

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

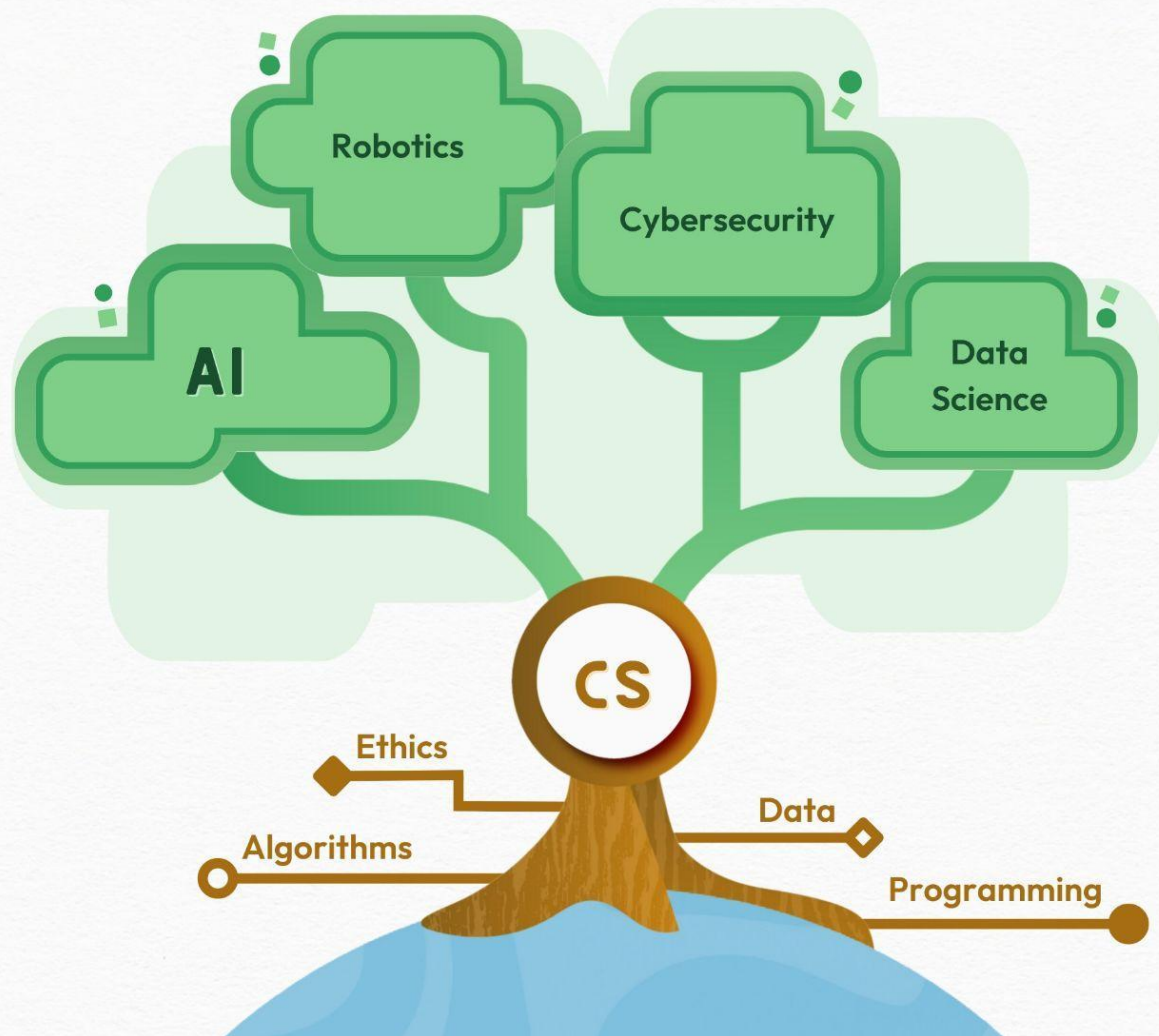
Education

Employment

Pipeline



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



What is your vision for Computer Science in Maryland?



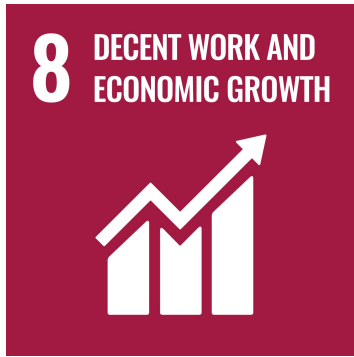
Why?

Computer Science
Education



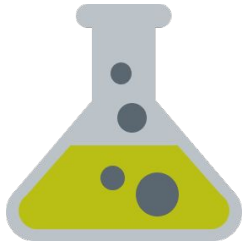
Imperative for Computing Education

- Economic
- Educational
- Civic



Studies show: Children who study computer science...

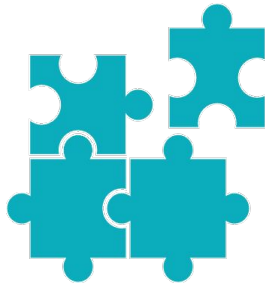
perform better in other subjects



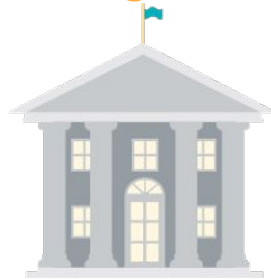
develop better executive functioning



excel at problem solving



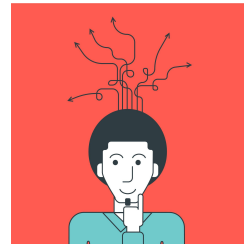
are 17% more likely to pursue a college degree

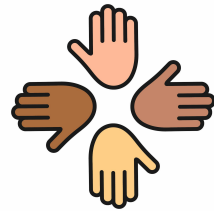


do better on tests of creativity, mathematical skills, metacognition, spatial skills, and reasoning skills.



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,**

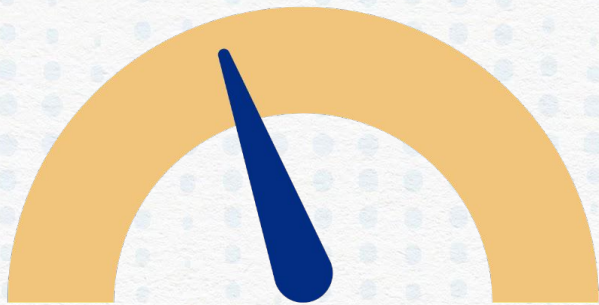


**largest
source of all
new wages
in the U.S.**

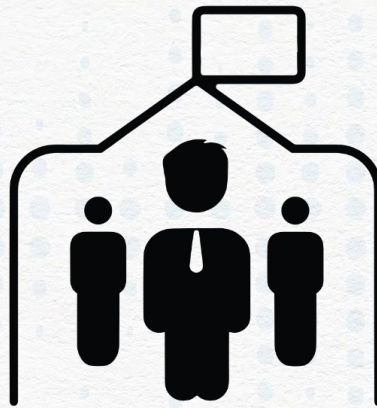
Artificial Intelligence



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.



Cybersecurity

Global cyber attacks have put a new spotlight on cybersecurity.



Cyber Maryland by the Numbers

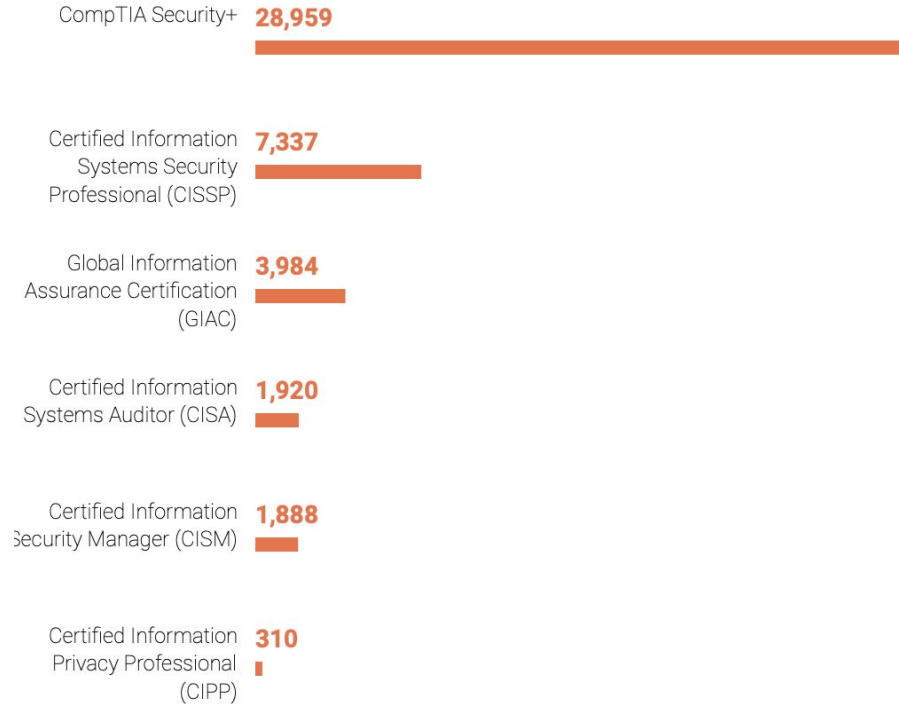


30,000

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.

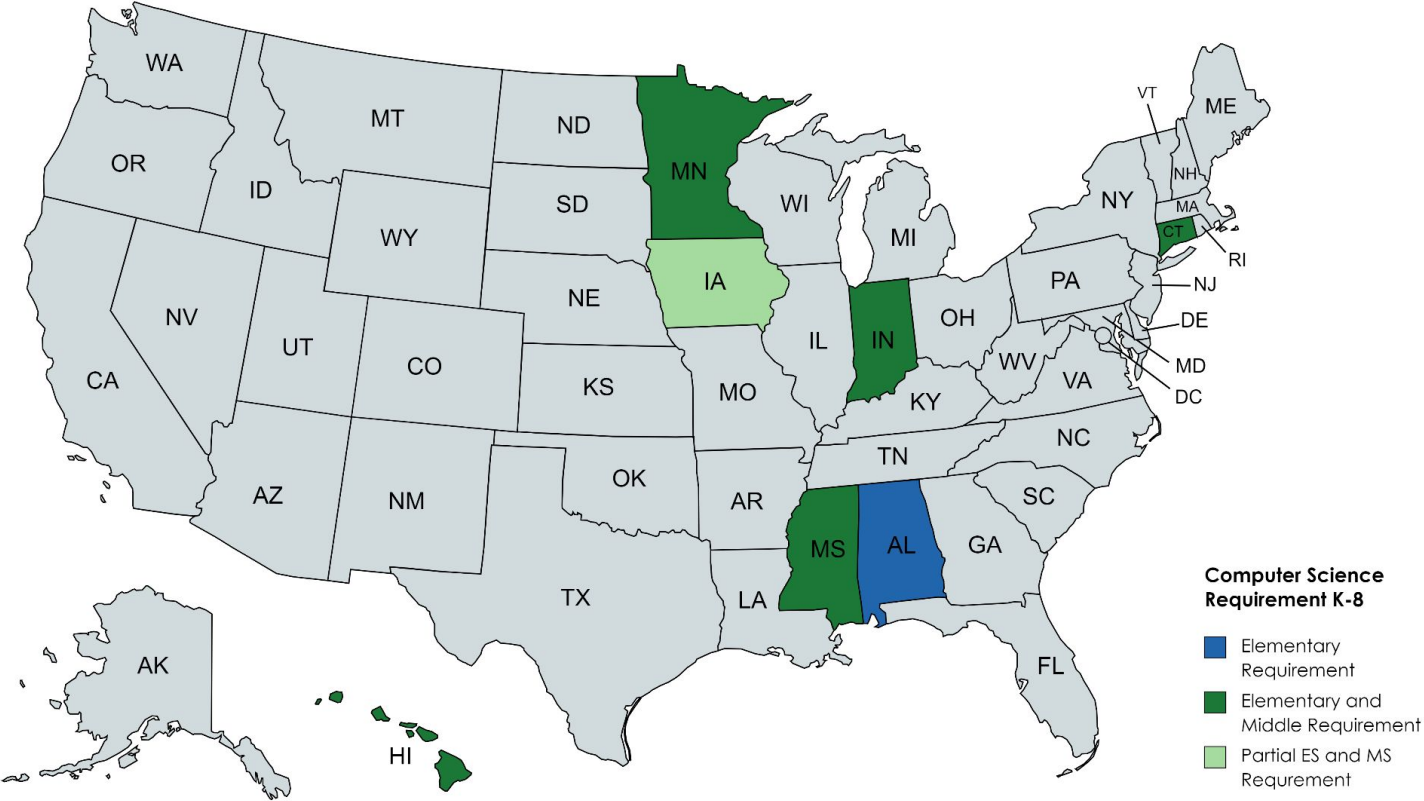


Where are we going?

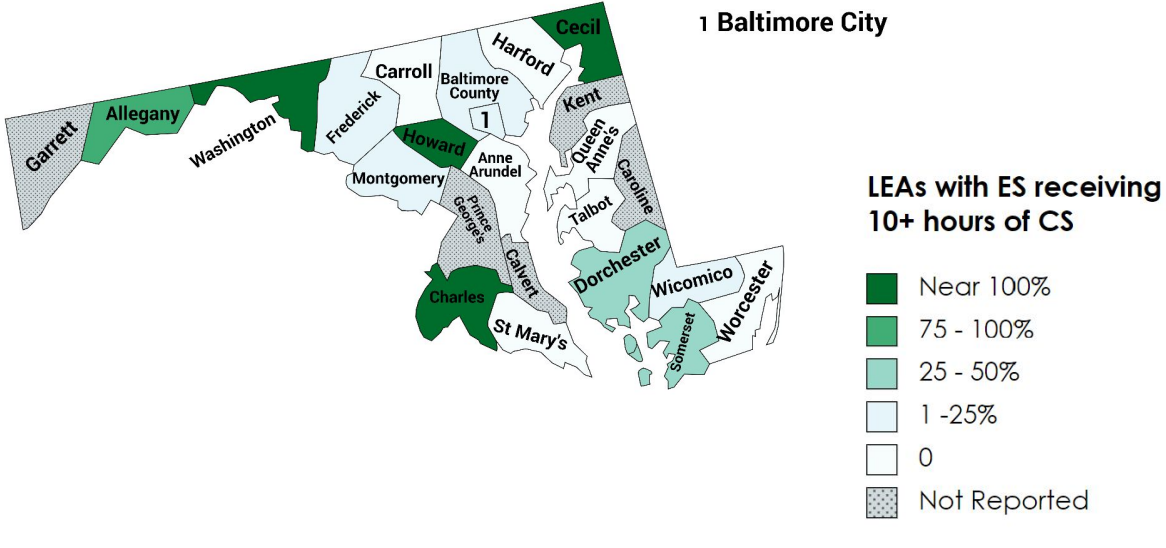
Next Steps for Advancing
CS in Maryland



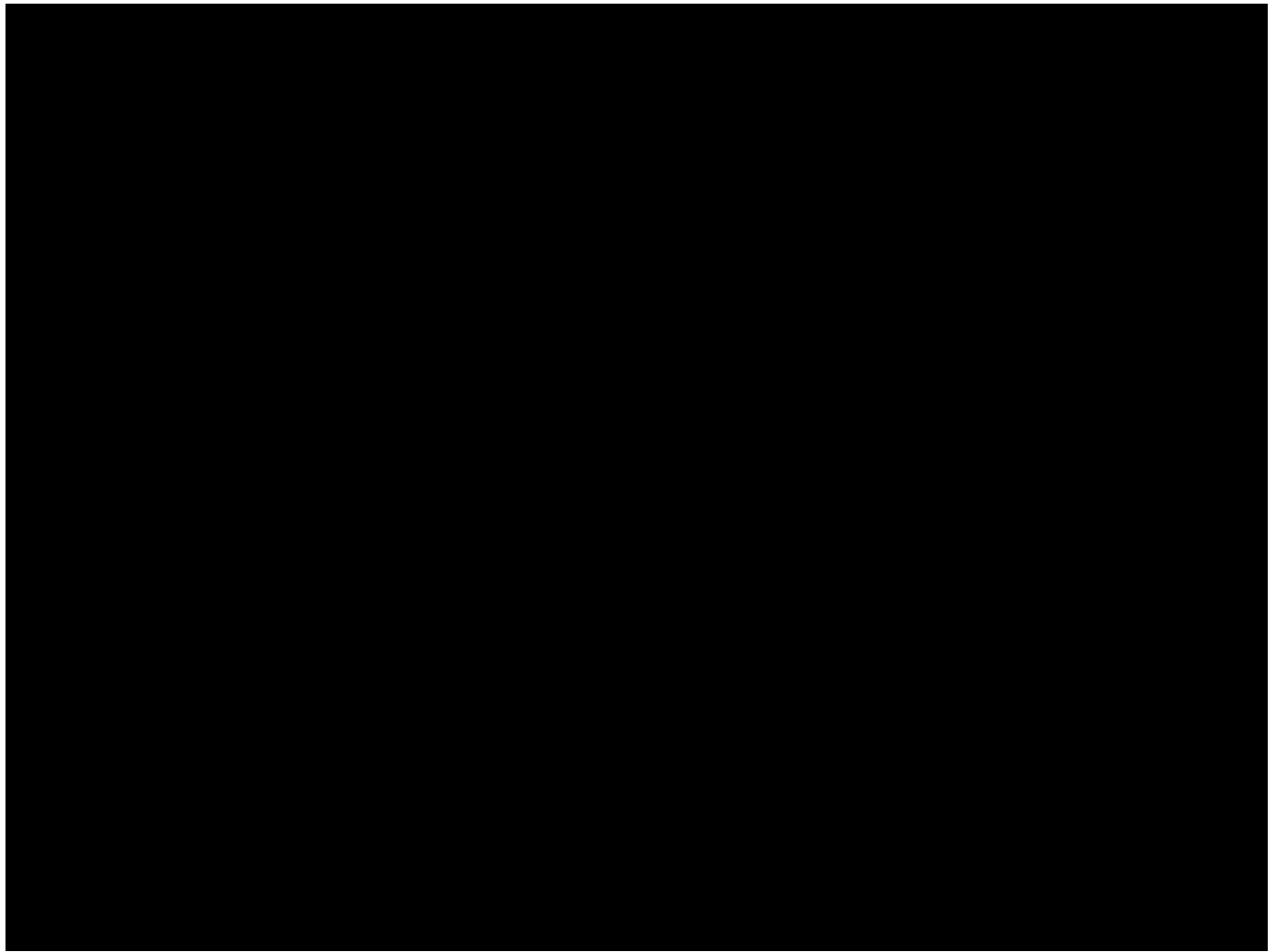
States with existing K-8 Mandates



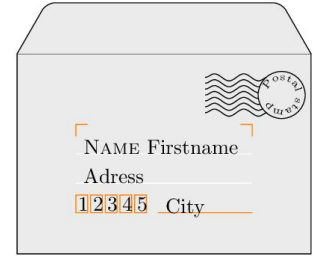
MD Counties with % of ES Students receiving 10+ hours of CS per Year



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?



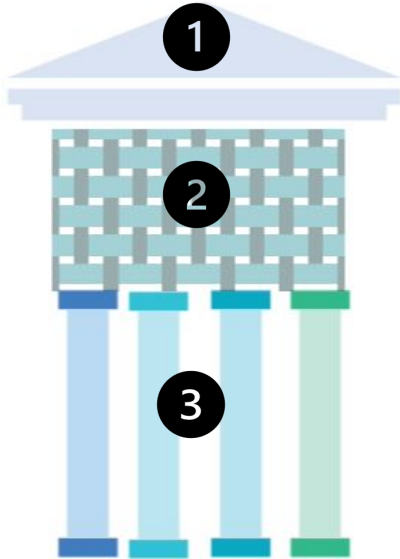
How do we get there?

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

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!

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

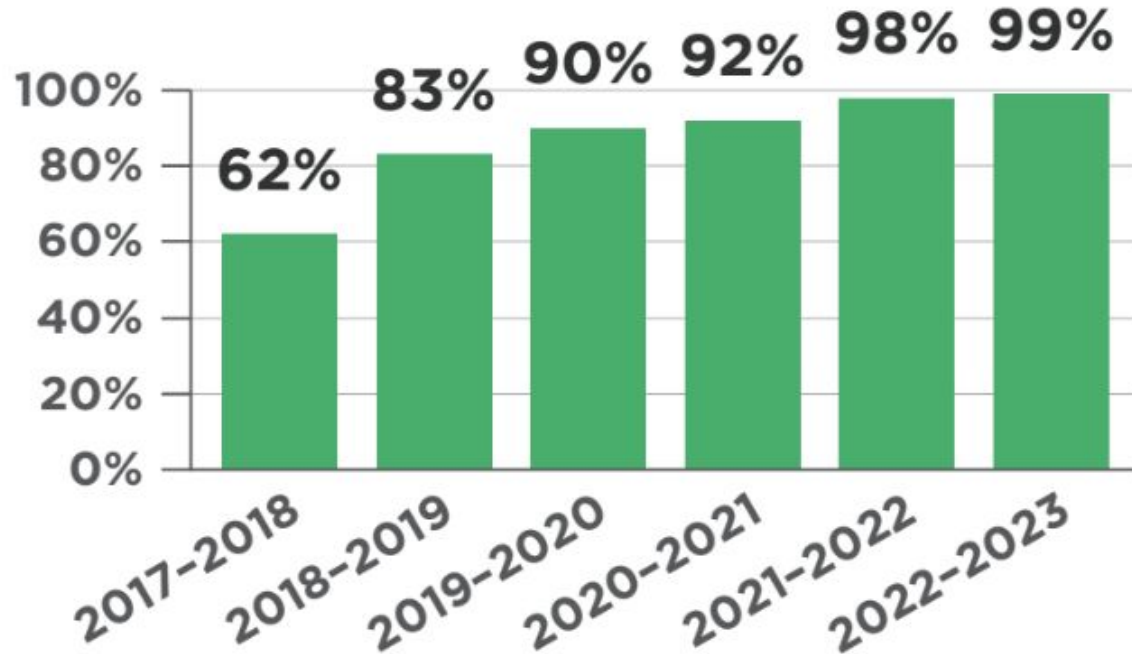
4,807

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

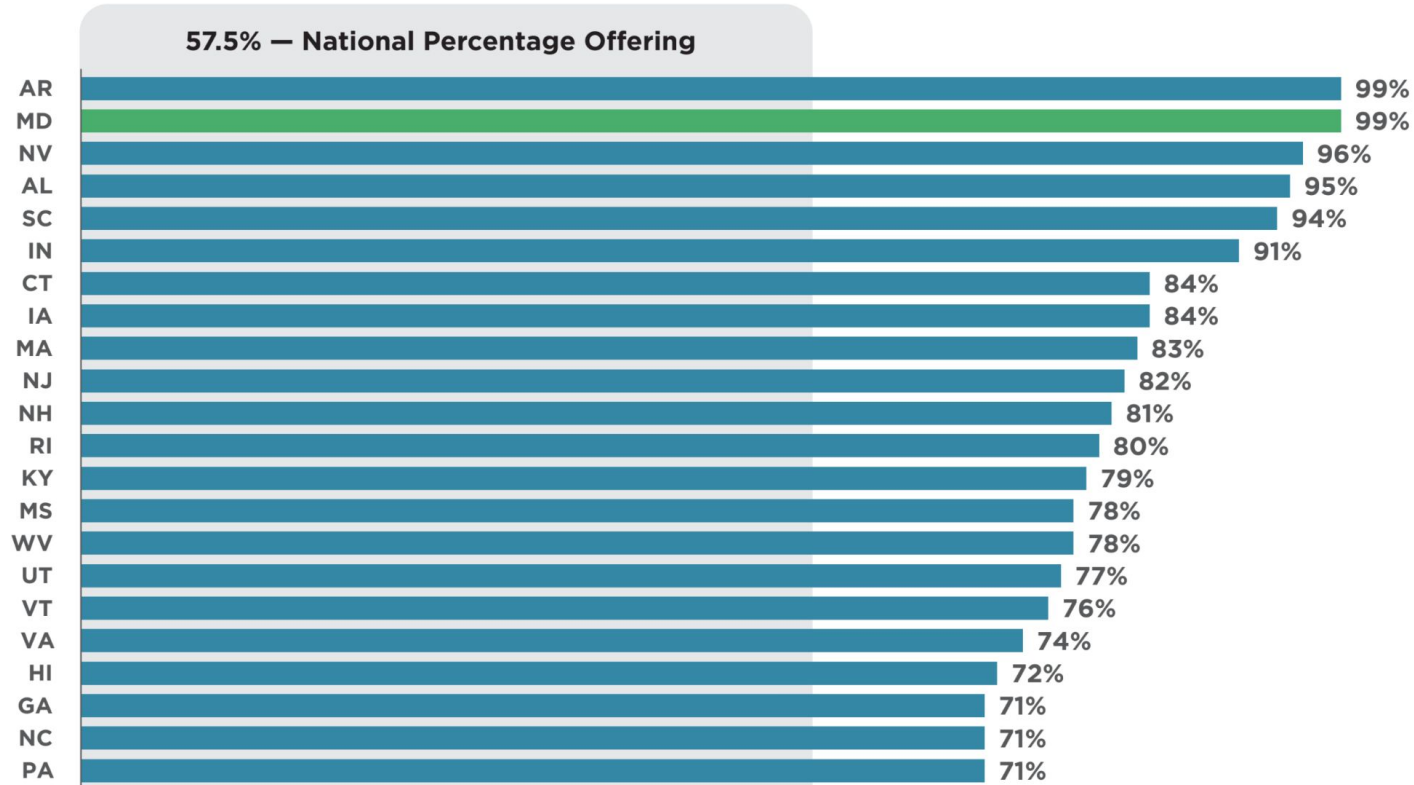


Steady Growth in HS CS Offerings

Access by School Year

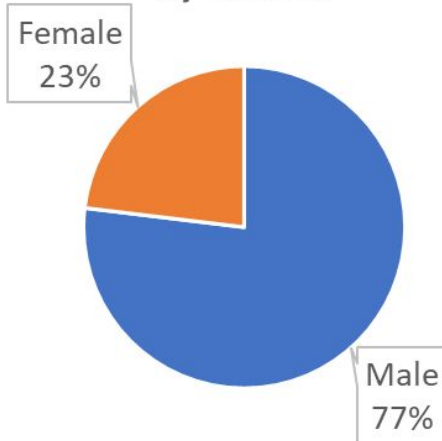


MD is Tied for First in the Nation in % High Schools Offering Computer Science

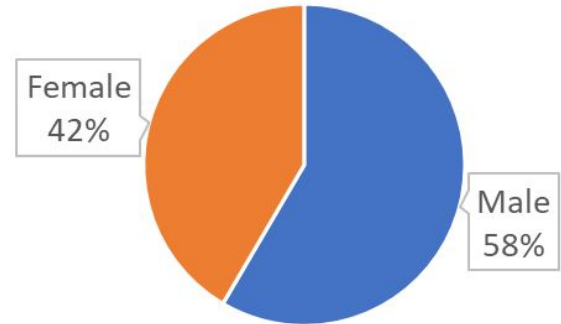


MD HS CS Gender Gap is Decreasing

2015 HS CS Students
by Gender

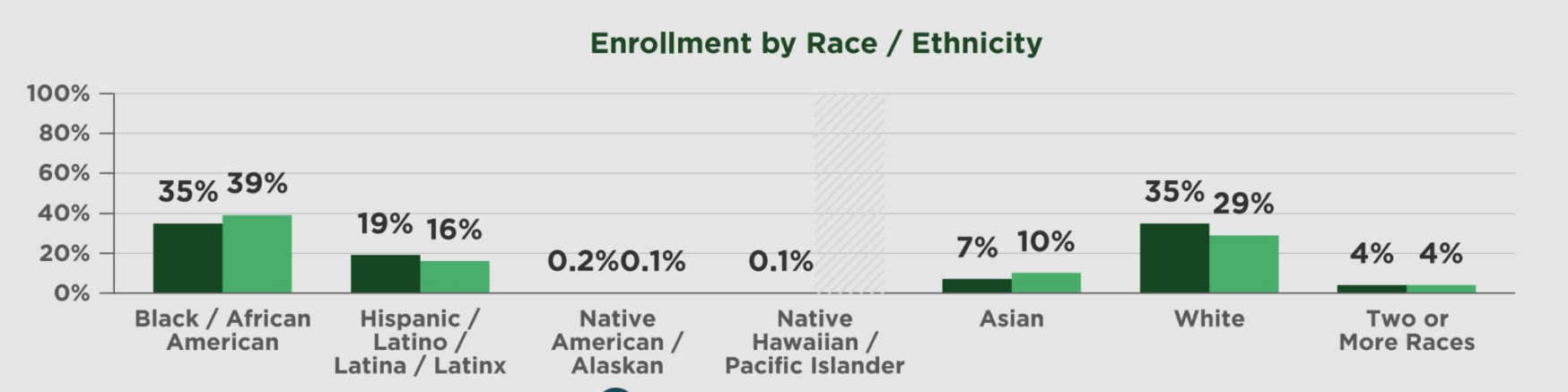


2021 HS CS Students
by Gender



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

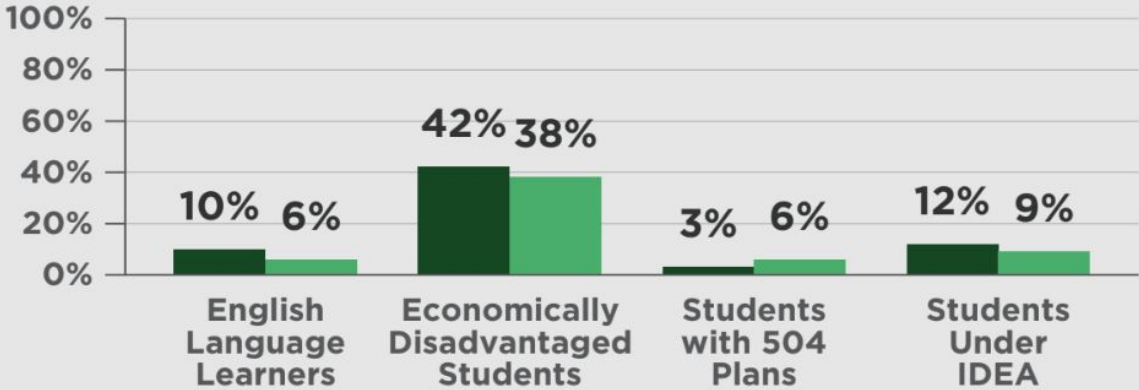
2023



Participation in Foundational High School Computer Science Courses by Subgroup

2023

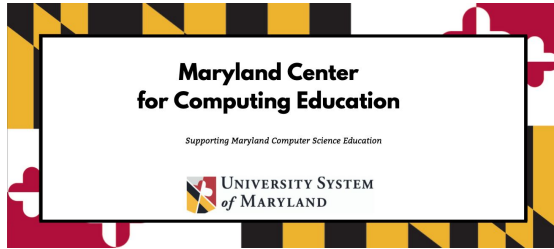
Enrollment by Subgroup



- 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**

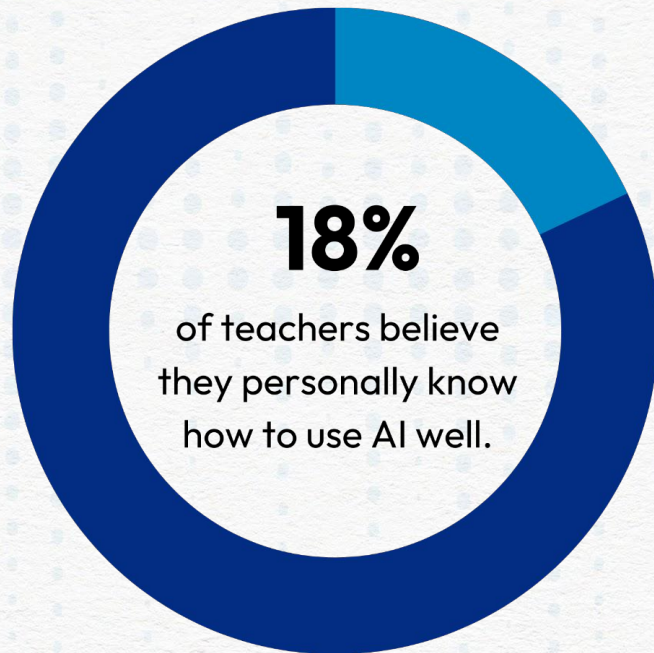
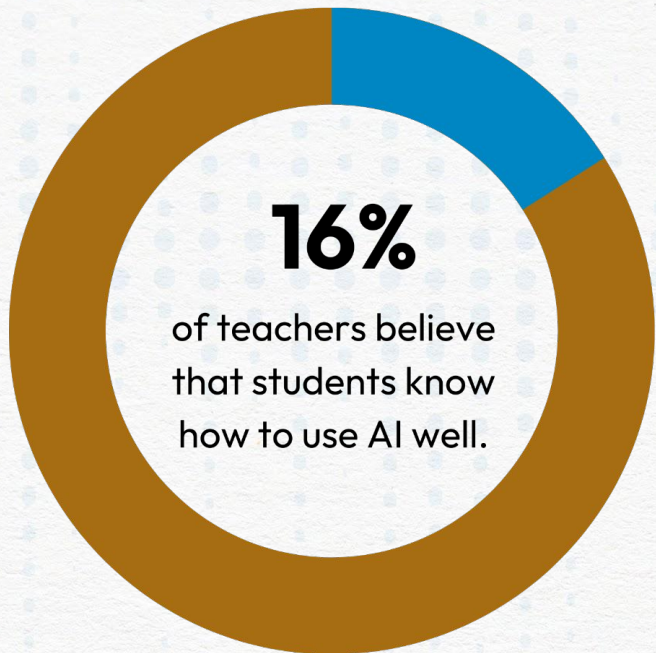
Compromised student **privacy** and unauthorized data collection

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



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

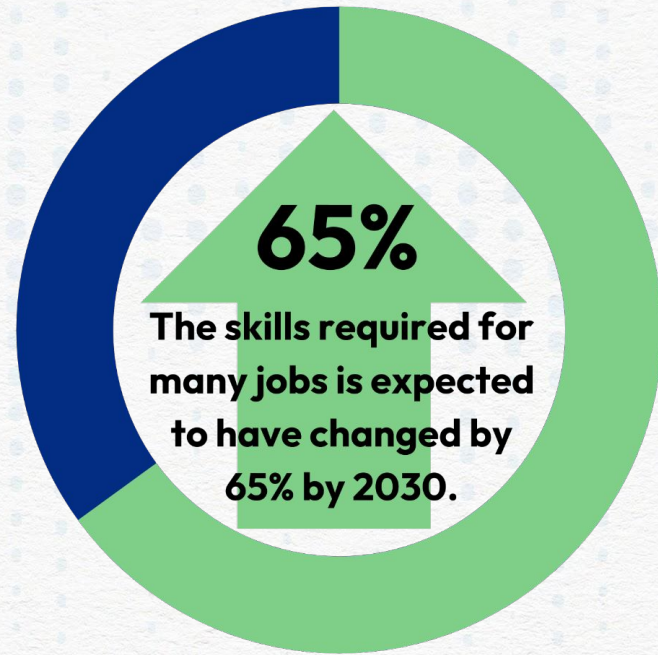
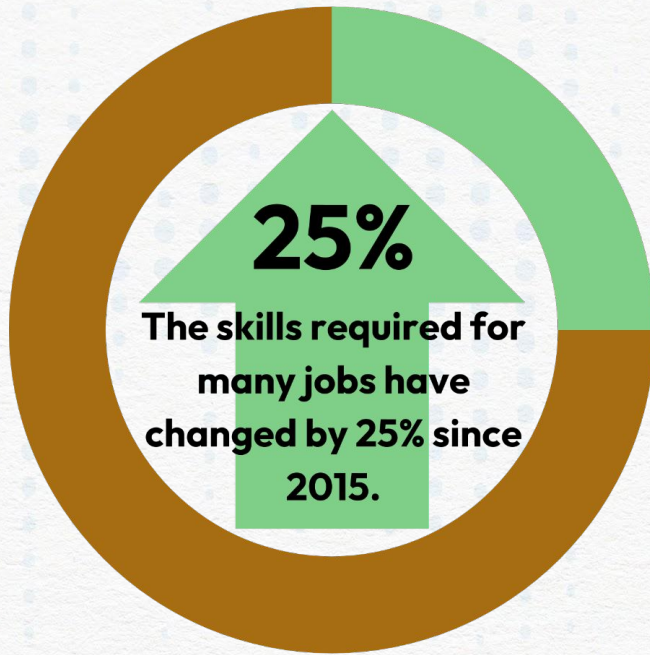
It is in all of our lives and industries.

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.

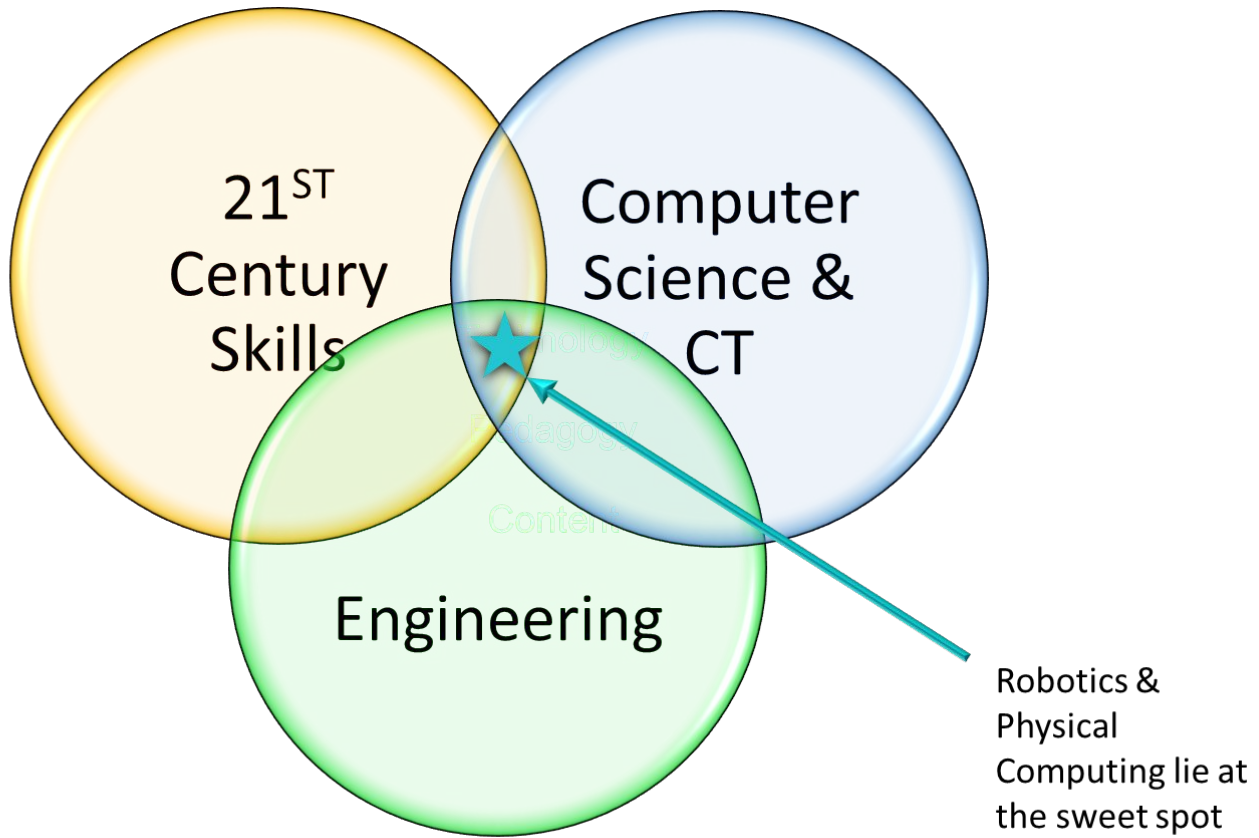
Skills Required for Job Success are Changing



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.





Robotics & Physical Computing lie at the sweet spot



Progression of Learning Tools



Calculator



Laptop



Educational Robot



There are challenges, but we have a plan.



1.

Expanding tech-based jobs is a powerful lever for expanding CS education



2.

ICT in schools provides the foundation to expand CS education



3.

Developing qualified teachers for CS education should be a top priority



4.

Exposing students to CS education early helps foster demand, especially among underserved populations



5.

Engaging key stakeholders can help address bottlenecks



6.

When taught in an interactive, hands-on way, CS education builds skills for life

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, relevance, collaboration, and productive struggle. CS can be taught with some unplugged activities and some tactile robotics/physical computing activities.

