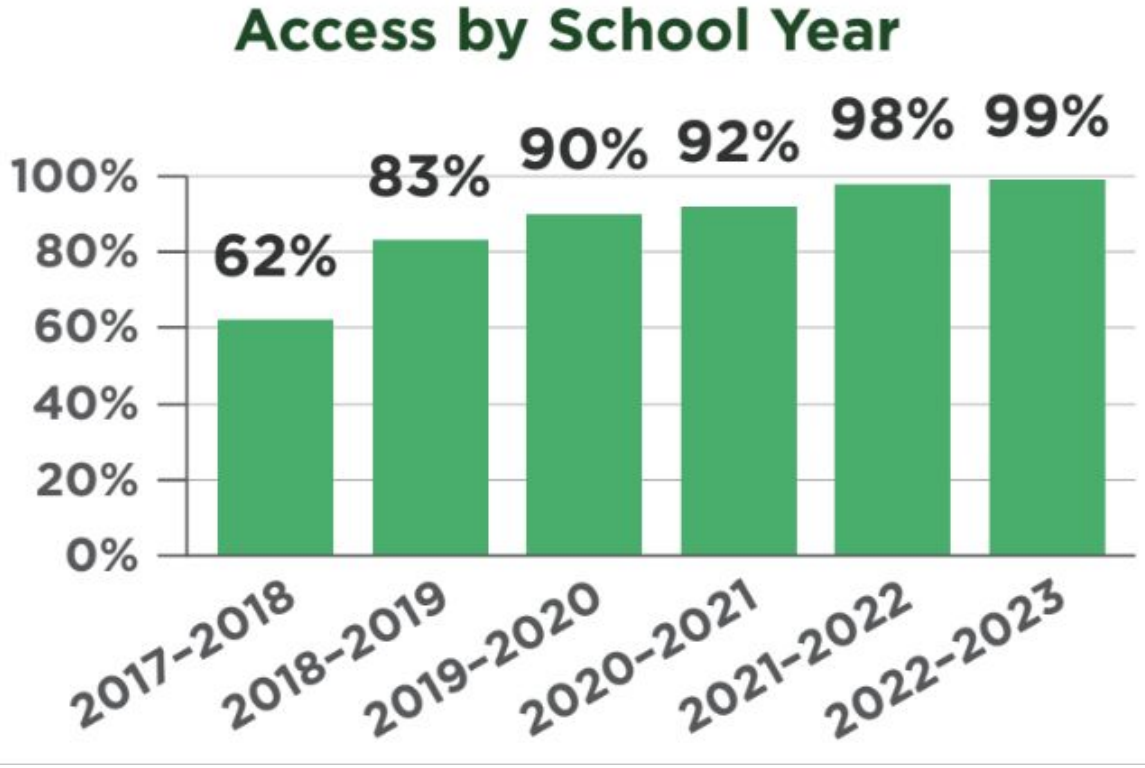
$122,332

These jobs have an average salary of $122,332

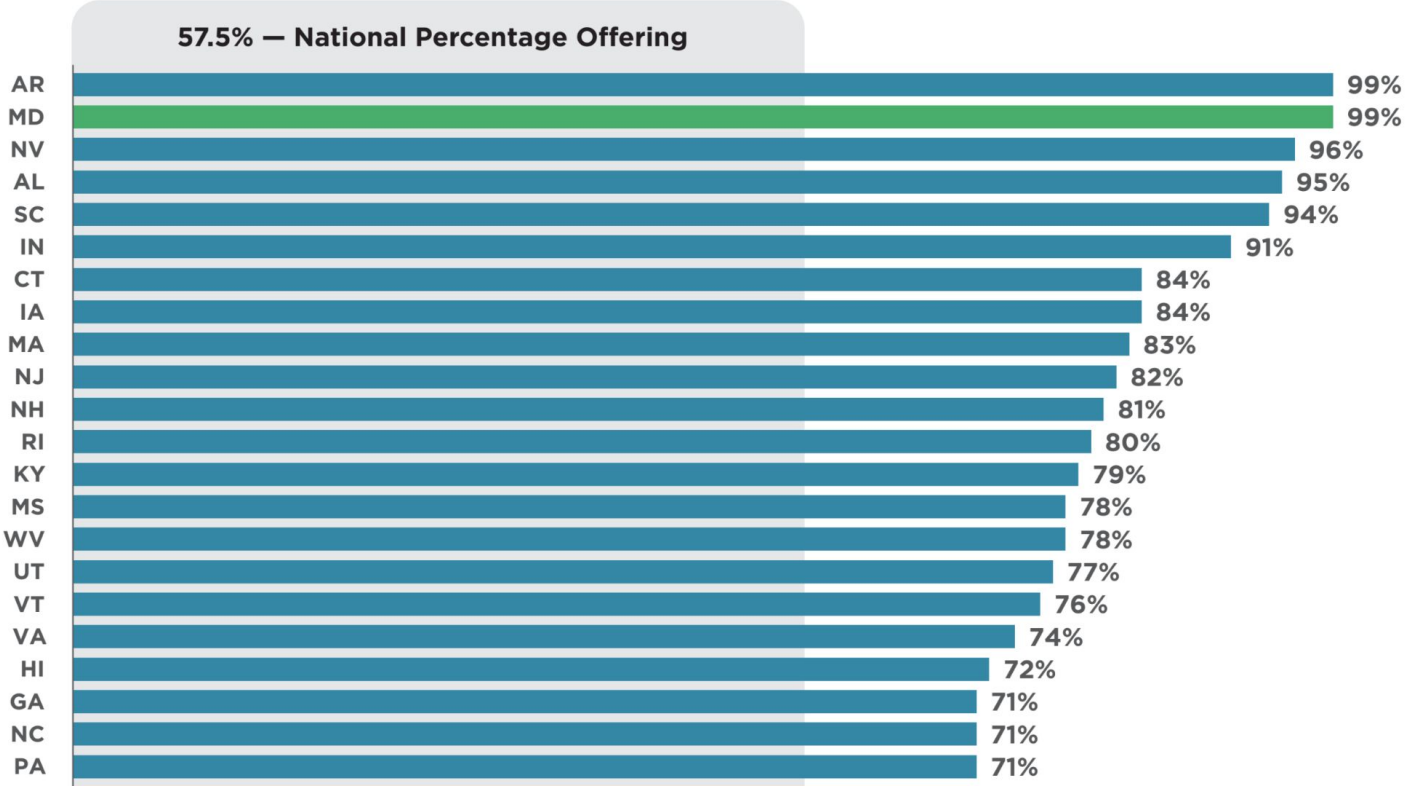
4,807

Yet there were only 4,807 graduates in computer science in 2019

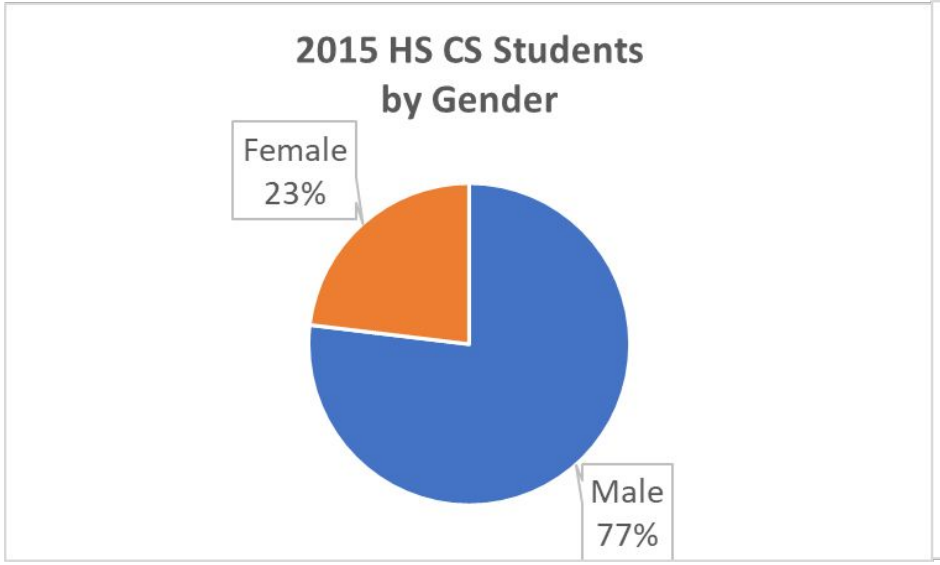
Steady Growth in HS CS Offerings

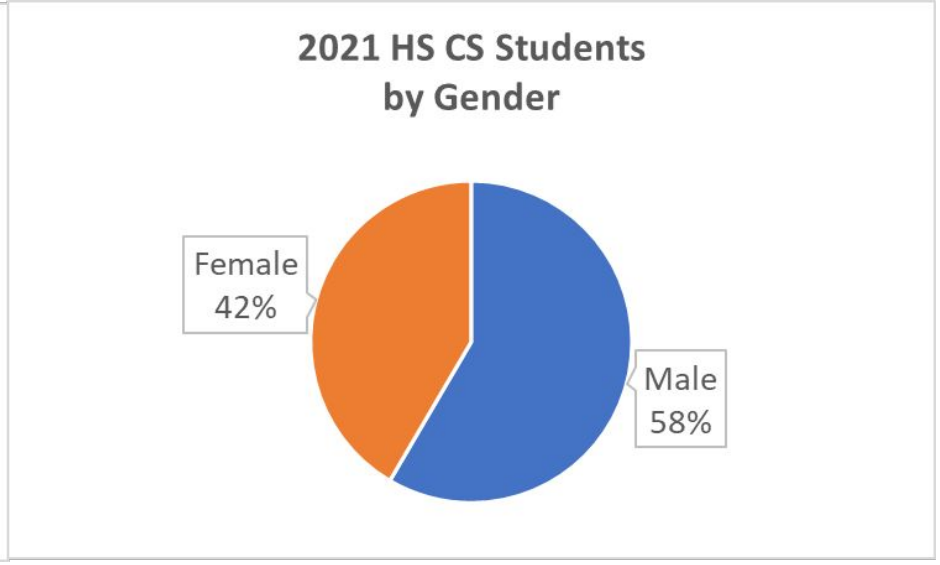


MD is Tied for First in the Nation
in % High Schools Offering Computer Science



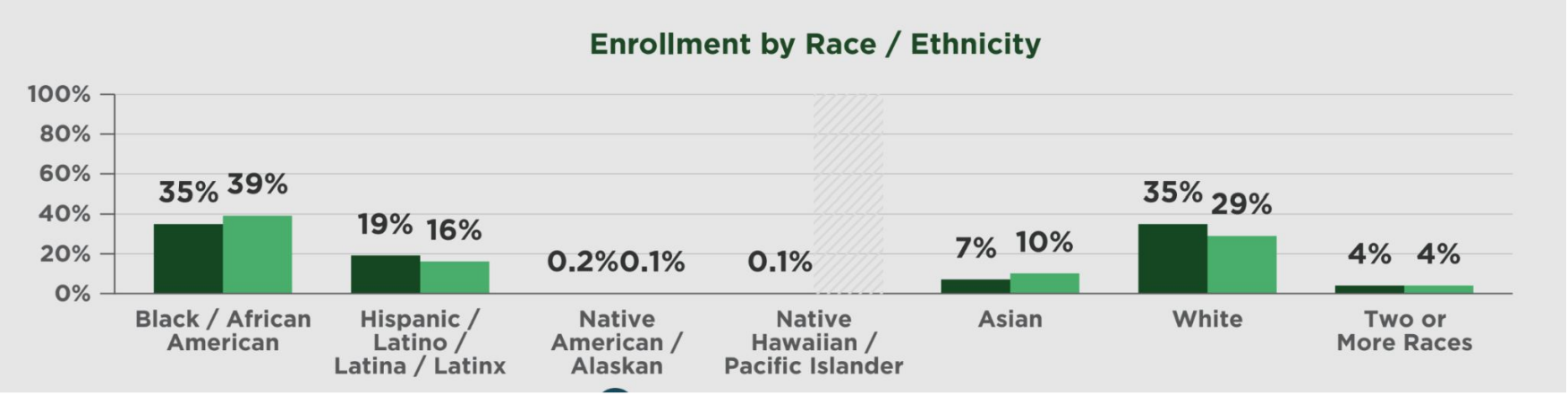
MD HS CS Gender Gap is Decreasing





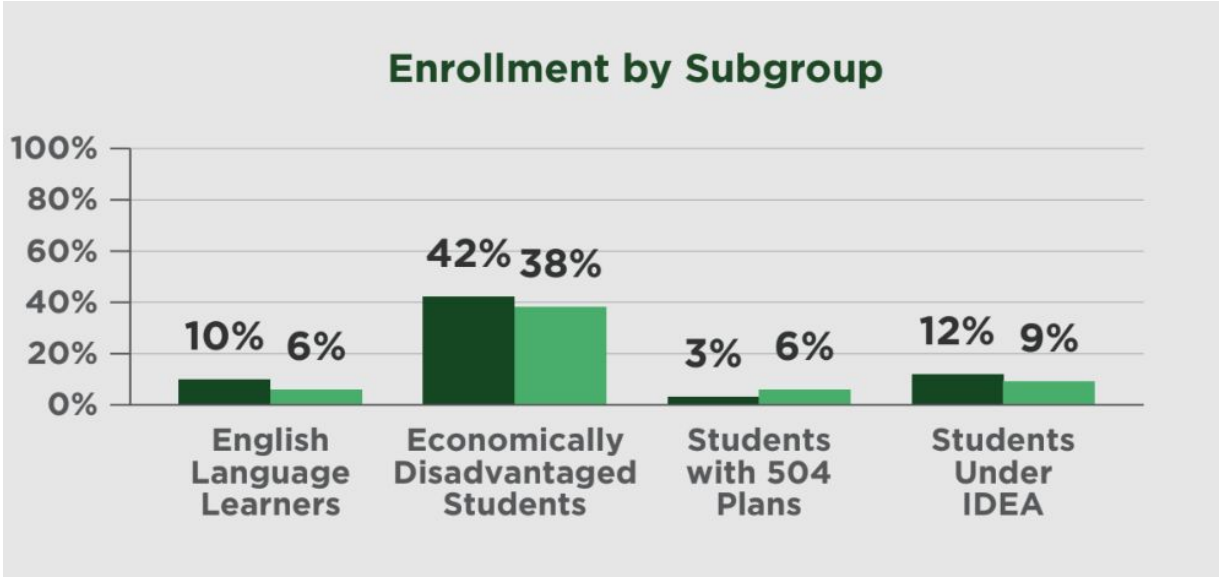
Participation in Foundational High School Computer Science Courses by Race / Ethnicity

2023



Participation in Foundational High School Computer Science Courses by Subgroup

2023



Student Demographics 9–12

Participation in Foundational Courses

Standing on the Shoulders of Giants

Potential Benefits & Risks of Using AI in Education

Potential Benefits

Content development and differentiation

Assessment design and timely, effective feedback

Tutoring and **personalized** learning assistance

Aiding **creativity** and **collaboration**

Operational and administrative **efficiency**

Misinformation, errors, and academic dishonesty

Diminished student and teacher agency and **accountability**

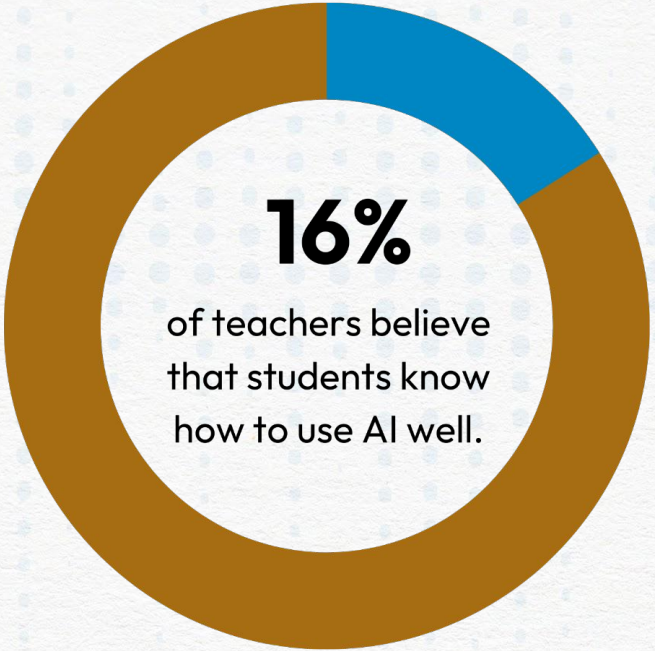
Compromised student **privacy** and unauthorized data collection

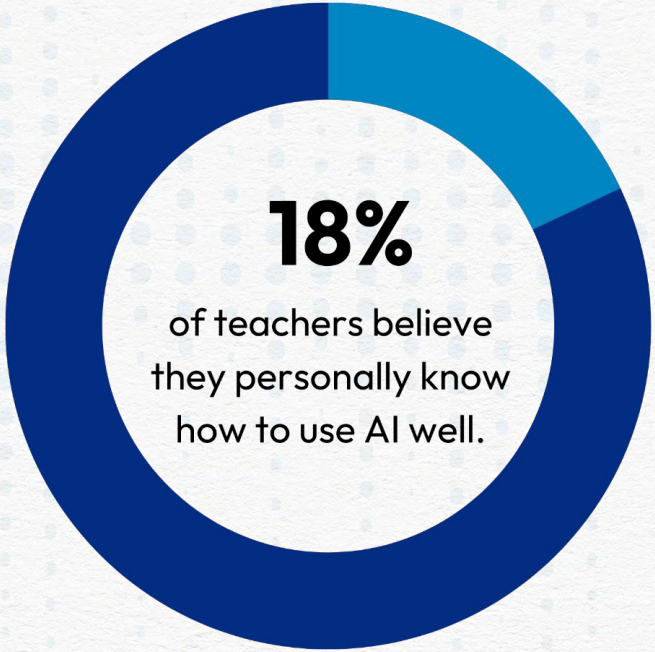
Overreliance and loss of critical thinking

Societal bias and lack of cultural sensitivity

Potential Risks

Educators and Students Don't Know How to Use AI





Source: Hart Research

AI is:

- Online and in-store shopping
- Robotic tractors, precision agriculture
- Warehouse Fulfillment
- Credit Card Fraud Protection
- Insurance Rates
- NASA images from space
- Text to Speech
- Foreign Language Translation
- Mapping and Navigation

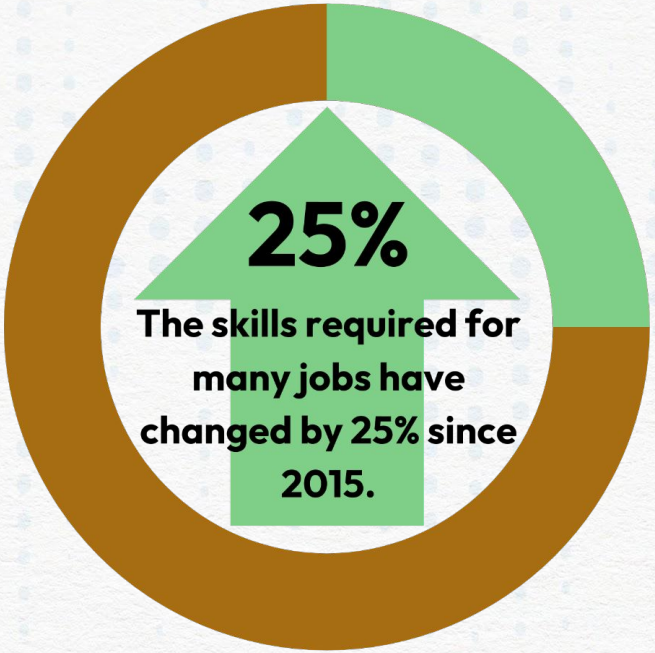
It is in all of our lives and industries.

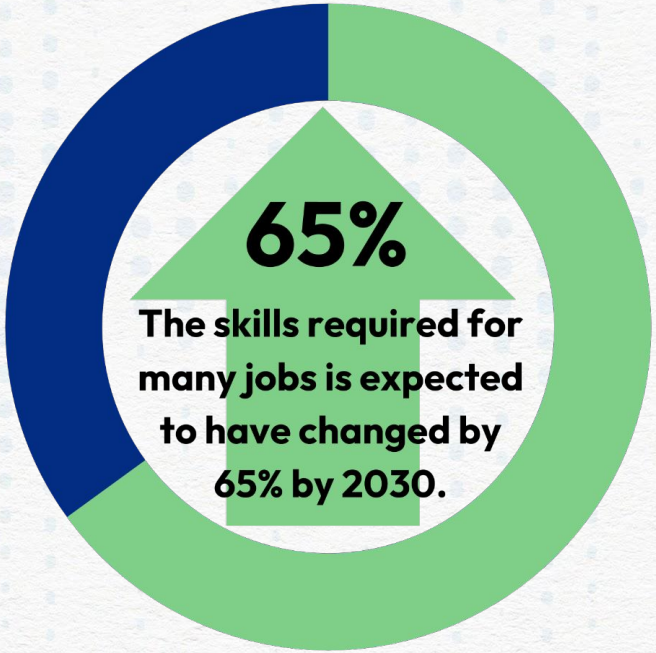
AI is NOT:

- Alive
- Smarter than us
- Killer robots
- Only for geniuses
- Only for people in tech cities
- Always physical. It is inside our computer software and phone apps.

And it is not going away.

Skills Required for Job Success are Changing

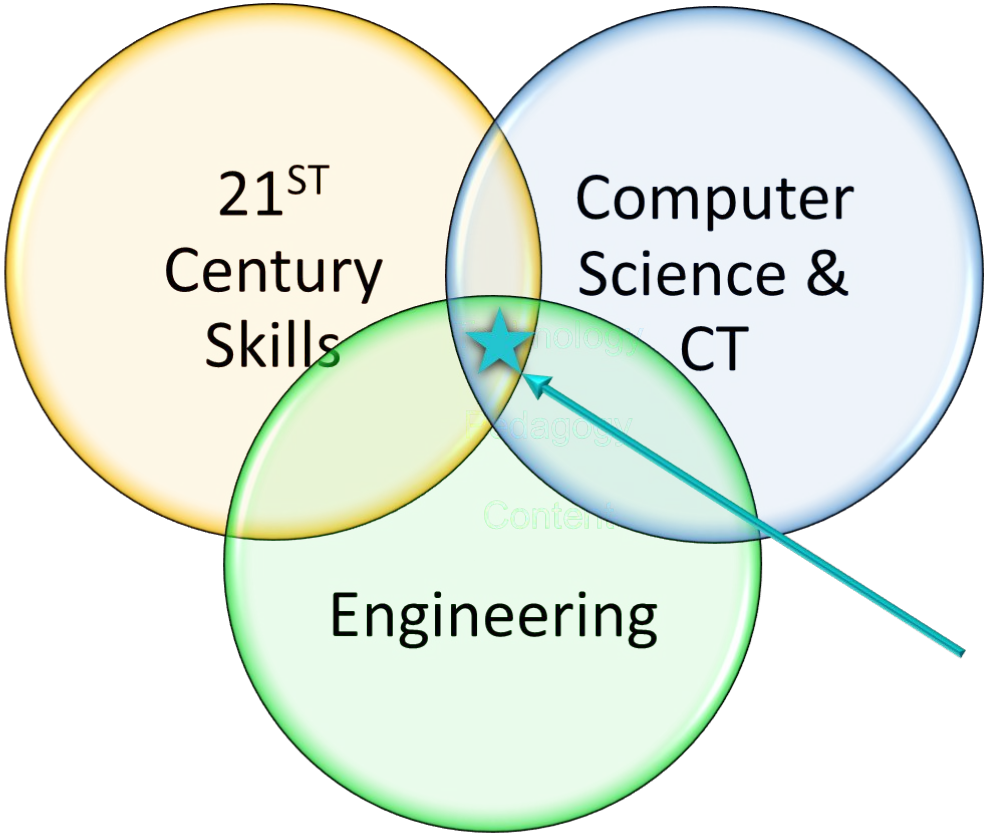




Source: LinkedIn Future of Work Report

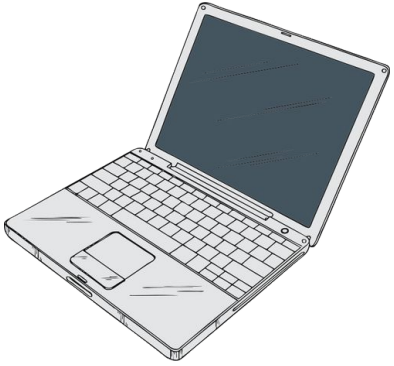
Vision: Imagine a Maryland where …

- **Computing Education:** Every student is provided standards-aligned, high-quality, hands-on instruction in computer science and computational thinking.
- **Engineering**: Every child is given the opportunity to think, learn, and act like an engineer.
- **Robotics**: School systems have robust, in-school robotics programs that support computing education and engineering.
- **Workforce Readiness:** Maryland has the most advanced local and State information technology (IT) workforce in the nation, which, to the maximum extent possible, reflects the racial, gender, ethnic, and geographic diversity of the State.


21ST Century Skills
Computer Science & CT
Engineering
Robotics & Physical Computing lie at the sweet spot

Progression of Learning Tools

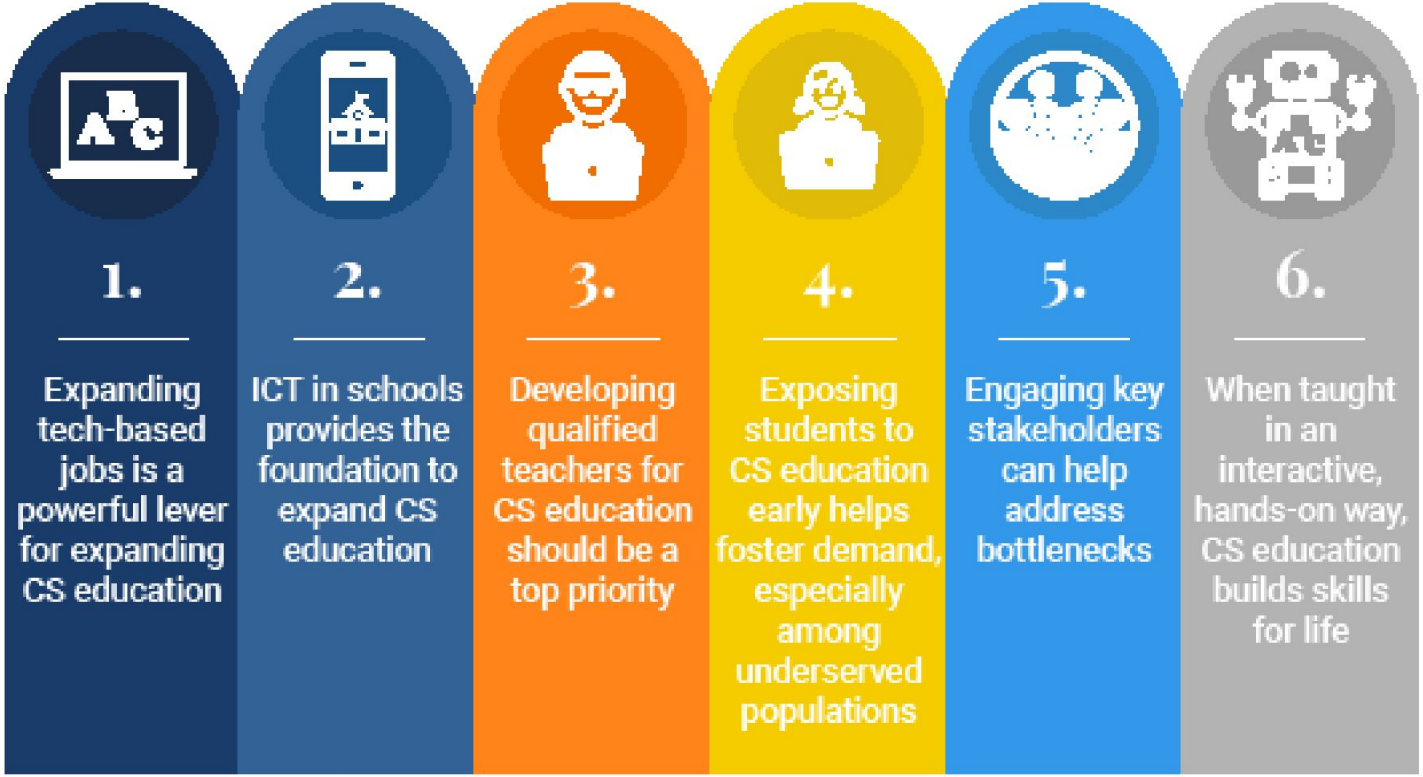
Calculator



Laptop

Educational Robot

There are challenges, but we have a plan.



Issues part 1 of 2

Issue	Remedy
Access to Devices	Coming out of the pandemic, most school systems have adequate access to devices to implement computer science education but funding for access to robotics and physical computing is needed.
New to most K-8 teachers	Vanguard trained in MD CS ES Ambassador's program. Vanguard will train one teacher per school and provide coaching.

Issues part 2 of 2

Issue	Remedy
Tested areas are the priorities	CS education improves motivation, academic achievement in content areas (Reading, Math, Science), problem-solving, executive functioning, and social-emotional skills. CS education supports performance in tested areas.
Nurture the whole child	Quality CS education is fun, collaborative, hands-on and engenders autonomy, revelevance, collaboration, and productive struggle. CS can be taught with some unplugged activities and some tactile robotics/physical computing activities.

SB980 Testimony.docx.pdf
Uploaded by: Katie Fry Hester
Position: FAV

KATIE FRY HESTER
Legislative District 9
Howard and Montgomery Counties

Education, Energy, and
Environment Committee

Chair, Joint Committee on
Cybersecurity, Information Technology
and Biotechnology

THE SENATE OF MARYLAND
ANNAPOLIS, MARYLAND 21401

Annapolis Office
James Senate Office Building
11 Bladen Street, Room 304
Annapolis, Maryland 21401
410-841-3671 · 301-858-3671
800-492-7122 *Ext.* 3671
KatieFry.Hester@senate.state.md.us

Testimony in Support of SB0980 Education - Computer Science - Content Standards and Requirements

March 6, 2024

Chairman Feldman, Vice-Chair Kagan, and members of the Education, Energy, and the Environment Committee:

Thank you for your consideration of Senate Bill 980, which seeks to bolster and provide equitable access to computer science education for all students in Maryland's K-12 schools.

In 2018, we passed HB281, which required public high schools to offer at least one high-quality computer science course beginning in the 2021-2022 school year. Uploaded alongside my testimony on your floor system, you will find a presentation that highlights some of the key data points gathered since that deadline.

Currently, 95% of high schools offer computer science courses, but less than 14% of high school students enroll in these courses before graduating[1]. The fact that a course is listed in the school catalog does not mean the course was actually offered. Courses are cancelled due to low enrollment, which happens most often with elective courses. Course offerings for electives are dependent upon student interest, teacher availability and scheduling, hence the likelihood of overreporting. This poor enrollment rate can be attributed to low computer science engagement in K-8 classrooms. According to a MSDE self-reported survey of schools, only 23% of elementary students receive more than one hour of computer science instruction a month.

HB281 also established the Maryland Center for Computing Education (MCCE) with the goal of identifying methods to increase access to high-quality computer science education and close the digital divide. Today, SB980, incorporates recommendations from the MCCE and a number of other key stakeholders and will improve and expand our state's current computer science education efforts by:

[1] https://mldscenter.maryland.gov/ComputerscienceDashboard.html

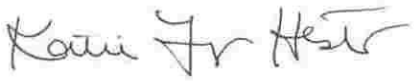
- Requiring each public high school, elementary, and middle school to offer at least one developmentally appropriate, high-quality computer science course, meeting or exceeding the MD K-12 Computer Science standards.
- Diversifying enrollment in middle and high school computer science courses in college and career ready (CCR) pathways, including female students, students with disabilities, students of ethnic and racial minorities, and other demographic groups that are underrepresented in the computer science field as identified by the Equal Employment Opportunity Commission.
- Requiring the State Board to update the computer science framework every 3 years to ensure that instruction is consistent with recent advances in computer science, particularly in the areas of fast moving technology such as Artificial Intelligence and cybersecurity.

These investments in computer science will yield enormous economic and societal benefits:

- Computer science is the fastest-growing, best-paying, and largest source of new wages in the United States, with an estimated 377,500 new job openings every year.
- Early exposure to computer science has a significant and long-term impact on executive functioning skills, problem-solving, creativity, emotional intelligence, mathematical abilities, and metacognition.
- Underrepresented students who experience computer science courses early in their education are more likely to enroll in subsequent computer science courses, promoting diversity within the field. [2]
- Students who take computer science courses at a young age are 17% more likely to pursue a college degree. [3]

By introducing computer science early in childhood education, Maryland takes a proactive stance towards building a skilled workforce and fostering diversity in the computer science field. **For these reasons, I respectfully request a favorable report on SB0980.**

Sincerely,



Senator Katie Fry Hester
Howard and Montgomery Counties
Senate Chair, Joint Committee on Cybersecurity, Information Technology & Biotechnology

[2] https://advocacy.code.org/2022_state_of_cs.pdf
[3] https://psycnet.apa.org/doiLanding?doi=10.1037%2Fedu0000314

RJR-(NCF) SB980 Letter (SUPPORT) (2024).pdf
Uploaded by: Laura Nelson
Position: FAV

Senator Brian Feldman, Chair
Senator Cheryl Kagan, Vice-Chair
Senate Education, Energy, and the Environment Committee
Miller Senate Office Building, 2 West
Annapolis, Maryland 21401

Re: **Senate Bill 980: Education - Computer Science - Content Standards and Requirements - SUPPORT**

March 6, 2024

Dear Chairman Feldman and Committee Members:

As President & Chief Executive Officer of the National Cryptologic Foundation (NCF) and member of the Maryland Cybersecurity Council on the Workforce Development Sub-committee, I write this letter in support of Senate Bill 980, entitled*: Education - Computer Science - Content Standards and Requirements*.

NCF's mission is to educate the public on the importance of cryptology and cybersecurity in defending our nation, focusing on educating the public, especially the nation's brightest young minds. As a nationally reputed provider of assured quality cyber education resources focused on K-20 cohorts, our efforts help reduce cyber workforce deficits and current skills shortfalls, promoting cyber professions as a fulfilling career choice. The purpose of this Senate Bill 980 aligns with the NCF's educational and workforce goals in Maryland and across the country.

As written, Senate Bill 980 would require public high schools to promote and increase the enrollment of students (of color and underrepresented groups) in high school computer science courses. In addition, the enactment of this legislation would require, beginning on or before June 1, 2025, the State Board of Education to update computer science content standards to include AI and cybersecurity.

More importantly, the enactment of this bill would also require county boards of education to provide developmentally appropriate computer science instruction in public elementary and middle schools in the county. This computer science instruction will be aligned to the same State content standards for Maryland's high school students (grades 9 through 12). The intent will be to increase the enrollment of high school computer science courses as well as providing the needed preparation and support to guide interested students into computer science-related courses and potential career pathways.

It is for these reasons; I am in full support of Senate Bill 980. I strongly urge this committee to give this legislation a **FAVORABLE** report and to enact this important piece of legislation. Thank you for your consideration.

Sincerely,

Laura Nelson
President & Chief Executive Officer
National Cryptologic Foundation

Lia Yunga HB980.pdf
Uploaded by: Lia Yunga
Position: FAV

3/5/2024

Good Afternoon chairmen and members of the committee, My name is lia yunga and im a fourth grader im here to tell you about SB980, I think that SB980 is great because it is making science on mobile fun for kids like me! And im currently doing coding clases at co.stem and it's going great! there is a lot of ideas like nothing ive know, My Mind has opened from all the coding I had done for the past 2 years, and I have noticed little changes like me pairing how I started in the beginning and to now I have grew and grew to now know that coding can be difficult in the start but then you notice to change it's not hard for you anymore and that shows that coding isn't always easy it take time.

And I would like other kids like me to do the same thing and that's why I would like your help for little kids and older kids than me to have the corage to do science or mobile apps and that's why I gave this little speech

And thanks for your Atention, C

- Lia Yunga
Marian 3. Abarca

Expand Access to K-8 CS Education in MD.pdf
Uploaded by: Maggie Glennon
Position: FAV

Expand Access to K-8 Computer Science Education in Maryland

Computer science is a necessary foundational subject for all Kindergarten to 12th-grade students that develops students' computational and critical thinking skills and teaches them how to create—not just use—new technologies. Given the rapid pace of technological advancement and artificial intelligence, the importance of a foundational understanding of computer science for all students is critical. However, for K-8 students in Maryland, access to computer science courses is limited. Every Maryland student must be equipped with the knowledge and skills to harness the power of computer science.

In 2019, House Bill 281 mandated that all high schools offer at least one high-quality computer science course. Since its implementation, Maryland has expanded access to courses, narrowing socially, culturally, and economically diverse enrollment gaps. Today, 99% of Maryland high schools offer computer science. However, while high schools have seen significant progress, HB 281 asked school systems to "make efforts" to provide computer science instruction in grades K-8. While these voluntary efforts have moved us forward, just one-quarter of Maryland public elementary schools deliver at least ten hours of computer science instruction annually.

Maryland must expand K–8 computer science education to prepare students and broaden equitable participation. We call on our Maryland leaders to pass Senate Bill SB 980 to extend the high school computer science requirement to require instruction in computer science education from Kindergarten to 8th grade.

The significance of early exposure to computer science cannot be overstated. Research has shown that introducing computer science in the early years has a profound and lasting impact on a student's creative thinking, mathematical skills, metacognitive skills, reasoning skills, spatial skills, student achievement[1], executive functioning[2], and literacy[3]. By providing this foundation, we are setting the stage for lifelong learning.

The post-pandemic landscape has unveiled glaring inequities in education along racial and economic lines. Early access to computer science education is essential to combat disparities[4][5]. An early investment in comprehensive computer science education can level the playing field, ensuring that every student, regardless of their background, has access to the skills and knowledge needed to thrive in the 21st-century workforce.

We, the undersigned, urge you to take bold action to support this critical initiative. Together, we can make a lasting impact on the lives of all Maryland public school students.

---

[1] The Cognitive Benefits of Learning Computer Programming: A Meta-Analysis of Transfer Effects
[2] Coding in Primary Grades Boosts Children's Executive Functions
[3] Supporting Literacy with Coding
[4] Career ambitions 'already limited by age of seven'
[5] U.S. Students' Computer Science Participation Lags Interest

Supported by:

Electronic Signatures from:

Kathy Benson, Program Manager, Tequity4All, Resident District 10
Bethany Berkowitz, Technology Resource Teacher, Baltimore County Public Schools
Debra Bruch, Teacher, Anne Arundel County Public Schools
Nora Burkhauser, Magnet Program Teacher, Montgomery County Public Schools
Stephanie Carl-Krisulevicz, The Salisbury School
David Chiles, CEO of LET'S GO Boys and Girls
Monica Chuppetta, Instructional Technology Teacher, Howard County Public Schools
Laura Davis, Instructional Technology Teacher, Howard County Public Schools
Carries Dawes, Instructional Technology Teacher, Howard County Public Schools
Zafar Daud, Coding and Robotics Academy
Sharae Felder, Instructional Manager, Code in the Schools
David Floyd, Instructional Technology Teacher, Howard County Public Schools
Serena Garcia
Rachel Gelinas, Instructional Technology Teacher, Howard County Public Schools
Christina Hataway, Instructional Technology Teacher, Howard County Public Schools
Alaina Hazlett
Mike Hinkey, Hinkey Consulting
Anita Kassof, Executive Director, Baltimore Museum of Industry
Micah Levine, Instructional Technology Teacher, Howard County Public Schools
Jacquelyn Matanin, Instructional Technology Teacher, Howard County Public Schools
Norman McGaughey, Coordinator for Career & Technology Education, Frederick County Public Schools
Sarah Melvin, Instructional Technology Teacher, Howard County Public Schools
Abena Njeeri
Keri Payne, Makerspace Teacher, Worcester County Public Schools

Kimberley Row, Library Media Specialist, Montgomery County Public Schools
Charlene Saint-Jean, Library Media Specialist, Prince George's County Public Schools
Edmond Saint-Jean, Music Teacher, Prince George's County Public Schools
Brittany Simmons, Library Media Specialist, Caroline County Public Schools
Elizabeth Stover, Instructional Technology Teacher, Howard County Public Schools
Diane Stulz, Coordinator of Instruction, Worcester County Public Schools
Kim Suter, Program Director, Code in the Schools
Clair Wise, Facilitator, Maryland Center for Computing Education

SB980_Maggie Glennon Code.org_Fav.pdf
Uploaded by: Maggie Glennon
Position: FAV

Code.org
801 5th Avenue
Suite 2100
Seattle, WA 98104

http://code.org
info@code.org

Senate Education, Energy, and the Environment Committee
Written Testimony on SB 980
Code.org
March 6, 2024

Chair Feldman, Vice Chair Kagan, and esteemed members of the Senate Education, Energy, and Environment Committee:

Thank you for accepting written testimony from Code.org in support of requiring K-8 schools to offer computer science in SB 980. Code.org is a nonprofit dedicated to expanding access to computer science in K-12 education, especially for students historically underrepresented in the field.

Computer science is a foundational subject - just like English or math - necessary for today's students to be active, informed contributors to our increasingly technology-based society. And the past year's widespread adoption of generative artificial intelligence has underscored the importance of an understanding and knowledge of computer science for all students. By teaching students logical and abstract thinking, data analysis, creative problem solving, and collaboration, computer science educates students on leveraging technology to solve tomorrow's problems. We should ensure that school curriculum is aligned with the demands of the 21st century and require that all students learn computer science. Multiple studies show that students learning computer science in primary school perform better in reading, math, and science; score better on standardized AP exams in secondary school; are 17% higher likelihood of enrolling in university; and perform better at problem-solving from primary school to university.

Elementary and middle school instruction in computer science is a vehicle for equity in the subject, and **foundational courses in K–8 schools help all students develop confidence in computer science, better preparing them for high school courses**. Students who are historically underrepresented in computer science and who experience the subject early are more likely to enroll in subsequent computer science courses and are more likely to stay in the field. This sense of belonging in computing is crucial to address early in a student's education.

The tech sector still grapples with issues of representation, and diverse enrollment in computer science classes lays the foundation for a computing ecosystem that more accurately reflects the needs and experiences of the whole population.

We shouldn't leave to chance who has access to foundational subjects like computer science. Thank you for your consideration.

Maggie Glennon
Senior Director of Government Affairs, Code.org
maggie@code.org

Expand Access to K-8 CS Education in MD_SB 980.pdf
Uploaded by: margaret durkin
Position: FAV

Expand Access to K-8 Computer Science Education in Maryland

Computer science is a necessary foundational subject for all Kindergarten to 12th-grade students that develops students' computational and critical thinking skills and teaches them how to create—not just use—new technologies. Given the rapid pace of technological advancement and artificial intelligence, the importance of a foundational understanding of computer science for all students is critical. However, for K-8 students in Maryland, access to computer science courses is limited. Every Maryland student must be equipped with the knowledge and skills to harness the power of computer science.

In 2019, House Bill 281 mandated that all high schools offer at least one high-quality computer science course. Since its implementation, Maryland has expanded access to courses, narrowing socially, culturally, and economically diverse enrollment gaps. Today, 99% of Maryland high schools offer computer science. However, while high schools have seen significant progress, HB 281 asked school systems to "make efforts" to provide computer science instruction in grades K-8. While these voluntary efforts have moved us forward, just one-quarter of Maryland public elementary schools deliver at least ten hours of computer science instruction annually.

Maryland must expand K–8 computer science education to prepare students and broaden equitable participation. We call on our Maryland leaders to pass Senate Bill SB 980 to extend the high school computer science requirement to require instruction in computer science education from Kindergarten to 8th grade.

The significance of early exposure to computer science cannot be overstated. Research has shown that introducing computer science in the early years has a profound and lasting impact on a student's creative thinking, mathematical skills, metacognitive skills, reasoning skills, spatial skills, student achievement[1], executive functioning[2], and literacy[3]. By providing this foundation, we are setting the stage for lifelong learning.

The post-pandemic landscape has unveiled glaring inequities in education along racial and economic lines. Early access to computer science education is essential to combat disparities[4][5]. An early investment in comprehensive computer science education can level the playing field, ensuring that every student, regardless of their background, has access to the skills and knowledge needed to thrive in the 21st-century workforce.

We, the undersigned, urge you to take bold action to support this critical initiative. Together, we can make a lasting impact on the lives of all Maryland public school students.

---

[1] The Cognitive Benefits of Learning Computer Programming: A Meta-Analysis of Transfer Effects
[2] Coding in Primary Grades Boosts Children's Executive Functions
[3] Supporting Literacy with Coding
[4] Career ambitions 'already limited by age of seven'
[5] U.S. Students' Computer Science Participation Lags Interest

Supported by:

Electronic Signatures from:

Kathy Benson, Program Manager, Tequity4All, Resident District 10
Bethany Berkowitz, Technology Resource Teacher, Baltimore County Public Schools
Debra Bruch, Teacher, Anne Arundel County Public Schools
Nora Burkhauser, Magnet Program Teacher, Montgomery County Public Schools
Stephanie Carl-Krisulevicz, The Salisbury School
David Chiles, CEO of LET'S GO Boys and Girls
Monica Chuppetta, Instructional Technology Teacher, Howard County Public Schools
Laura Davis, Instructional Technology Teacher, Howard County Public Schools
Carries Dawes, Instructional Technology Teacher, Howard County Public Schools
Zafar Daud, Coding and Robotics Academy
Sharae Felder, Instructional Manager, Code in the Schools
David Floyd, Instructional Technology Teacher, Howard County Public Schools
Serena Garcia
Rachel Gelinas, Instructional Technology Teacher, Howard County Public Schools
Christina Hataway, Instructional Technology Teacher, Howard County Public Schools
Alaina Hazlett
Mike Hinkey, Hinkey Consulting
Anita Kassof, Executive Director, Baltimore Museum of Industry
Micah Levine, Instructional Technology Teacher, Howard County Public Schools
Jacquelyn Matanin, Instructional Technology Teacher, Howard County Public Schools
Norman McGaughey, Coordinator for Career & Technology Education, Frederick County Public Schools
Sarah Melvin, Instructional Technology Teacher, Howard County Public Schools
Abena Njeeri
Keri Payne, Makerspace Teacher, Worcester County Public Schools

Kimberley Row, Library Media Specialist, Montgomery County Public Schools
Charlene Saint-Jean, Library Media Specialist, Prince George's County Public Schools
Edmond Saint-Jean, Music Teacher, Prince George's County Public Schools
Brittany Simmons, Library Media Specialist, Caroline County Public Schools
Elizabeth Stover, Instructional Technology Teacher, Howard County Public Schools
Diane Stulz, Coordinator of Instruction, Worcester County Public Schools
Kim Suter, Program Director, Code in the Schools
Clair Wise, Facilitator, Maryland Center for Computing Education

SB980_Hester_fav.pdf
Uploaded by: Melissa Dark
Position: FAV

FAVORABLE

TESTIMONY PRESENTED TO THE
SENATE EDUCATION, ENERGY, AND THE ENVIRONMENT COMMITTEE

SB 980 (EDUCATION - COMPUTER SCIENCE - CONTENT STANDARDS AND REQUIREMENTS)

DR. MELISSA DARK

POSITION: SUPPORT
MARCH 6, 2024

Good afternoon, Mr. Chairman, Madam Vice Chair, and members of the committee. I am Dr. Melissa Dark, Founder and CEO of DARK Enterprises, Inc., a nonprofit dedicated to developing, supporting, and stewarding excellent cybersecurity education at the secondary level. Examples of our work in cybersecurity education include teachcyber.org, teachcyber.org/NCTA, and cybersupply.org. I urge a favorable report on SB 980.

I have worked in cybersecurity education for 25 years. One of the greatest challenges our nation faces is producing a robust cybersecurity workforce. To fill the national cybersecurity workforce shortage, the U.S. needs 1 in every 32 eligible[1] workers (those of working age to specialize and work in cybersecurity. The need in Maryland is even greater. Maryland needs 1 in every 12 eligible workers in Maryland to specialize and work in cybersecurity.

One way to fill this workforce shortage is to grow your talent pool starting earlier. This is what SB 980 will do. It will help Maryland get much-needed high quality cybersecurity education into your public schools to grow its supply of cybersecurity talent.

Let me share the following facts based on research that my organization conducts (cybersupply.org).

- Only 18% of public high schools in Maryland are positioned to offer a cybersecurity course (cybersupply.org). This means the school has a qualified teacher to teach the course, curriculum, labs, etc.

[1] The Bureau of Labor Statistics (BLS) defines the eligible labor force to include persons 16 years of age and older residing in the 50 States and the District of Columbia who are not inmates of institutions (for example, penal and mental facilities, homes for the aged), and who are not on active duty in the Armed Forces.

- In comparison, your neighboring state of Virginia offers cybersecurity in 61% of Virginia public high schools.
- While 18% of your schools offer cybersecurity, given seat limits and schedule constraints, fewer than 3.6% of Maryland high school students can actually enroll in a cybersecurity course compared to 14% in Virginia.

The net effect is that Maryland high school students have ¼ the access to quality cybersecurity education when compared to Virginia, another state with high worker demand in cybersecurity. SB 980 can potentially to bring opportunities to Maryland high school students to set them on the pathway for high tech, high wage, high demand jobs in cybersecurity and to meet cybersecurity workforce demands.

Again, I urge a favorable report on SB 980.

Thank you.

Mia Yunga HB980.pdf
Uploaded by: Mia Yunga
Position: FAV

by: Mia 4.
3/5/2024

Good Afternoon chairman and members of the committee,

My name is Mia and I'm in fourth TN Grade. And I'm here to tell you that I think SB980 is good because its ~~mkes~~ all about making science fun for kids like me in public schools. I like playing games on computers, coding, and I think learning about it would awsome to learn more about it! SB980 says that school will help more kids like me join computer science classes and that's great because every one should have a chance to learn and have fun. I also like that SB980 wants schools to teach computer science to younger kids like me in elementary and middle school. Thats amazing because it means he can start learning early and maybe even become super smart when we grow up. So I hope you really, really support SB980 because its about making sure all kids get to have fun learning about computers. Thanks for helping we learn cool stuff... Best wishes

Mia

SB980_Dammers_fav.pdf
Uploaded by: Robyn Dammers
Position: FAV

Chair Senator Feldman, Vice Chair Senator Kagan, and esteemed members of the Committee, thank you for this opportunity to support Senate Bill 980. My name is Robyn Dammers and I am a mother of two children in Baltimore County Public Schools.

My third-grade son says he wants to be an engineer when he grows up. I want him to get a chance to study computer science and robotics, but that is only offered at less than 10% of the elementary schools in the county. It should be offered at all schools across the state. He enjoys coding the Code & Robot we have at home and likes to teach his friends about it as well.

My first-grade daughter has other non-technology interests, but I still want her to be exposed to computer science instruction because it helps foster skills like creativity, communication, collaboration, and critical thinking. At age 5, she played with the Scratch Jr. coding platform with her grandma. She used it to retell her favorite movie Encanto. She created and decorated the costumes of the characters, laid out about four scenes from the movie and programmed it to switch between the scenes. She wanted it to play her favorite song “We don’t talk about Bruno”, but she was not satisfied with her own singing. She walked the iPad over to the home Alexa. She told Alexa to “play we don’t talk about Bruno” and pressed the record button in Scratch Jr. on the iPad. We wer flabber gasted by this ingenuity! I can’t wait to see what great things she will create if she is given the proper preparation.

Please fund this bill so that my children and others like them can benefit from the opportunities.

_Siobhan Hayes Testimony for SB 980 (CS funding).f

Uploaded by: Siobhan Hayes

Position: FAV

Good afternoon Chair and members,

My name is Siobhan Hayes, I am the Tech Lab Director at Digital Harbor Foundation. I am here today to speak in favor of SB980.

Digital Harbor Foundation is a nonprofit organization focused on disrupting the root causes of the digital divide. Our work focuses on promoting digital inclusion through developing innovative, equity-based STEM learning experiences for youth, educators, organizations, and communities.

We empower youth to be *creators* of technology rather than *consumers* of technology.

In our Tech Center in the Federal Hill neighborhood of Baltimore we serve approximately 400 youth per year in addition to offering professional development for educators both locally and across the country.

Each day, youth discover their own capacity to create and love of computer science through our afterschool program in topics such as robotics, coding, and 3-D design.

Baltimore youth systemically lack STEM education opportunities that would lead them to access economic opportunities available in their own community.

This lagging investment in STEM education disproportionately impacts youth who are already underrepresented in STEM fields, especially youth of color, females, and youth with disabilities and from low income families. As Baltimore's tech sector continues to grow, ignoring or leaving behind these populations will result in even greater disparities in Baltimore's workforce.

By requiring public high schools to reflect the demographic composition of the school in their computer science enrollments, this bill directly addresses these inequities.

The bill mandates that the State Board of Education update computer science content standards to include recent advances in the field, such as artificial intelligence and cybersecurity. This ensures that students in Baltimore City, a federally designated Tech Hub, are receiving instruction that is not only relevant but also provides them with the skills needed to access and thrive in the modern workforce.

Many Baltimore-area schools and teachers struggle to integrate technology into their classrooms and curriculum. The Maryland General Assembly found that 78% of Baltimore City schools do not offer any computer science courses. The requirement for county boards of education to provide developmentally appropriate computer science instruction in public elementary and middle schools is particularly significant for Baltimore City, where early exposure to computer science can help bridge the gap in technology skills and prepare students for future success. Youth start to develop STEM identity during preadolescence, highlighting the importance of increasing exposure to computer science in the early grades

Senate Bill 980 is a critical step towards equity. It has the potential to open doors to new opportunities, empower our students, and create a more inclusive local tech industry.

I urge you to support Senate Bill 980 for the benefit of Baltimore City's students and building an inclusive future for our community.

SB0980TimDixonfav.pdf
Uploaded by: Timothy Dixon
Position: FAV

Thank you, Chair Senator Feldman, Vice Chair Senator Kagan, and members of the Education, Energy, and Environment Committee for the opportunity to support Senate Bill 980. My name is Tim Dixon. I am a consultant for Maryland Center for Computer Education and a former elementary teacher in Prince George's County for 28 years. I've worked with diverse groups of students including English Language Learners, special needs students alongside general educational students during my teaching career.

Honorable legislators, ensuring all our students are prepared for the 21st century workplace and society is of utmost importance. This includes our English language learners. By incorporating computational thinking and computer science into their curriculum, we equip these students with critical skills for success, regardless of their future profession.

Computer science develops vital computational and critical thinking abilities that translate across disciplines. Students learn to break down complex problems, analyze data logically, and create solutions - competencies coveted by employers. This fundamental knowledge about how technology works empowers students to become creators and innovators, not just consumers of tech.

Moreover, the practices of computational thinking parallel those required for English language development. Both emphasize problem-solving, logical thinking, collaboration, and communication. As students code programs and debug errors, they apply many of the same cognitive skills needed to analyze texts and express ideas clearly.

For English learners specifically, visually-engaging coding platforms present opportunities to develop language proficiency without being constrained by current reading/writing levels. They gain confidence tackling complex challenges through a modality that reduces linguistic barriers. Students with IEPs also benefit from the same links to speech, functional routines, as well as academic goals like sequencing and numeracy in a more creative setting. Students can have cybersecurity or IT as a transition goal on their IEP when they demonstrate the skill at home but do not have the opportunity to demonstrate it at school.

By prioritizing these concepts from an early age, we prepare a future-ready workforce and citizenry equipped with the literacies of the modern world. I urge you to support computer science and computational thinking education for all our students, including English language learners. Their success is pivotal to Maryland's thriving in our technological age.

Research has shown that elementary school students who experience coding, computational thinking and other computer science instruction increase their executive function skills(Self-regulation of cognitive processes) and collaboration skills. Our English learners' access to CS is limited compared to their monolingual peers because of their emerging English. There is a great need for teacher training on how to embed linguistic supports that can bridge the language of computer science and its concepts for them. "

We have already made inroads into county curriculums such as Prince George's County including computer science in their middle school English Language Learners middle school curriculum and Loyola and other colleges including computer science in their elementary pre-service courses. We are currently meeting with educators from across the country who also integrate computer science and computational thinking into their English Language Learners instruction to develop "Best Practices" for Maryland.

Senate Bill 980 would help provide the resources to expand our efforts to better support the nearly 60,000 Elementary English Language Learner students in Maryland.

Should I include research on Executive Function? Cognitive Skills Challenges to Teaching English Language Learners computer science when I upload the document before the oral testimony?

SB0980TimDixonfav1.pdf
Uploaded by: Timothy Dixon
Position: FAV

Thank you, Chair Senator Feldman, Vice Chair Senator Kagan, and members of the Education, Energy, and Environment Committee for the opportunity to support Senate Bill 980. My name is Tim Dixon. I am a consultant for Maryland Center for Computer Education and a former elementary teacher in Prince George's County for 28 years. I've worked with diverse groups of students including English Language Learners, special needs students alongside general educational students during my teaching career.

Honorable legislators, ensuring all our students are prepared for the 21st century workplace and society is of utmost importance. This includes our English language learners. By incorporating computational thinking and computer science into their curriculum, we equip these students with critical skills for success, regardless of their future profession.

Computer science develops vital computational and critical thinking abilities that translate across disciplines. Students learn to break down complex problems, analyze data logically, and create solutions - competencies coveted by employers. This fundamental knowledge about how technology works empowers students to become creators and innovators, not just consumers of tech.

Moreover, the practices of computational thinking parallel those required for English language development. Both emphasize problem-solving, logical thinking, collaboration, and communication. As students code programs and debug errors, they apply many of the same cognitive skills needed to analyze texts and express ideas clearly.

For English learners specifically, visually-engaging coding platforms present opportunities to develop language proficiency without being constrained by current reading/writing levels. They gain confidence tackling complex challenges through a modality that reduces linguistic barriers. Students with IEPs also benefit from the same links to speech, functional routines, as well as academic goals like sequencing and numeracy in a more creative setting. Students can have cybersecurity or IT as a transition goal on their IEP when they demonstrate the skill at home but do not have the opportunity to demonstrate it at school.

By prioritizing these concepts from an early age, we prepare a future-ready workforce and citizenry equipped with the literacies of the modern world. I urge you to support computer science and computational thinking education for all our students, including English language learners. Their success is pivotal to Maryland's thriving in our technological age.

Research has shown that elementary school students who experience coding, computational thinking and other computer science instruction increase their executive function skills(Self-regulation of cognitive processes) and collaboration skills. Our English learners' access to CS is limited compared to their monolingual peers because of their emerging English. There is a great need for teacher training on how to embed linguistic supports that can bridge the language of computer science and its concepts for them. "

We have already made inroads into county curriculums such as Prince George's County including computer science in their middle school English Language Learners middle school curriculum and Loyola and other colleges including computer science in their elementary pre-service courses. We are currently meeting with educators from across the country who also integrate computer science and computational thinking into their English Language Learners instruction to develop "Best Practices" for Maryland.

Senate Bill 980 would help provide the resources to expand our efforts to better support the nearly 60,000 Elementary English Language Learner students in Maryland.

Executive Function Cognitive Skills Challenges to Teaching English Language Learners computer science when I upload the document before the oral testimony?
Links to support benefits of IEP students' inclusion in computational thinking and computer science instruction.
https://sites.google.com/csta-hq.org/csaccesshub/home

MIT's MITRE Neurodiversity@Work Initiative
https://www.mitre.org/news-insights/impact-story/value-thinking-differently-mitres-neurodiversityworks-inclusive-outreach

SB 980.Computer Science and AI Curriculum and Inst

Uploaded by: John Woolums

Position: UNF

MABE
MARYLAND ASSOCIATION OF BOARDS OF EDUCATION

621 Ridgely Avenue, Suite 300, Annapolis, Maryland 21401
410-841-5414 · 800-841-8197 · Fax: 410-841-6580 · MABE.org

BILL: **Senate Bill 980**
TITLE: **Education - Computer Science - Content Standards and Requirements**
POSITION: **OPPOSE**
DATE: **March 6, 2024**
COMMITTEE: **Education, Energy, and the Environment**
CONTACT: **John R. Woolums, Esq.**

The Maryland Association of Boards of Education (MABE) opposes Senate Bill 980, which would not only mandate updated state standards for instruction in computer science, including the role of artificial intelligence (AI), but also mandate a major expansion of computer science instruction in public elementary and middle schools.

Generally, MABE opposes efforts by the General Assembly to legislate curriculum, courses of instruction, assessments, or graduation requirements, firmly believing that this role belongs to local boards of education in conjunction with the State Board of Education. Exceptions to this rule are rare. In creating the State Board and local boards of education, the General Assembly has delegated to them the responsibility for guiding and delivering a high-quality statewide system of public education through state standards and accountability measures, and locally governed and administered curriculum, teaching, and learning.

MABE recognizes and shares the General Assembly's strong support for computer science education. In 2018, legislation was enacted to require all public high schools to offer at least one high-quality computer science course beginning in the 2021-2022 school year. MABE supported this legislation as amended and greatly appreciates the initiative to establish and fund the Maryland Center for Computing Education to support much needed computer science-related professional development. The Center provides professional development, curriculum resources, and computer science education mentorships. At present, the Center is offering professional development for educators on artificial intelligence and on teaching cybersecurity.

Regarding artificial intelligence (AI), local boards of education recognize the importance of adopting statewide guidelines and local policies and procedures informed by this guidance to facilitate the optimal use of artificial intelligence (AI) in the educational setting. This is why MABE is supporting legislation such as Senate Bill 979.

Again, MABE's opposition to Senate Bill 980 does not rest on an evaluation of the merits of teaching any specified subject matter, certainly not computer science, but rather on the association's opposition to legislation proposing to mandate or modify curriculum, course requirements, assessments, or high school graduation requirements.

For these reasons, MABE requests an unfavorable report on Senate Bill 980.

SB980.Curr.Comp.24.pdf
Uploaded by: Virginia Crespo
Position: UNF

Maryland Retired School Personnel Association

8379 Piney Orchard Parkway, Suite A ● Odenton, Maryland 21113
Phone: 410.551.1517 ● Email: mrspa@mrspa.org
www.mrspa.org

Senate Bill 0980
In Opposition Of
Education - Computer Science - Content Standards and Requirements
Education, Energy, and the Environment Committee
Hearing: March 6, 2024 - 1:00 p.m.

Dear Honorable Senator Brian Feldman, Chair, and Honorable Senator Cheryl Kagan, Vice Chair, and distinguished Education, Energy, and Environment Committee members,

The Maryland Retired School Personnel Association (MRSPA) opposes SB 0980 - Education - Computer Science - Content Standards and Requirements.

MRSPA's Education Priority is clear: "MRSPA supports legislation designed to enhance public education and promote lifelong learning for all students. Support for public education and lifelong learning is essential to forming an educated and productive citizenry." However, MRSPA's position is that "curriculum decisions made in support of public education and lifelong learning must be the responsibility of State and Local Boards of Education."

MRSPA supports promoting and increasing enrollment in computer science courses, updating computer science content, and having elementary and middle school students receive computer science instruction. However, MRSPA's position is that all decisions about curriculum related to the above fall under the purview of the State and Local Boards of Education. We urge you to allow the State and Local Boards of Education to do their due diligence regarding curriculum.

On behalf of the 12,000 members of the Maryland Retired School Personnel Association, we urge your opposition to and an unfavorable report on SB 0980.

Sincerely,

Carla J. Duls
President

Virginia G. Crespo
Legislative Aide

SB 980 - State Board - OPPOSE.pdf
Uploaded by: Zachary Hands
Position: UNF

Maryland
STATE DEPARTMENT OF EDUCATION

Carey M. Wright, Ed.D.
Interim State Superintendent of Schools

Clarence C. Crawford
President, State Board of Education

TO: Senate Education, Energy, and the Environment Committee

BILL: Senate Bill (SB) 980 – Education – Computer Science – Content Standards and Requirements

DATE: March 6, 2024

POSITION: Oppose

The Maryland State Board of Education (State Board) and the Maryland State Department of Education (MSDE) respectfully oppose Senate Bill (SB) 980 - Education – Computer Science – Content Standards and Requirements, which requires the State Board of Education to update computer science content standards with information on artificial intelligence and cybersecurity as well as requires county boards of education to provide computer science instruction in public elementary and middle schools.

We do not oppose the bill based on the merits of the proposed subject matter but on the grounds that the legislative requirement would run counter to the process that is entrusted to the State Board, MSDE, and LEAs. Separate processes and timelines for the review and approval of standards, frameworks, and curricular resources could be counterproductive to both MSDE and to local education agencies. Additionally, SB 980 would allow for a short timeline for LEAs to complete the required curricular resource development, training, and procurement of new materials.

Annually, the Computer Science Teachers Association, in partnership with Code Advocacy Coalition and Expanding Computing Education Pathways, releases a report titled, "2023 State of Computer Science Education" that provides an update on national and state-level computer science education policy, including policy trends, maps, state summaries, and implementation data. The report accesses states based on 10 policies to make computer science foundational in public schools:

1. Create a statewide plan for K–12 computer science,
2. Define computer science and establish standards for K–12 computer science,
3. Allocate funding for rigorous computer science teacher professional learning,
4. Implement clear certification pathways for computer science teachers at elementary and secondary levels,
5. Create university programs to encourage all preservice teachers to gain exposure to computer science,
6. Establish dedicated computer science positions in a state education agency,
7. Require that all schools offer computer science with appropriate implementation timelines,
8. Allow computer science to count toward a core graduation requirement,
9. Allow computer science to satisfy an admission requirement at higher education institutions, and
10. Require that all students take computer science to earn a high school diploma.

According to the report, 99% of Maryland high schools offer computer science courses. This exceeds the national average by 41.5%. Furthermore, the Maryland State Board of Education adopted a regulation requiring students to earn one credit in computer science, engineering, or technology education to meet their graduation requirements.

MSDE has made great progress in the statewide implementation of computer science in public schools through collaborative partnerships with the Maryland Center for Computing Education (MCCE), Code in the Schools, and the MCCE Advisory Committee. Working in tandem with these organizations, computer science is expanding at all levels of education:

Elementary School Computer Science and Computational Thinking
At the elementary level, an Elementary Computer Science Ambassadors program was established. Over 75 elementary educators from across the state have received extensive professional development in computer science and computational thinking. Their roles vary, but in general, they implement these topics in their classrooms, mentor and support other interested teachers, and work on other projects with the partnership.

Middle School Computer Science and Computational Thinking
At the middle school level in Maryland, there is a requirement in the Every Student Succeeds Act (ESSA) for computational thinking. Currently, most students meet the requirement through computer science or technology education courses.

High School Computer Science and Career and Technical Education
Many of the computer science courses at the high school level are incorporated into Career and Technical Education (CTE) programs of study. The CTE programs prepare students for high-wage, high-skill, high-demand STEM jobs after high school, by providing technical training and/or preparing students to go on to higher education. Computer science courses are also offered as electives and/or courses that allow students to meet the Computer Science, Engineering, or Technology Education requirement or the mathematics requirement. Currently, under the *Securing the Future: Computer Science for All* Maryland law, cited above, each public high school must offer at least one high quality computer science course. The local school systems have all met this requirement as of the 2021-2022 school year.

Teachers and Computer Science Certification
An ongoing issue for many STEM subjects is the availability of teachers, and this issue is especially problematic for computer science education. It is hard to convince those who can make substantially more money working in industry to work in education. Thus, there is a constant shortage of computer science teachers at the elementary, middle, and high school levels. While local education agencies will continue to pursue their teacher recruitment efforts, a necessary component of the partnership is to provide professional learning to current Maryland educators to either teach stand-alone computer science courses or integrate computer science and computational thinking into other content areas.

Standards and Frameworks Review Committee (SFRC)
MSDE, in partnership with teachers, supervisors, parents, institutes of higher education, and other stakeholders will continue to undertake significant reviews of state standards and frameworks.

To be included in this process is the MSDE proposed "Standards and Frameworks Review Committee" (SFRC), which will address the concerns of SB 980 by enhancing the process's mechanism for responding to emergent standards, framework, and curricular resource needs. The SFRC shall be comprised of no more than ten educators (such as teachers, administrators, and/or content supervisors), two parents of Maryland Public School students, two community members (such as University scholars and/or associated content experts) as well as a chairperson selected by MSDE. All members of the SFRC shall undergo a rigorous application and selection process along with training in MSDE protocol. The objective and scope of the SFRC shall be to improve student outcomes by ensuring the alignment of standards and frameworks to emergent needs as identified by MSDE. As we move forward with this process, MSDE will be certain to include our critical partners in the General Assembly.

The Department and the State Board respectfully request that the committee consider this information on **SB 980.** Please contact Dr. Akilah Alleyne, Executive Director of Government Affairs, Education Policy, and Government Relations, at Akilah.alleyne@maryland.gov or at 410-767-0504 or Zach Hands, Executive Director of the State Board, at Zachary.hands1@maryland.gov or at 443-915-6094, if you would like any additional information.