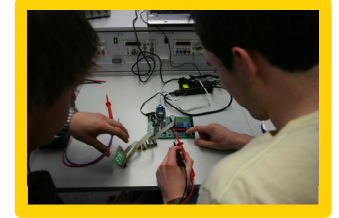


Agenda

- Introduction – Sli.do audience participation
- What is computer science
- Urgency and Equity
 - Perspective from Duane Penzien, Systems Integration Specialist, DpenzTech Consulting, LLC
 - Frederick Carr, Anchor Systems
- Standards Overview
- Computer Science Implementation
 - Kevin St. Onge, Eastern Upper Peninsula STEM Region Director
 - Isiah Otten, Rudyard School District
- Question and Answer Segment – Sli.do

Sli.do

- Open browser on your phone and type in sli.do
- Type in U294 and press return or enter
- We will now activate the poll – what is your role
- As the presentation continues,
 - Type in your question (name is optional) and press send
 - Vote on questions you like to bring them up to the top of the queue
 - We also have notecards for those who would like to use them



What is Computer Science?

Computer Science Is Changing Everything

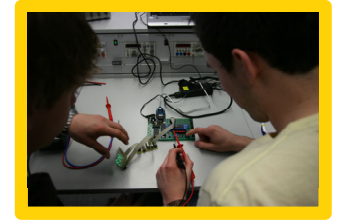


Computer Science is:

- a theory and practice that allows you to program a computing device to do what you want it to
- a tool that helps to 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

Computer Science is **not**:

- learning how to type or use a mouse
- learning to use word processing, spreadsheet, or presentation software (e.g., Word, PowerPoint, Google Docs & Drive)
- learning how to build or repair computers
- playing video games
- skills to facilitate online assessment taking



Urgency and Equity: Setting the Stage

Urgency

Michigan High-Demand, High-Wage Careers	Projected Annual Job Openings	Hourly Wage Range	Job Growth from 2016 to 2026	Typical Education and Training*
Computer and Information System Managers	830	\$46-\$73	12.3%	Bachelor's degree, plus work experience
Computer Systems Analysts	1,200	\$31-\$49	8.5%	Bachelor's degree
Computer User Support Specialists	1,790	\$17-\$29	11.0%	Some college, no degree
Software Developers, Applications	2,160	\$33-\$53	31.0%	Bachelor's degree
Software Developers, Systems Software	1,000	\$33-\$52	15.2%	Bachelor's degree

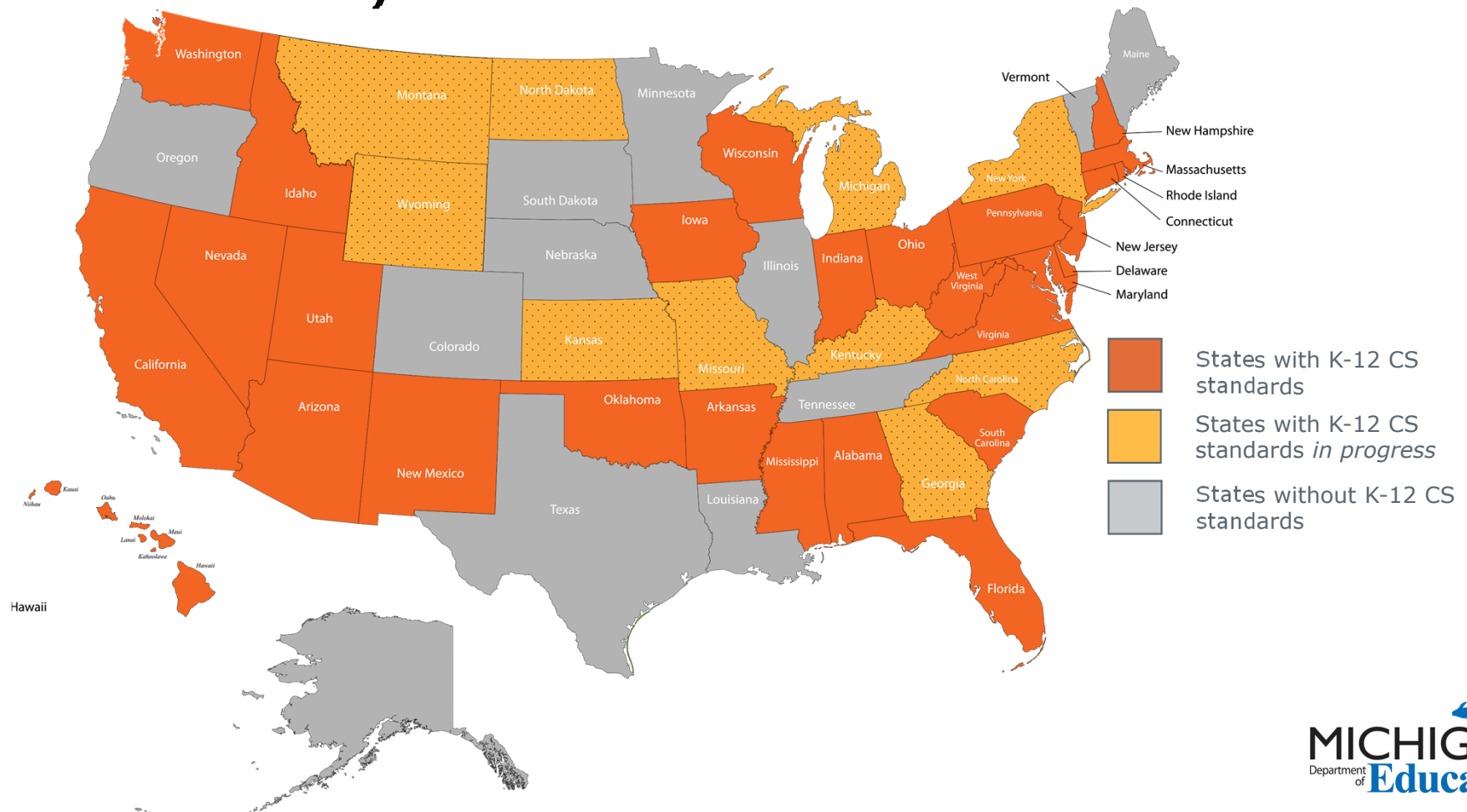
Source: [Bureau of Labor Market Information and Strategic Initiatives](#)

National Outlook

- Computer and information technology occupations are projected to grow 13% from 2016 to 2026
- Growth is faster than the average for all occupations
- Approximately 557,100 new jobs will be added
- Demand will stem from greater emphasis on cloud computing, collection and storage of big data, and data security
- Median annual wage was \$84,580 in May 2017, higher than median annual wage for all occupations of \$37,690

Based on Bureau of Labor Statistics Data,
Occupational Outlook Handbook

Computer Science Standards Adoption Nationally



Computer Science and Other Career Pathways

- Computer science foundation will equip students with ability to explore other interests
- Succeed in any career they choose
- Use computer science skills to solve problems and be productive citizens
- Apply computational thinking to all industries

Equity

- Computer science learning opportunities are not widely available for *all* learners and teachers
 - 90% of students and parents agree that people who work in computer science have the opportunity to work on fun and exciting projects and make things that help improve lives (Google & Gallup, 2015)
 - Most Americans believe computer science is as important to learn as reading, writing, and mathematics (Horizon Media, 2015)
- An analysis of 2015 National Assessment of Educational Progress (NAEP) survey showed that only 44% of 12th graders attend high schools that offer any computer science courses (Change the Equation, 2016)
 - Students with the least access are Native American, African American, and Latino, from lower income backgrounds, and rural areas

AP Computer Science

Only 153* schools in Michigan – 23% of Michigan schools with AP programs – offered an AP Computer Science course in 2017-2018

2,931 AP computer science exams taken in 2018:

- 26% were female
- 114 were taken by Hispanic or Latino
- 71 were taken by black
- 5 were taken by American Indian/Alaska Native
- 2 exams were taken by Native Hawaiian/Pacific Islander

AP Course Correlation with a Greater Likelihood for Post-Secondary Pursuit

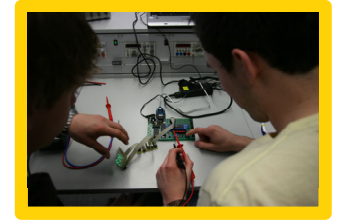
All students are **SIX TIMES** more likely to major in computer science than students who did not take AP CS

African American students are **SEVEN TIMES** more likely to major in computer science than students who did not take AP CS

Female students are **TEN TIMES** more likely to major in computer science than students who did not take AP CS

Hispanic/Latino students are **EIGHT and a HALF TIMES** more likely to major in computer science than students who did not take AP CS

Based on national data available from Code.org

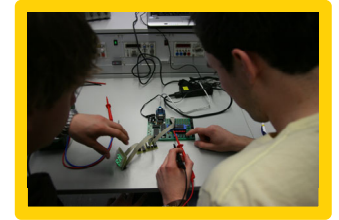


Urgency and Equity: Business and Industry Perspective

Duane Penzien, Systems Integration Specialist
DpenzTech Consulting, LLC

Why This is Important

- My background is in healthcare technology and information technology. Computer science skills are a must to understand and interact with equipment at all levels
- The business I am starting exists because there are many problems selecting and using the appropriate technology for performing a task
- The problems I work on encompass a broad range of technologies, but they all have one thing in common: computer technology. Computer science skills are a requirement that enables you to learn anything you need for the job



Urgency and Equity: Business and Industry Perspective

Frederick Carr
Anchor Systems

Why is Computer Science (CS) so Critical?

America's National Security and Defense is in a transformative phase, recognizing the rapid advances in technology development, have empowered America's competitors and adversaries (e.g. Russia, China, etc.), dramatically increasing the threat landscape across entire spectrums of government, business, industry and society.

Adversaries such as China, Russia, Iran, North Korea and terrorist organizations such as ISIS actively target U.S. innovation as a means to out maneuver U.S. forces, to stay under the radar of confrontation and ultimately seek to change the diversity, scale, complexity and pace of warfare to the their advantage.

Their ability to leverage advanced technologies derived directly from across the entire U.S. innovation base (industry, defense, academia, information, etc.) has dramatically increased the threat to America's economic power, innovation-base and ultimately America's National Security and American 'way of life'

"The Commission on the Theft of American Intellectual Property named China as the main offender, estimating the cost to the U.S. economy at up to \$600 billion a year."

China's ability to extract, exploit and leverage the systematic theft of U.S. innovation and turn it into Chinese profit (globally) has come at the **direct expense if the U.S. workforce, much of that workforce being from Michigan** when you consider the critical role that Michigan plays in the automotive and advanced manufacturing industry sectors.

"The Administration recognizes that the United States is engaged in a continuous competition against strategic adversaries, rogue states, and terrorist and criminal networks. Russia, China, Iran, and North Korea all use cyberspace as a means to challenge the United States, its allies, and partners, often with a recklessness they would never consider in other domains. These adversaries use cyber tools to undermine our economy and democracy, steal our intellectual property, and sow discord in our democratic processes. ..."

-National Cyber Strategy of the United States of America

Computer Science (CS)– Turn Disadvantage into Advantage

Critical shortage of technical and highly skilled technology-focused professionals - is NOT just a Michigan problem, it's a National Security problem with global ramifications. Michigan can be at the Core of the Solution.

One of the greatest risks to U.S. national security is the **critical shortage of technically skilled professionals** in technology development, cybersecurity, computer science/engineering, information technology, etc.

Numerous USG studies and strategies have identified the imperative to evolve the workforce composition in order to combat the dynamic and highly contested global battlespace. Specifically calling for increases in technical ability in data literacy (engineering/science), Cyber/information security, IT infrastructure, STEM and automation (AI, M/L, etc.)

Over the next decade, the USG, innovation-base, manufacturing industry and commercial sectors can expect to see the rapid development and increased deployment of;

- Advanced information technology (IT), Big Data/Cloud, and advanced wireless technologies (i.e. 5G)
- Focus on automation: Artificial intelligence (AI), Machine Learning (M/L)
- Alternative energy sources, biotechnology, food systems, critical infrastructure (energy)
- Autonomous transportation systems, maritime, rail, supply line management, etc.

Federal spending on Cyber is at historic levels (+\$20B), more than double (\$9.4B) from just a 6 years ago.

Cybersecurity growth projection estimate \$44B by FY2020

Estimated +350,000 open Cybersecurity positions in the US, with a predicted global shortfall of 3.5 million cyber security jobs by 2021.

The primary reason for the critical shortage of technical skills and personnel - chronic under-investment in training and education.

Use the Federal Government's current state of 'Disadvantage' in the acknowledgement, programs and initiatives for increased technical skills as opportunity to create long-term 'Advantage' for Michigan increasing Michigan Advantage across all technology-enhanced spectrums; innovation, industry, advanced manufacturing, government, education, medical and society.

Anchor Systems, LLC

Anchor Systems, LLC is a 100% Native-American owned, Small Disadvantaged Business (SDB), Service-Disabled Veteran-Owned Small Business (SDVOSB) consultancy; achieving *Advantage* through demonstrated *Mission* integration and delivering *Innovative* solutions directly to our Nation's warfighters – *fighting tomorrows threats today.*

Federal Cyber Systems Integration; systematic integration with direct mission focus, of complex technical and organizational systems within Federal, DoD, IC, Interagency and Law Enforcement (LE) architectures – optimizing the integration of latest commercial and emergent technologies to maximize policymaker decision-making, ultimately enabling the warfighter to 'win' against America's most dangerous threats.

Mission-focused expertise in Strategic Intelligence, Cyber and SIGINT in Federal government sectors; DOD, the US Intelligence Community (USIC) and Interagency providing strategic intelligence / risk assessment support, digital network engineering and Information Operations (IO) an Information Security (InfoSec) management. Cyberspace Operations (CO) subject matter experts (SMEs) with demonstrated real-world mission impact

Extensive experience in piloting priority USIC, DoD and Special Operations Forces (SOF) Cyber Ops/Intelligence programs. Acutely adept at navigating complex, sensitive and classified environments – delivering implementable technical solutions.

Proven track record of accelerated integration and interoperability within highly specialized communities. Demonstrated battlefield leadership providing technical, analytical and mission-relevant expertise throughout the SOF and Naval Special Warfare (NSW/SEAL) communities, NSA and USCYBERCOM Cyber Mission Force (CMF)

Innovative and Mission-driven Cyberspace solutions (National-level). Instrumental in establishing DoD Open Source intelligence (OSINT) programs, shaping emergent Policy and Doctrine through successful integration of cross-functional support to full-spectrum CO directly supporting the nation's highest priority missionsets.



DUNS: 08-096-3316 CAGE Code: 80MK9 | anchorcyber@gmail.com | 2780 W 16th Ave. Sault Sainte Marie, MI 49783



Proprietary Information – Anchor System



ANCHOR | **SYSTEMS**

Innovation | Mission | Advantage

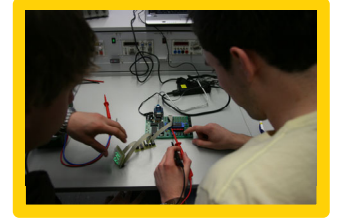
Frederick T. Carr

CEO – Anchor Systems, LLC
frederick.t.carr@gmail.com

DUNS: 08-096-3316 CAGE Code: 80MK9 | anchorcyber@gmail.com | 2780 W 16th Ave. Sault Sainte Marie, MI 49783

*Proprietary Information – Anchor
System*





Standards Overview

Process

- Brought together 45 individuals representing over 35 stakeholder groups in May 2018
- Convened seven in-person meetings



Agreed Upon Foundation

- Build upon K-12 Computer Science Framework which provides
 - Overarching, high-level guidance per grade bands
 - One primary input for standards development

K12 COMPUTER SCIENCE FRAMEWORK



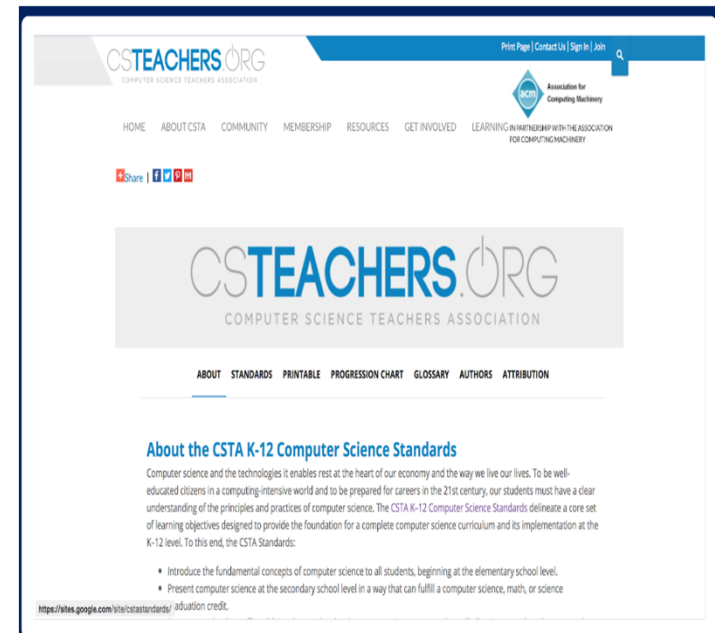
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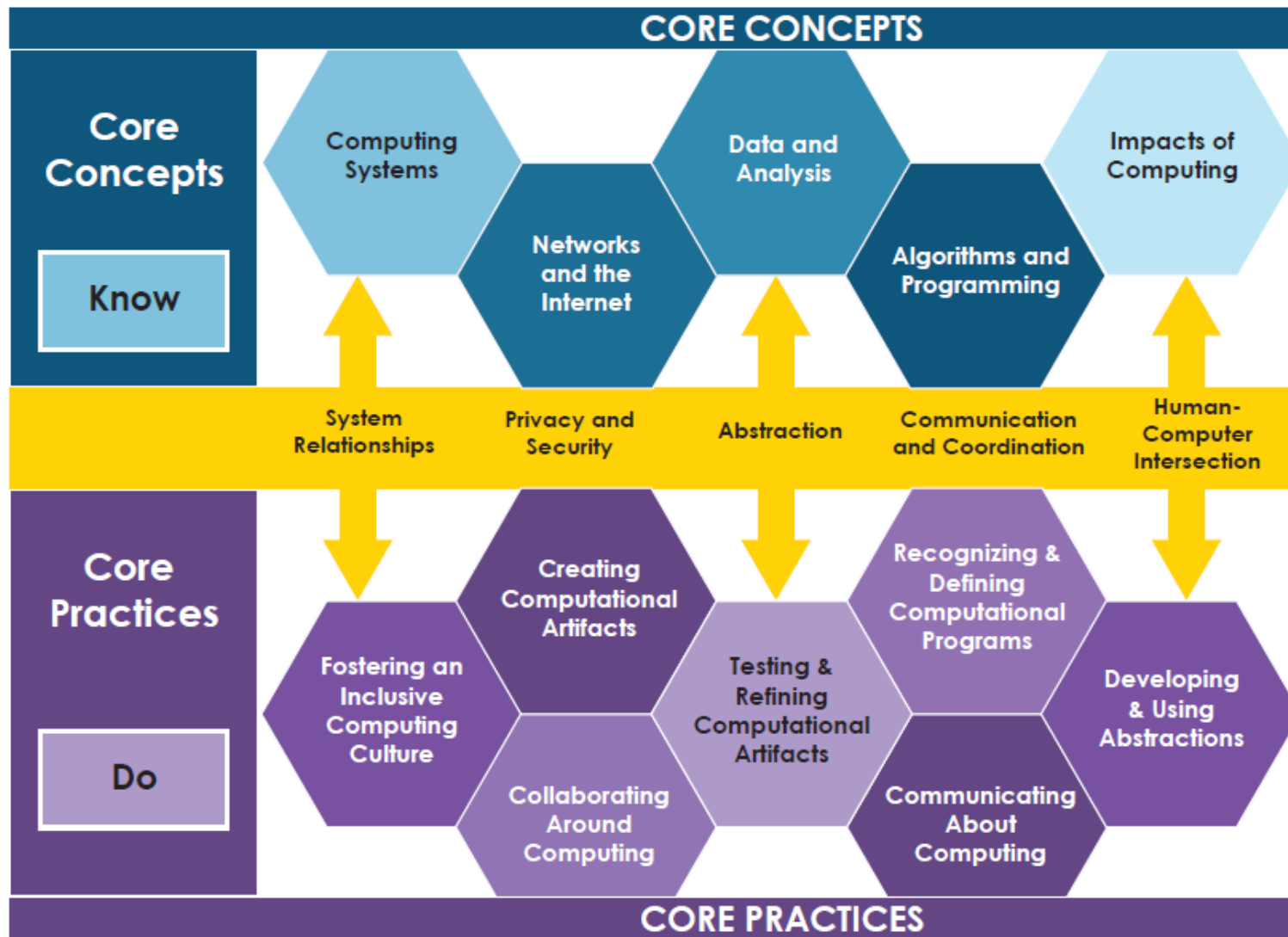
Guiding Principles

- Ensure that all students and teachers have equitable access to and participation in computer science
- Focus on essential standards that allow for expansion within context
- Use research and best practice to drive development and implementation
- Align to nationally-recognized standards and frameworks
- Enable teachers to implement the curriculum in ways that engage and inspire students and support the learning

Agreed Upon Foundation

- Computer Science Teachers Association (CSTA) Computer Science Standards
 - Delineate a core set of learning objectives designed to provide the foundation for a complete computer science foundation grades K-12
 - Provide detailed, measurable student performance expectations





Core Concepts

- Computing Systems
- Networks and the Internet
- Data and Analysis
- Algorithms and Programming
- Impacts of Computing

Computing Systems

- **Devices** – many everyday objects contain computational components. Students learn about connected systems
- **Hardware and Software** – Computing systems use hardware and software to communicate and process information in digital form
- **Troubleshooting** – When computing systems do not work as intended, troubleshooting strategies help people solve the problem

Networks and the Internet

- **Network Communication and Organization** – Computing devices communicate with each other across networks to share information
- **Cybersecurity** – Transmitting information securely across networks requires appropriate protection

Data and Analysis

- **Collection** – Data is collected with both computational and noncomputational tools and process
- **Storage** – Core functions of computers are storing, representing, and retrieving data
- **Visualization and Transformation** – Data is transformed throughout the process of collection, digital representation, and analysis
- **Inference and Models** – Computer science and science use data to make inferences, theories, or predictions based upon data collected from users or simulations

Algorithms and Programming

- **Algorithms** – Sequence of steps designed to accomplish a specific task
- **Variables** – A symbolic name used to keep track of a value that can change while a program is running
- **Control** – The use of elements of programming code to direct which actions take place and the order in which they do
- **Modularity** – Characteristic of a software/web application that have been divided (decomposed) into smaller modules
- **Program Development** – A set of instructions a computer executes to achieve a particular objective, developed through a design process

Impacts of Computing

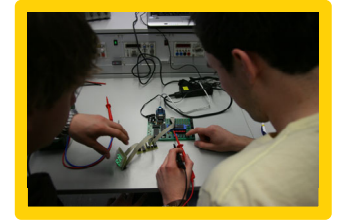
- **Culture** – Computing culture – including belief systems, language, relationships, technology, and institutions – and culture shapes how people engage with and access computing
- **Social Interactions** – Computing can support new ways of connecting people, communicating information, and expressing ideas
- **Safety, Law, and Ethics** – Legal and ethical considerations of using computing devices influence behaviors that can affect the safety and security of individuals and society

Core Practices

1. Fostering an Inclusive Computing Culture
2. Collaborating Around Computing
3. Recognizing and Defining Computational Programs
4. Developing and Using Abstractions
5. Creating Computational Artifacts
6. Testing and Refining Computational Artifacts
7. Communicating About Computing

Standards Adoption for Michigan

Level	Label	Grade Span	Details
1A	Lower Elementary	K - 2	CS standards for ALL students
1B	Upper Elementary	3 - 5	
2	Middle School	6 - 8	
3A	High School	9 - 10	
3B	High School - Specializing	11 - 12	For students who wish to pursue the study of CS in high school beyond what is required for all students

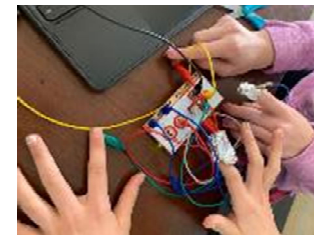
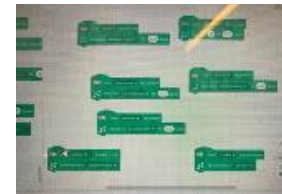


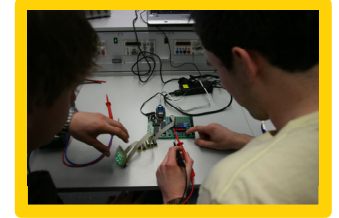
Computer Science Implementation

K-8 Integration Educator Perspective

Kevin St. Onge
Eastern Upper Peninsula ISD
STEM Region Director

Experiences Students and Teachers





Computer Science Implementation

Secondary Educator Perspective

**Isiah Otten
Rudyard School District**

How to Provide Feedback

- Public Comment available January 14 – February 20, 2019
- www.Michigan.gov/mde-cs

The **Proposed K-12 Computer Science Standards** is available for review. The **Online Public Comment Survey** is open through February 20, 2019

Questions? Email wartellar@michigan.gov

Question and Answer Segment

- Open browser on your phone and type in sli.do
- Type in U294 and press return or enter
 - Type in your question (name is optional) and press send
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Contact Information

Michelle Ribant

Director of 21st Century Learning
ribantm@Michigan.gov

Ann-Marie Mapes

Educational Technology Manager
Mapesa@Michigan.gov