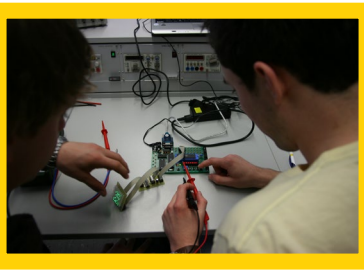

Michigan K-12 Computer Science Standards

Public Information Session

February 5, 2019

Cheboygan-Otsego-Presque Isle ESD

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Agenda

- Introduction – Sli.do audience participation
- What is computer science
- Urgency and Equity
  - Joe Smock, retired Master Sergeant, contractor liaison
- Standards Overview
- Computer Science Implementation
  - Alexandra Braddock, Inland Lakes Elementary
  - Scott Kelley, Cheboygan High School
- Question and Answer Segment – Sli.do

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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

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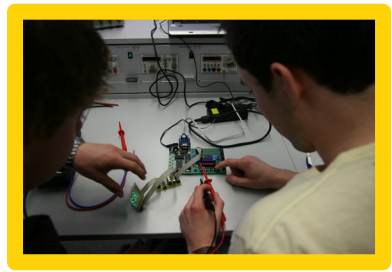

What is Computer Science?

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Computer Science Is Changing Everything

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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

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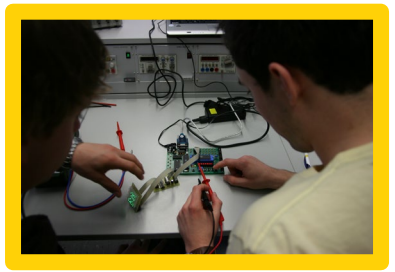

Urgency and Equity: Setting the Stage

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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

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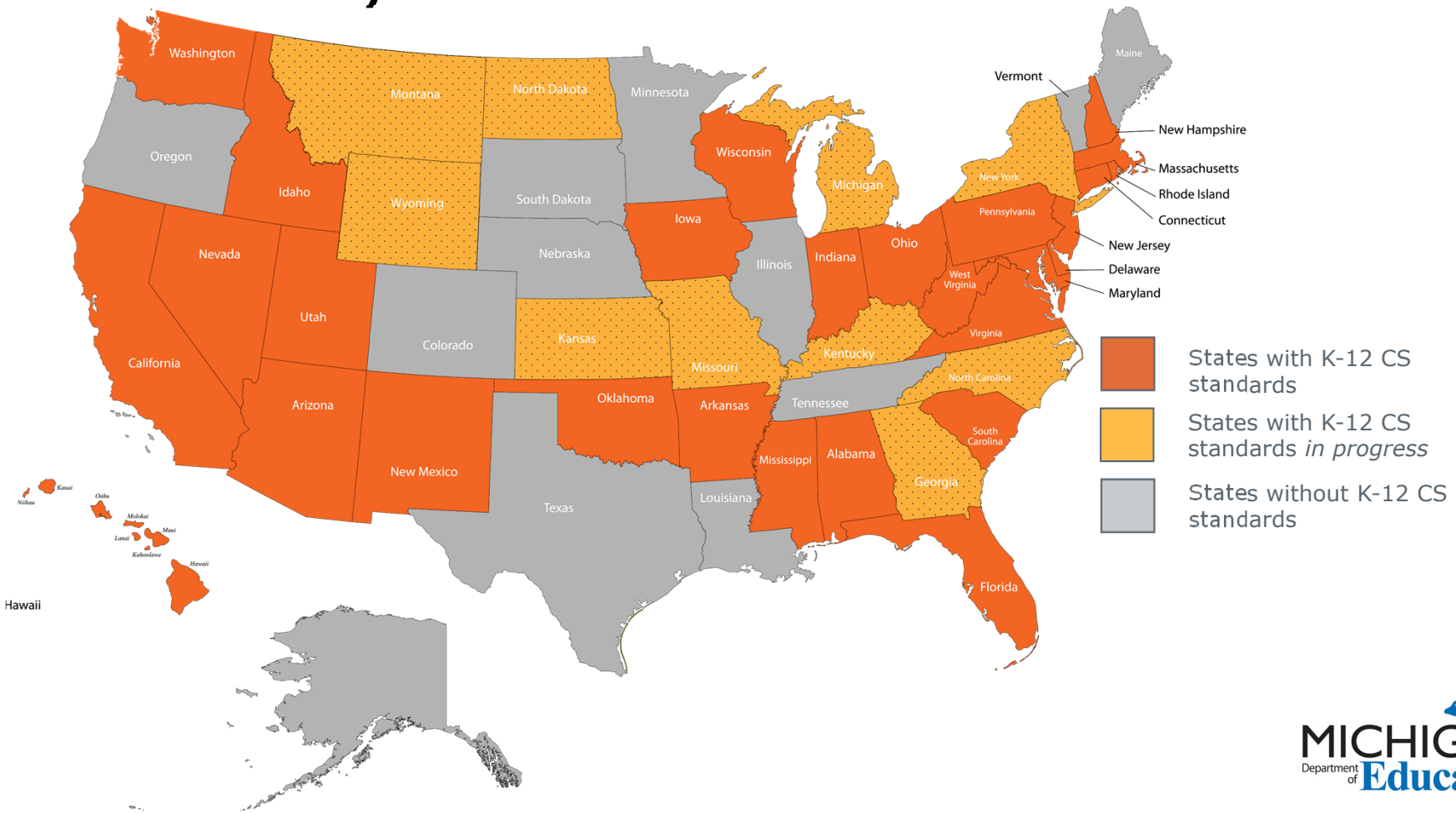
Computer Science Standards Adoption Nationally



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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

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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

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

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

All students are *SIX 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

African American students are *SEVEN 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

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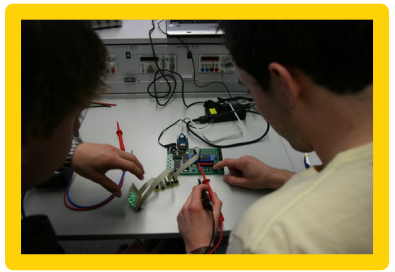

Urgency and Equity: Business and Industry Perspective

Joe Smock

Retired Master Sergeant, contractor liaison

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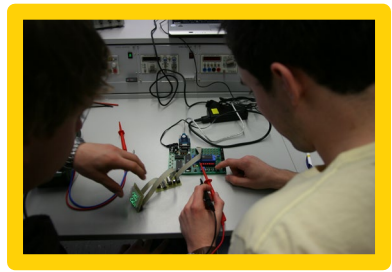

Standards Overview

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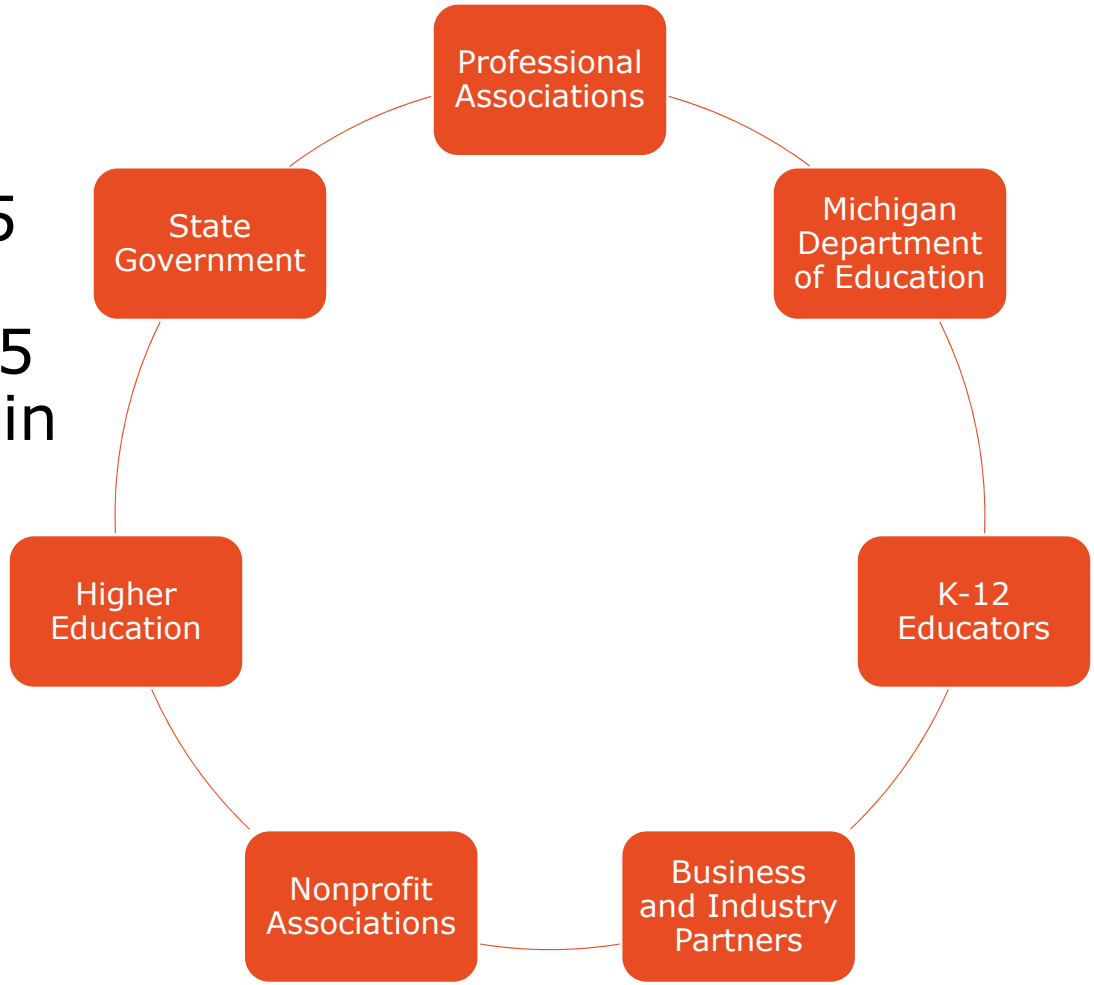
Process

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



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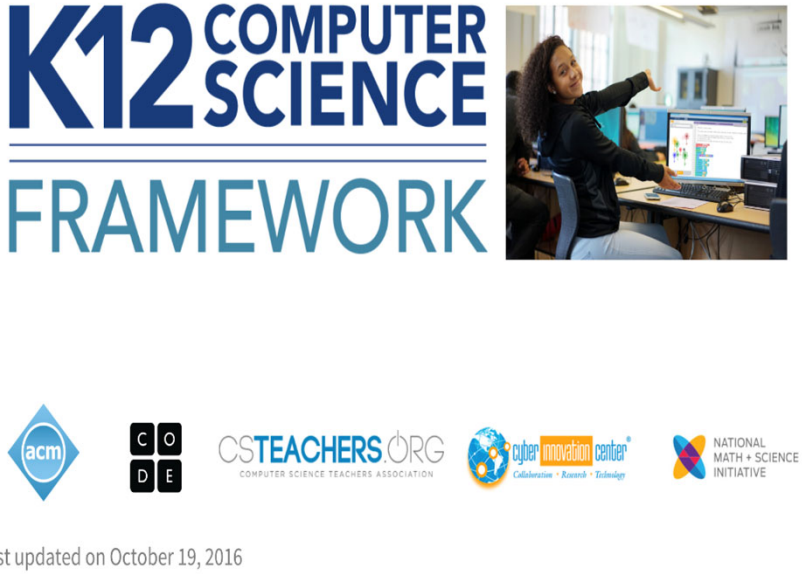
Agreed Upon Foundation

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



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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

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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

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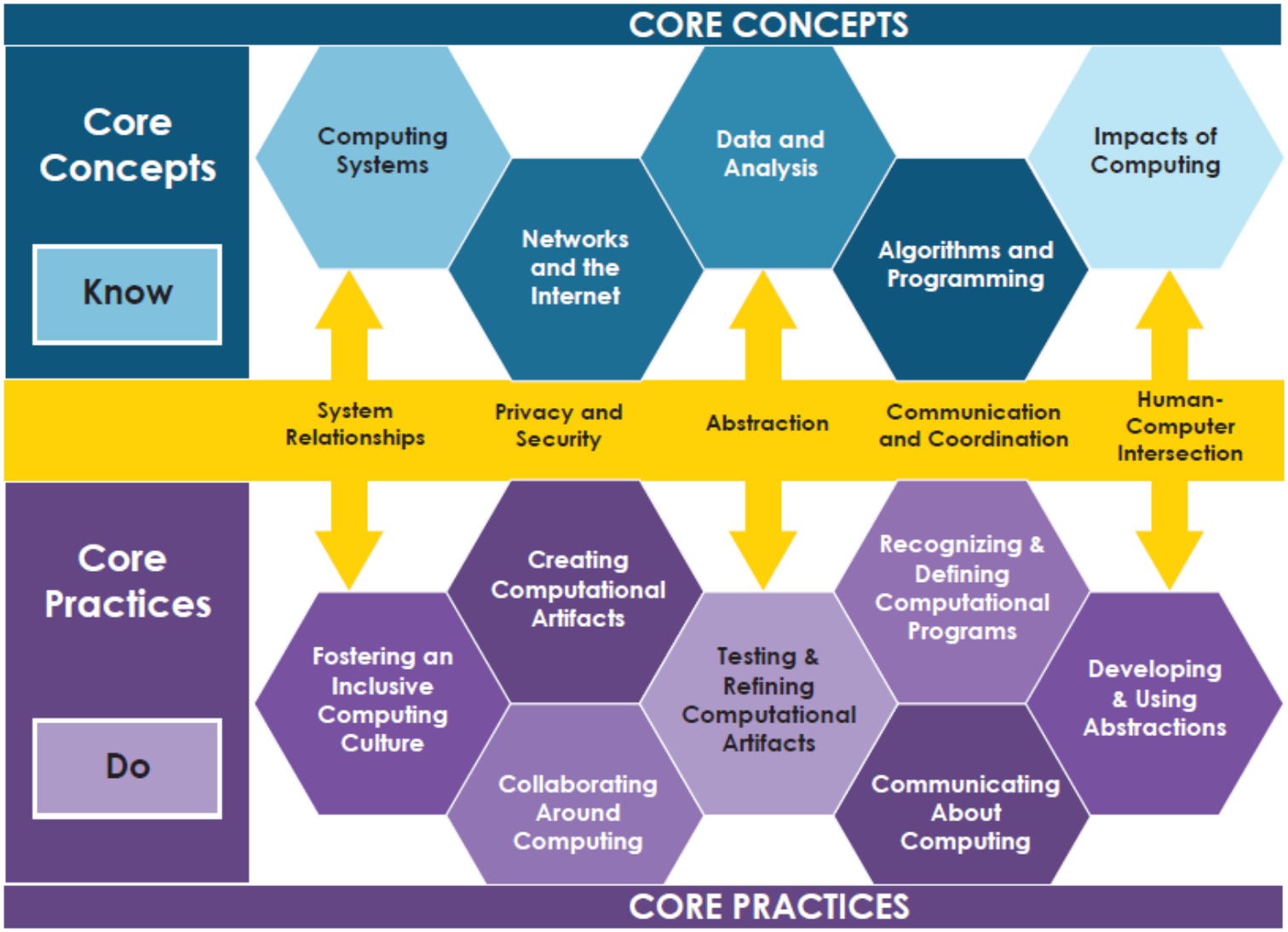

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Core Concepts

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

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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

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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

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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

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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

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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

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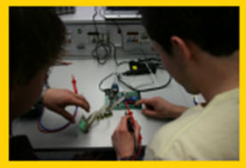

DRAFT

Michigan K-12 Standards
Computer Science

January 2019

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STANDARDS BACKGROUND AND ORGANIZATION

CONNECTION TO THE K-12 COMPUTER SCIENCE FRAMEWORK

When the Michigan CS Standards stakeholder group began the process of considering the need for standards for students in Michigan, it studied the K-12 Computer Science Framework (k12cs.org) developed by a cross-sector team that convened for similar purpose. The CS Framework has been taken up by other states across the nation as a reliable, representative compilation of the concepts and practices encompassed by the computer science field. After reviewing the CS Framework and talking with national experts involved in its development, the Michigan stakeholders determined that the CS Framework would serve as a foundation to Michigan CS Standards.

CONNECTION TO THE CSTA K-12 COMPUTER SCIENCE STANDARDS

Built upon the K-12 Computer Science Framework, a set of standards were created by the Computer Science Teachers Association, which have served as a model for adoption by other states. After studying models from other states, engaging in conversation among the experts in computer science, K-12 and high education, government, business, and industry, the Michigan stakeholder group unanimously supported the recommendation to adopt the CSTA Standards for Michigan.

THE CSTA STANDARDS:

- Introduce the fundamental concepts of computer science to all students, beginning at the elementary school level.
- Present computer science at the secondary school level in a way that can fulfill a computer science, math, or science graduation credit.
- Encourage schools to offer additional secondary-level computer science courses that will allow interested students to study facets of computer science in more depth and prepare them for entry into the work force or college.
- Increase the availability of rigorous computer science for all students, especially those who are members of underrepresented groups.

The standards have been written by educators to be coherent and comprehensible to teachers, administrators, and policy makers.

SECTION LABELING / CODING

Levels 1A, 1B, 2, and 3A are the computer science standards for ALL students. The Level 3B standards are intended for students who wish to pursue the study of computer science in high school beyond what is required for all students (specialty or elective courses.

Coding for each section references back to the Concepts and Practices of the K-12 CS Framework and is illustrated below:

Identifier	Standard	Subconcept	Practice
1A-CS-01	Select and operate appropriate software to perform a variety of tasks, and recognize that users have different needs and preferences for the technology they use.	Devices	1.1
1A-CS-02	Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware).	Hardware & Software	7.2
1A-CS-03	Describe basic hardware and software problems using accurate terminology.	Troubleshooting	6.2, 7.2

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

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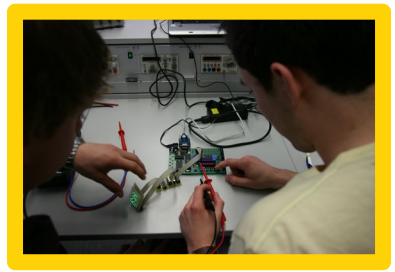

Computer Science Implementation

K-8 Integration Educator Perspective

Alexandra Braddock
Inland Lakes Elementary

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Inland Lakes Elementary Tech Class

Using technology, hands on learning and screen-free activities develop collaboration, problem solving, persistence and critical thinking skills

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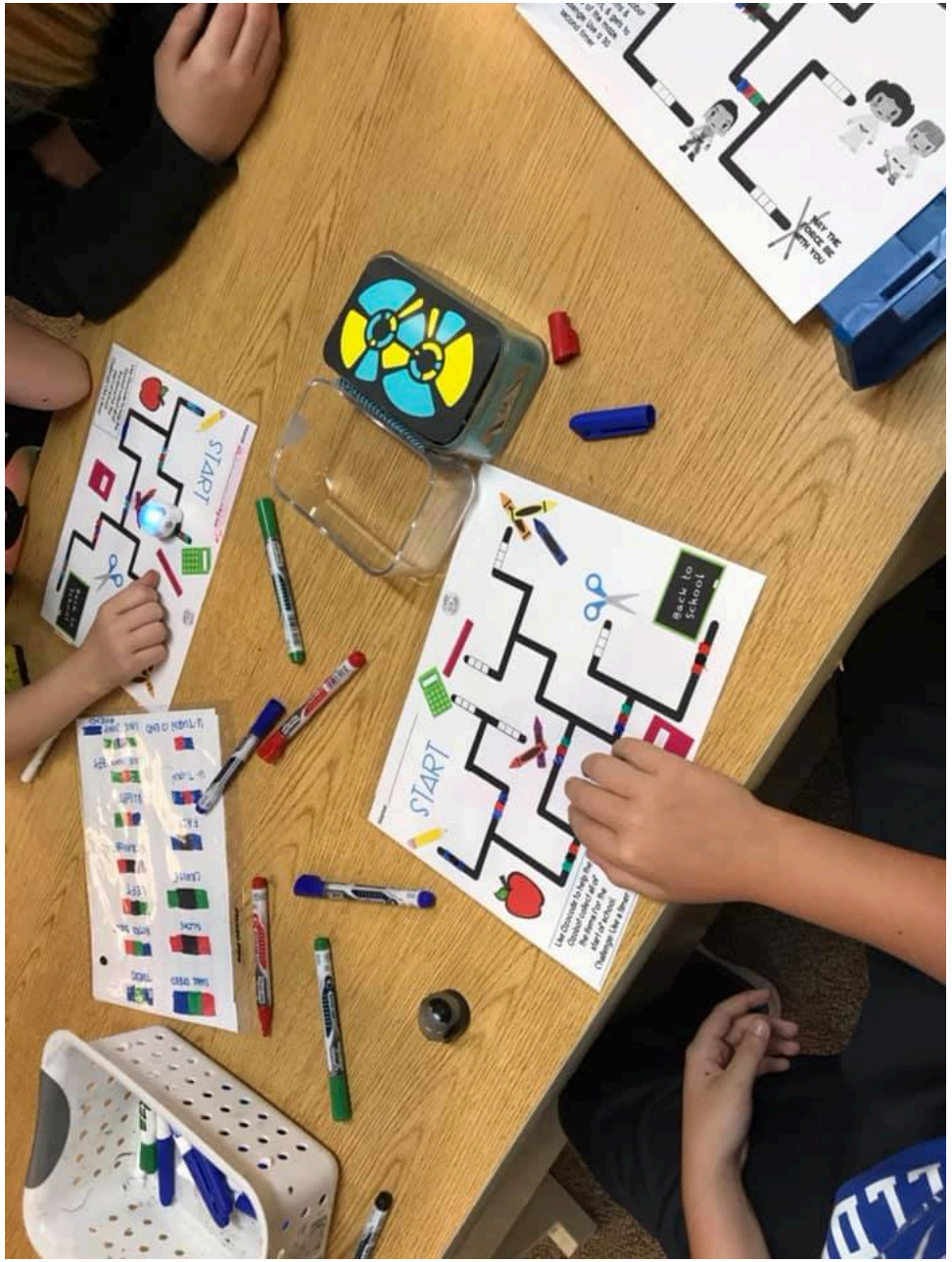

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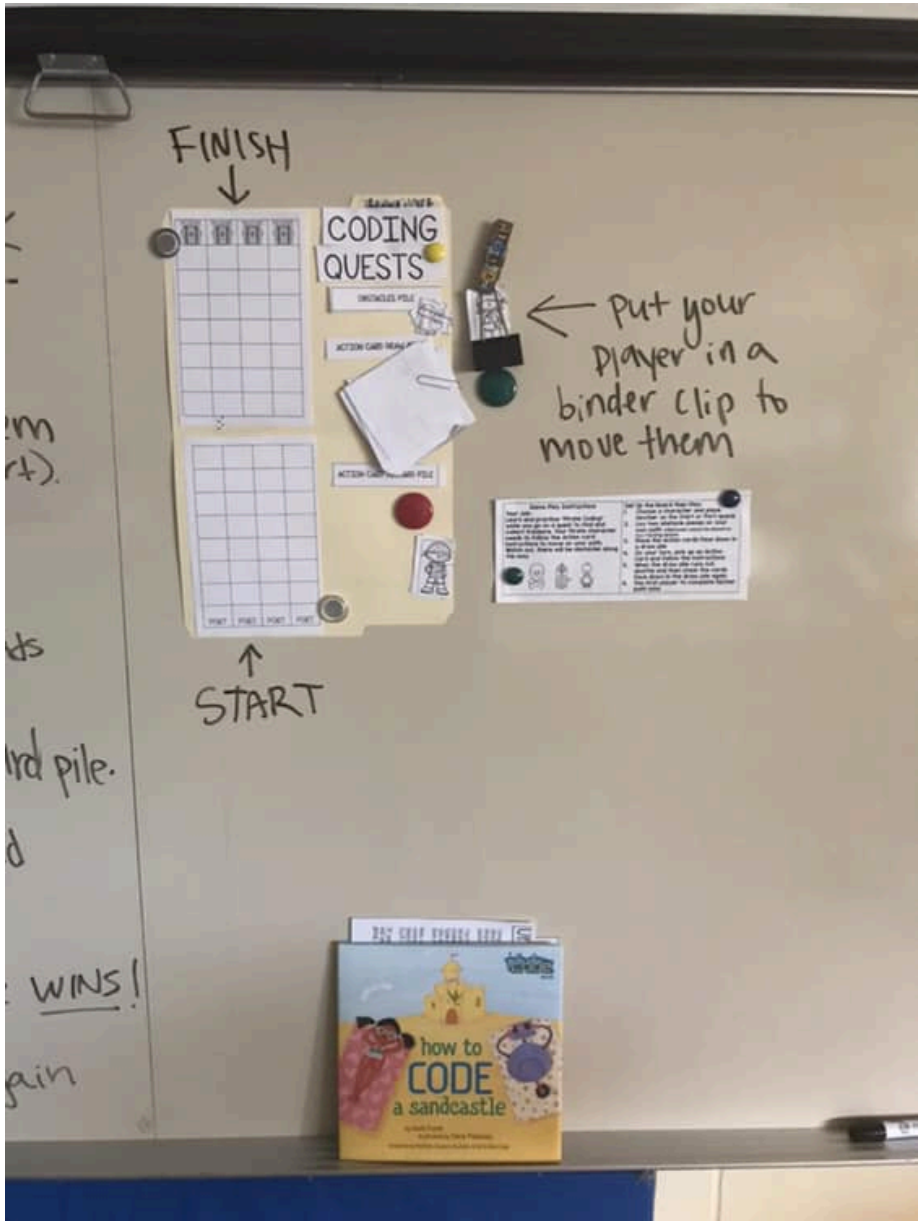

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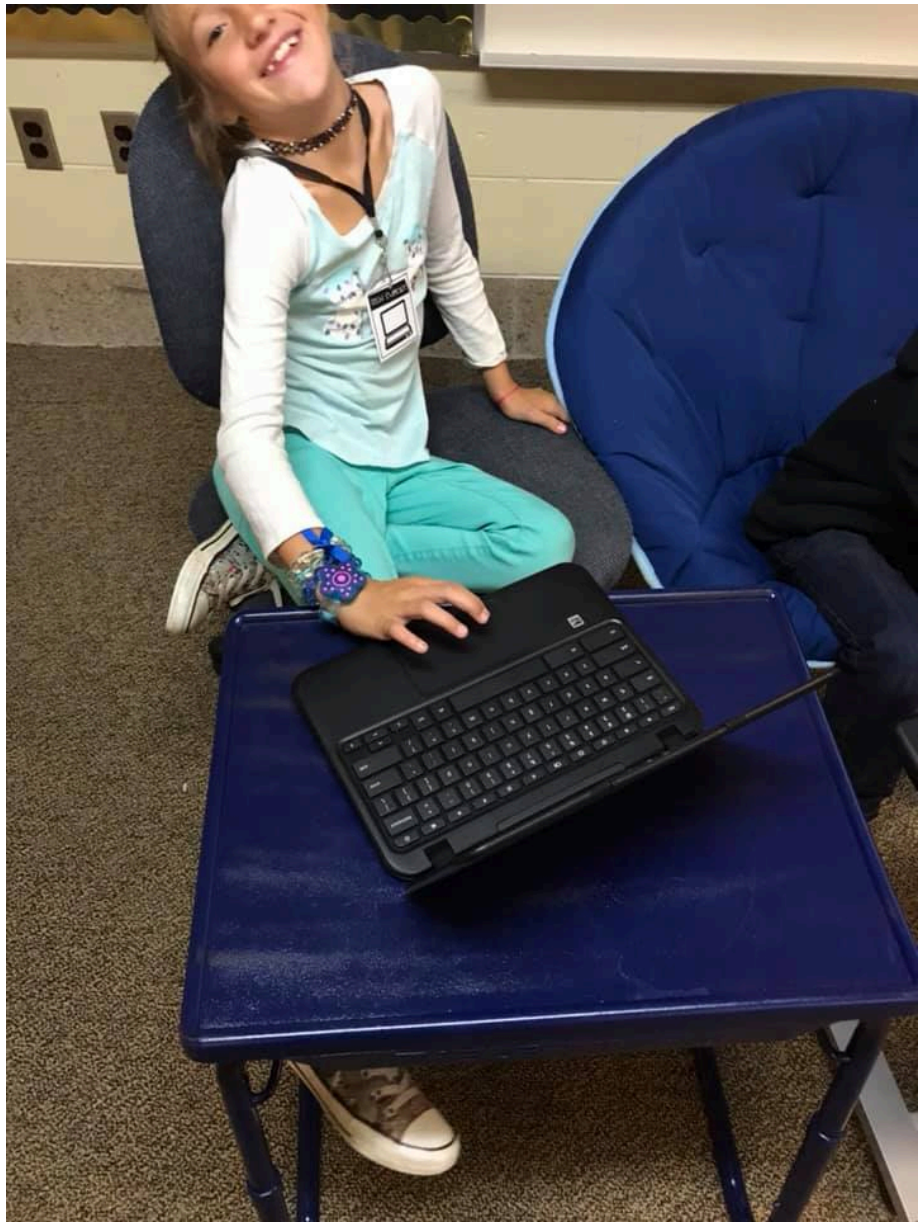

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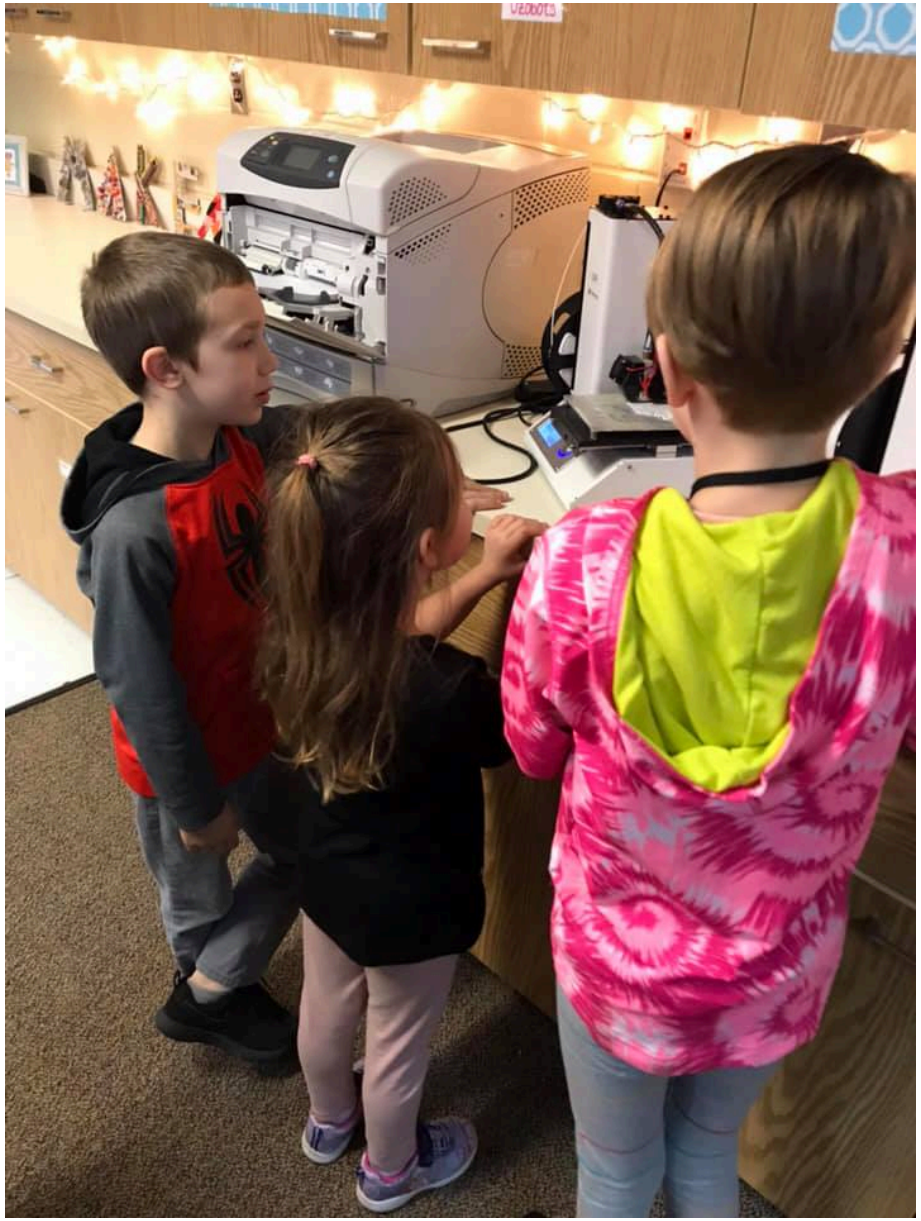

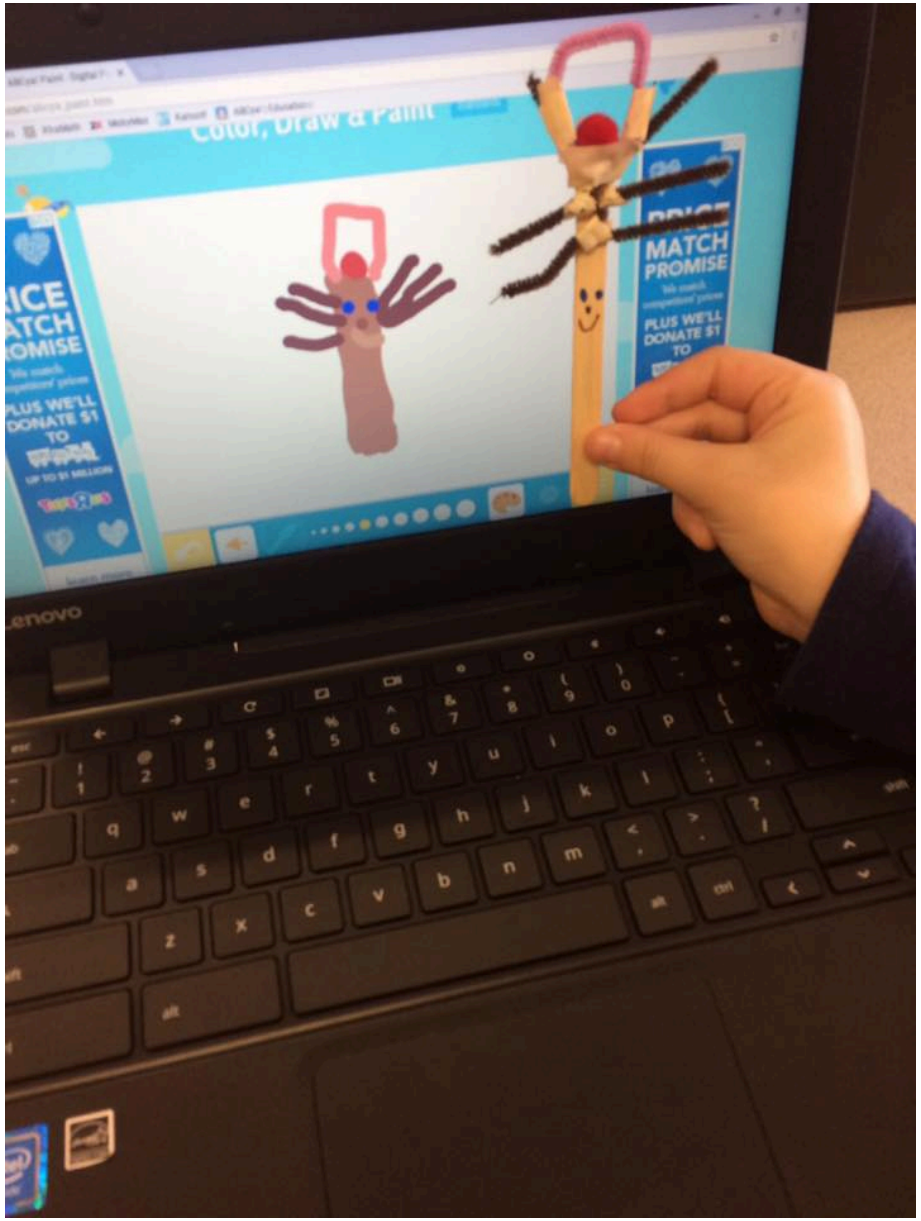

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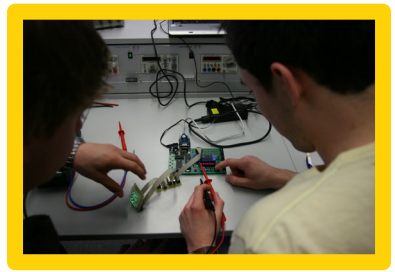

Computer Science Implementation

Secondary Educator Perspective

Scott Kelley
Cheboygan High School

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1. Unplugged vs. Plugged Activities
2. Activity before Content – Content before Vocabulary (ABC-CBV)
3. Logic used in computer science
4. Peer programming
5. Team programming

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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

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Question and Answer Segment

- Open browser on your phone and type in sli.do
- Type in U294 and press return or enter
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