



Northern Lights Collaborative for Computing Education

COLLEGE OF EDUCATION + HUMAN DEVELOPMENT

Integrating Computer Science to Support K-8 STEM Education

2026 Minndependent STEM Education Conference
Wednesday, August 12th, 2026

Slides: z.umn.edu/mnstem26



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About Northern Lights Collaborative

Our mission

We develop evidence-based programs and resources in collaboration with educators and partners that support inclusive K-16 computing education.

Our values

- Inclusive
- Community-oriented
- Evidence-based
- Impactful

Our vision

We aim to serve as a guiding light and a source of inspiration in creating a just and equitable society where computing education is universally accessible, inclusive, and responsive to the unique needs and aspirations of all learners and educators.



Northern Lights Collaborative
for Computing Education

Northern Lights Team



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Slides: z.umn.edu/mnstem26



Session Agenda

Time	Topic
5 min	Welcome
15 min	What is CS and CT
10 min	CS in MN
10 min	CSTA PK-12 Standards; MDE CS-Integrated Standards
20 min	Tool Exploration





Session Learning Goals

- Be able to define computer science and computational thinking
- Identify guiding CS education standards
- Explore tools and resources to get started with CS integration

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What is Computer Science?

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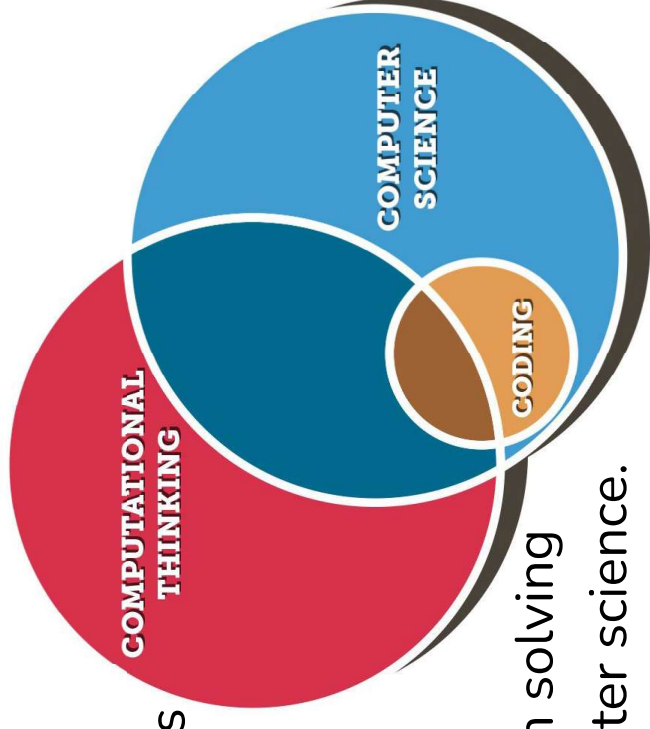


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Defining Computer Science

- **Computer Science** is the study of computers and algorithmic processes, including their principles, their hardware and software designs, their [implementation], and their impact on society.
- **Computational Thinking** is a set of problem solving skills and a process that is central to computer science.
- **Coding (programming)** is a specific technical skill within computer science.

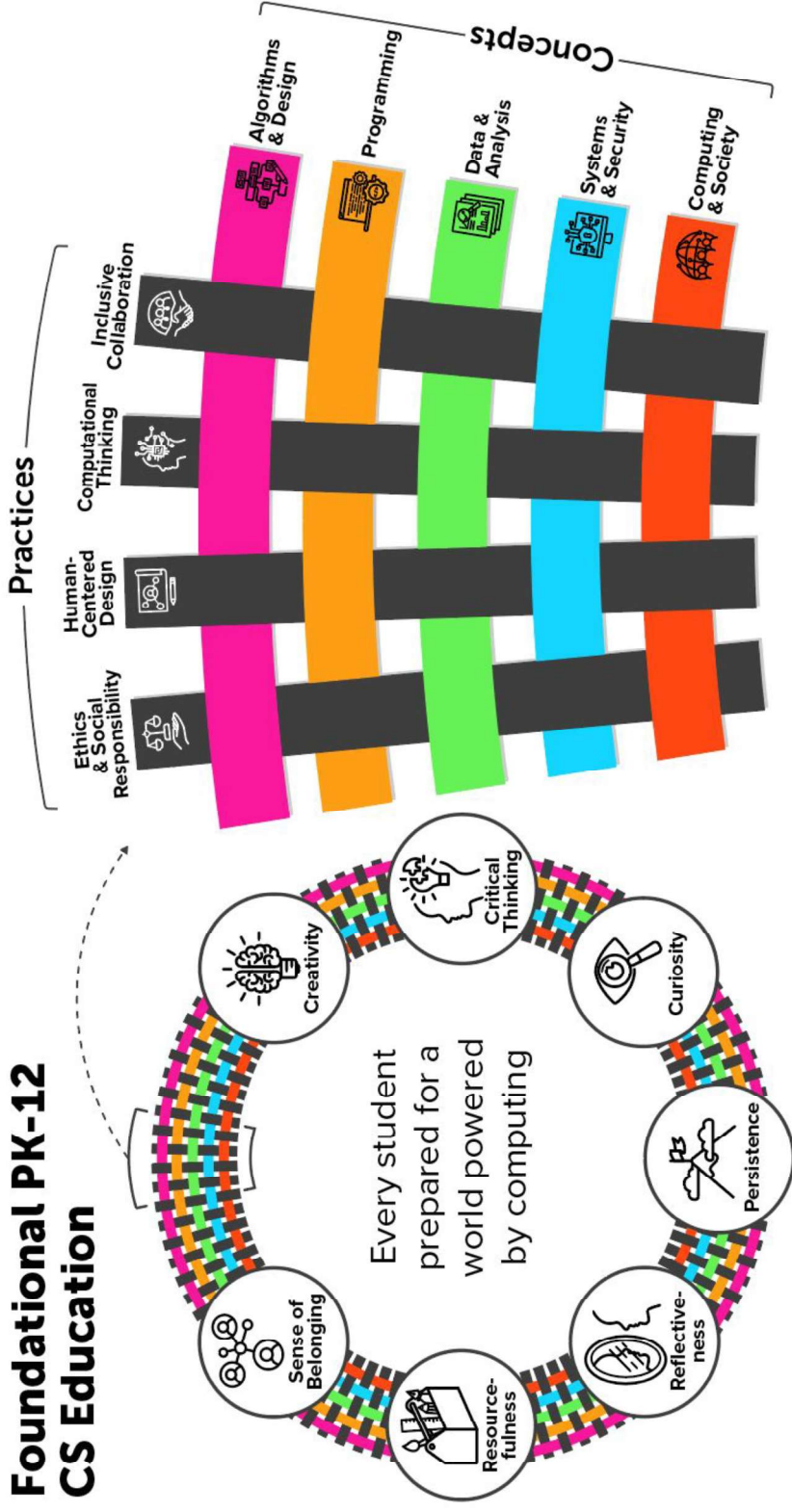


Source: Increasing Awareness to Computer Science in Minnesota Schools Powerpoint - 6/27/22 ([MDE Computer Science](#))
Image Source: <https://circlcenter.org/assessing-computational-thinking/>

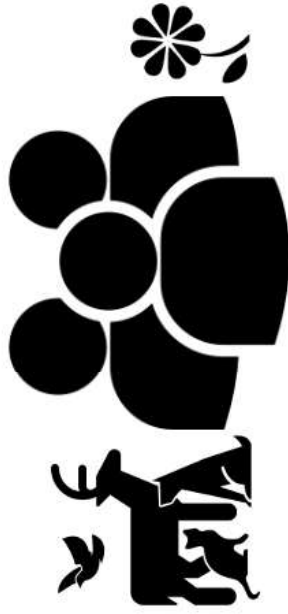


What does CS mean in practice?

Foundational PK-12 CS Education



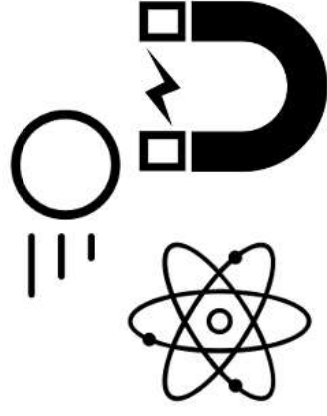
Source: <https://csteachers.org/k12standards/>



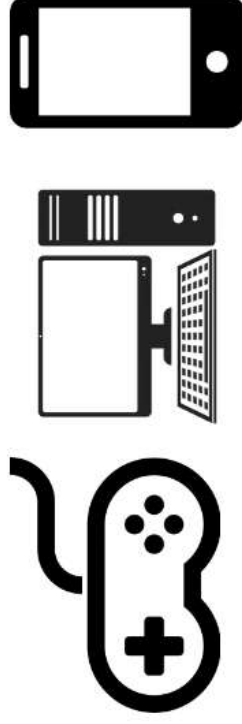
Life Science



Earth Science



Physical Science



Computer Science





*Computer science is **not**:*

- Learning how to use technologies or software
 - Basic Chromebook skills
 - Google Docs or Sheets
 - Keyboarding practice



What is Computational Thinking?

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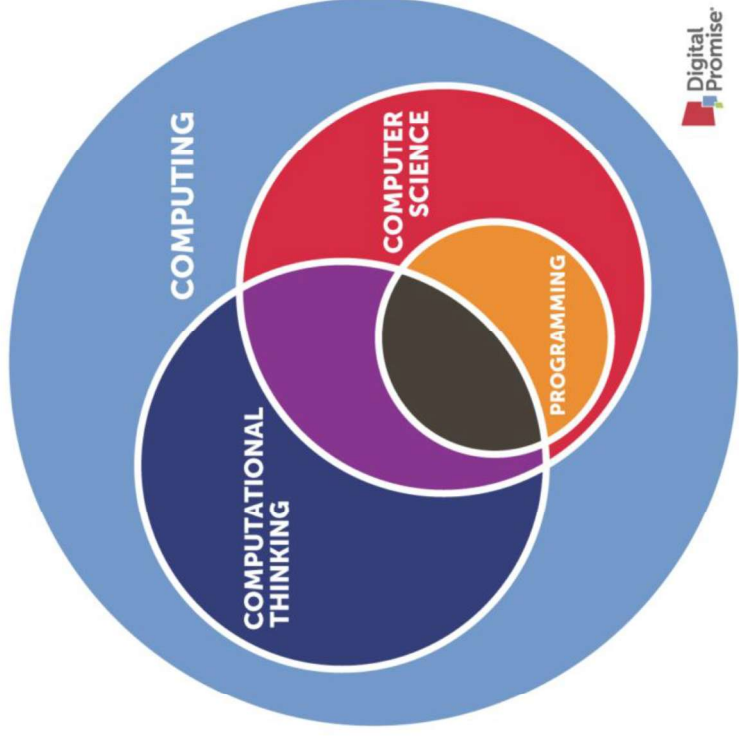


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What is Computational Thinking?

the thought processes involved in expressing solutions as computational steps or algorithms that can be carried out by a computer (k12cs.org).





Computational Thinking

Solving problems effectively, with or without a computer

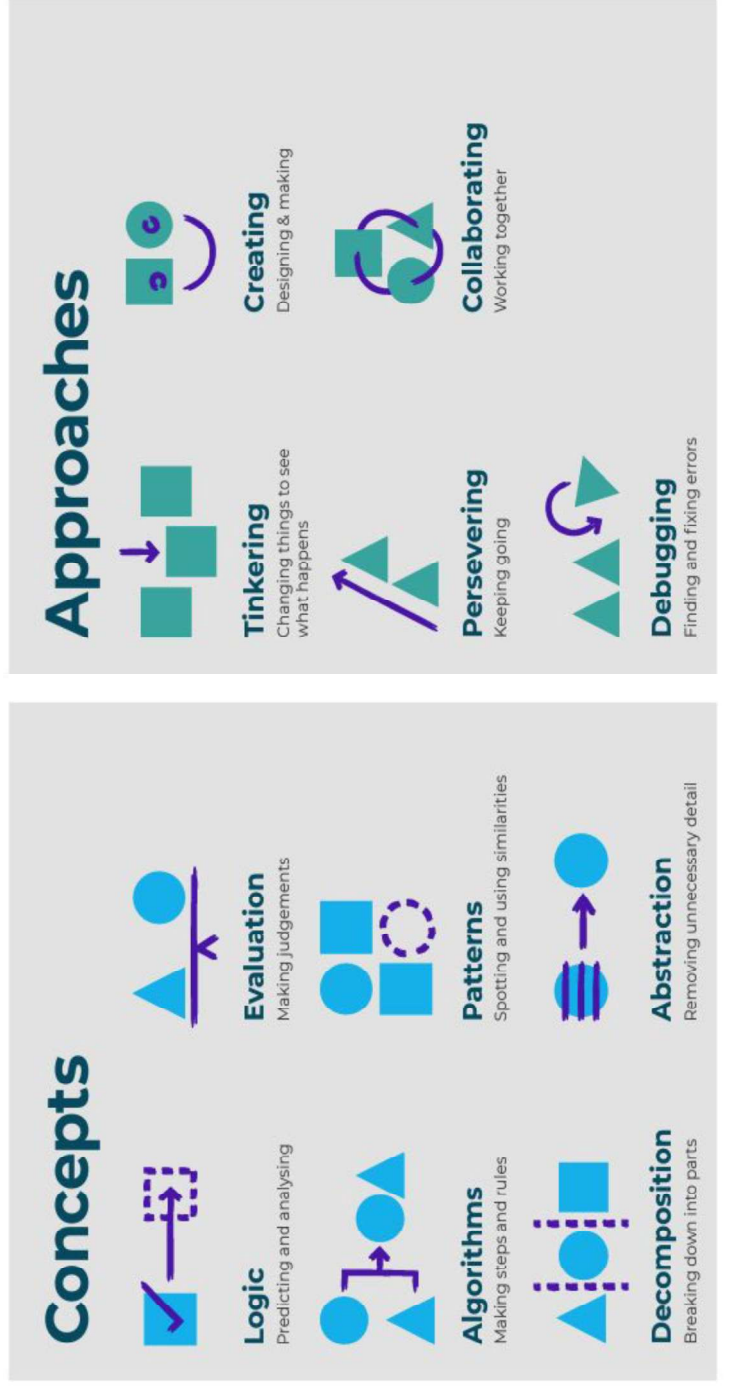
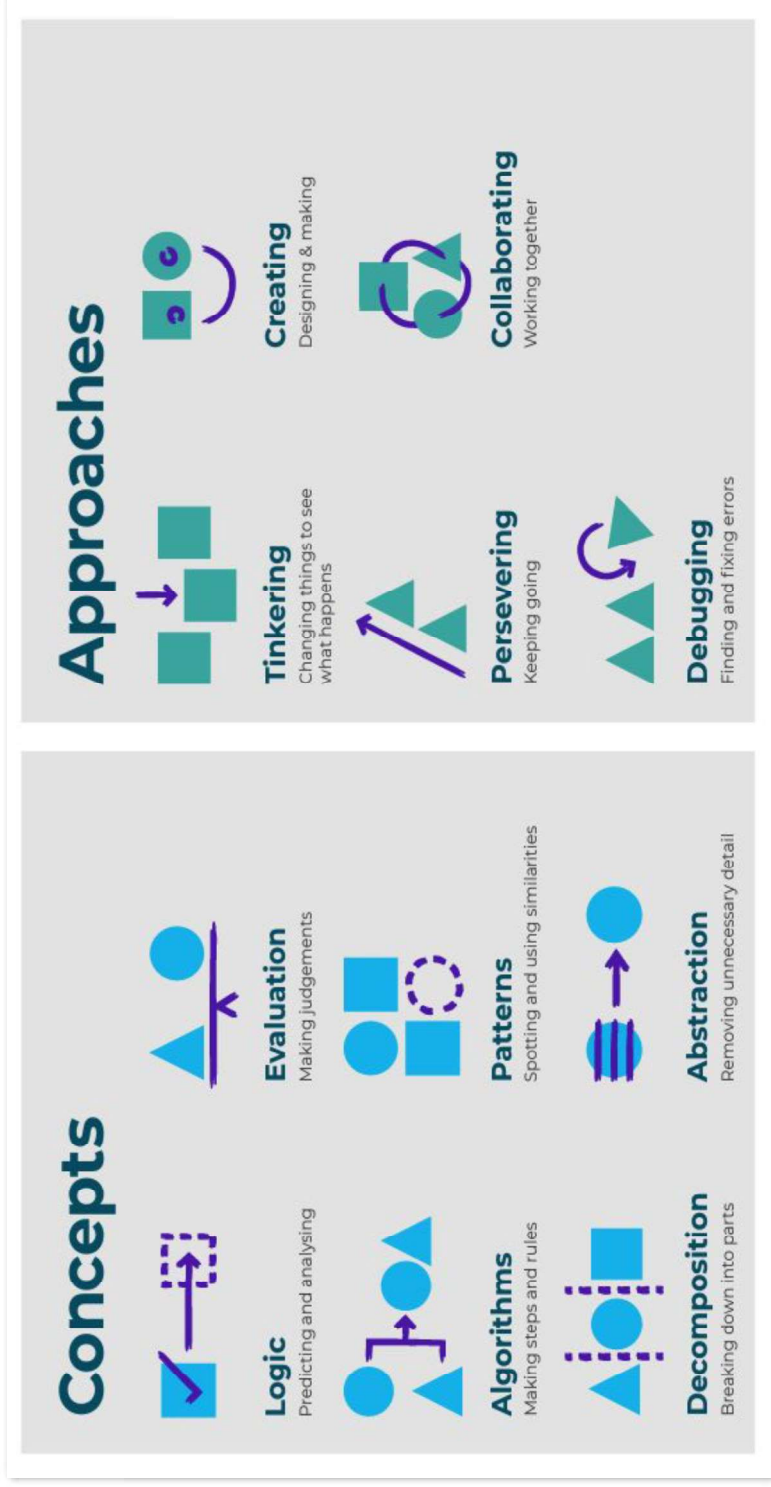


Image from: [Barefoot Computing](#) (lots of great, free CT resources)



Image from:
[Barefoot](#)
[Computing](#)



💬 *Turn and Talk* 💬

What connections do you see between the CT skills and skills students already are developing in your class?

Is this Computer Science?

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Is this computer science?

With neighbors close by

- We will look at three scenarios
- Discuss and determine if the scenario would count as “computer science education” or not
- Be sure to include reasons why or why not
- Be ready to share out to the group





Is this Computer Science?

Scenario 1:

In Mr. C's class, students are using Google Slides to create a presentation on their favorite dinosaur





Is this Computer Science?

Scenario 2:

Students in a 10th grade classroom use paper and pencil to design and sketch a plan for an app that will help solve an identified problem in their community





Is this Computer Science?

Scenario 3:

In 4th grade, students are playing an online game to help practice typing skills



CS Education in MN

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CS Ed in MN

- [Code.org State of AI+CS Report](#)
 - [MN Report](#)
 - [MN Slides](#)
- [Minnesota Dept. of Education CS Webpage](#)
 - Taking approach of CS-Integration into other subject areas
 - State Strategic Plan





Minnesota State Plan for CS *Recommendations*

- Every elementary student will receive 20 hours of CS instruction per year (focus on integration in other subjects)
- Every student will take at least 1 course, or receive equivalent total hours of instruction in CS during middle school (grades 6-8)
- Every high school will offer a foundational CS elective of at least 0.5 credits (review MDE, State of CS courses for what is considered foundational)



MDE CS-Integrated ELA Standards

[Link to MDE CS-Integrated Standards;](#)

Example 6th grade CS-Integrated ELA Standard:

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
6	English Language Arts	English Language Arts	Listening, Speaking, Viewing, and Exchanging Ideas	LSVEI 3 Media Literacy in Exchanging Ideas: Thoughtfully and safely access, analyze, and create written, oral, and digital content, applicable to task, purpose, audience, and discipline.	6.3.3.2	Create and share, individually or in a collaborative group, an informative multi-media work or digital communication, choosing tools to meet the task, purpose, and audience, demonstrating understanding of digital footprint.



Computer Science Teachers Association

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What is CSTA?

- Computer Science Teachers Association
- “World’s largest computer science department”
- Connect with other CS educators
- Guidance, resources, research, advocacy, etc





New! 2026 PK-12 Computer Science Standards

2026 K-12 Student Standards

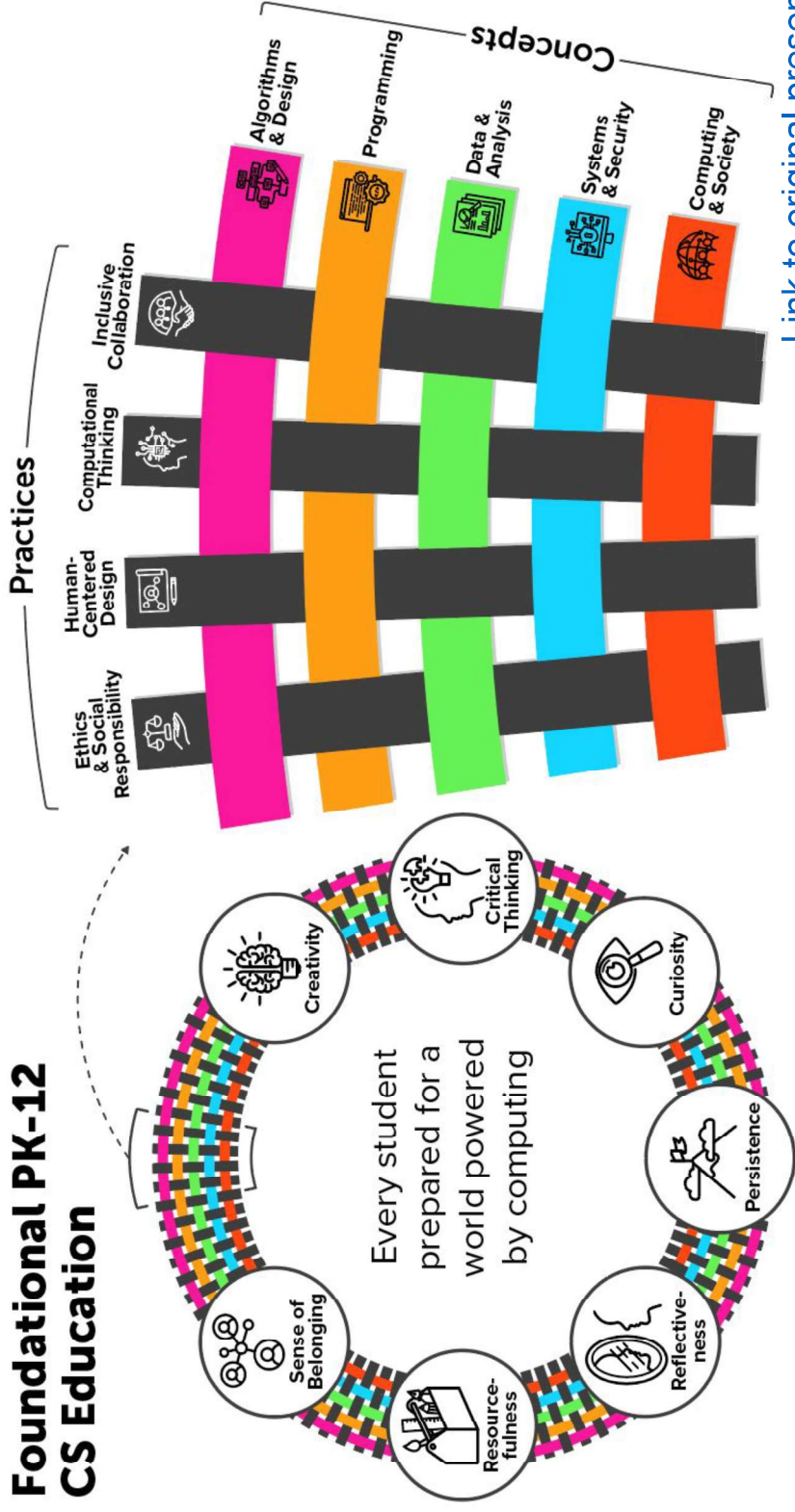
- Recently released (July 2026)
- K-12 learning progression for CS learning skills and concepts
- Website includes many great resources
- Keep in mind, these are a national set of standards- not held accountable in MN or WI for teaching these standards

***Note:** most of the content on the following slides comes from a [2026 CSTA National presentation by Bryan Twarek and Jake Koressel](#)



What does CS mean in practice?

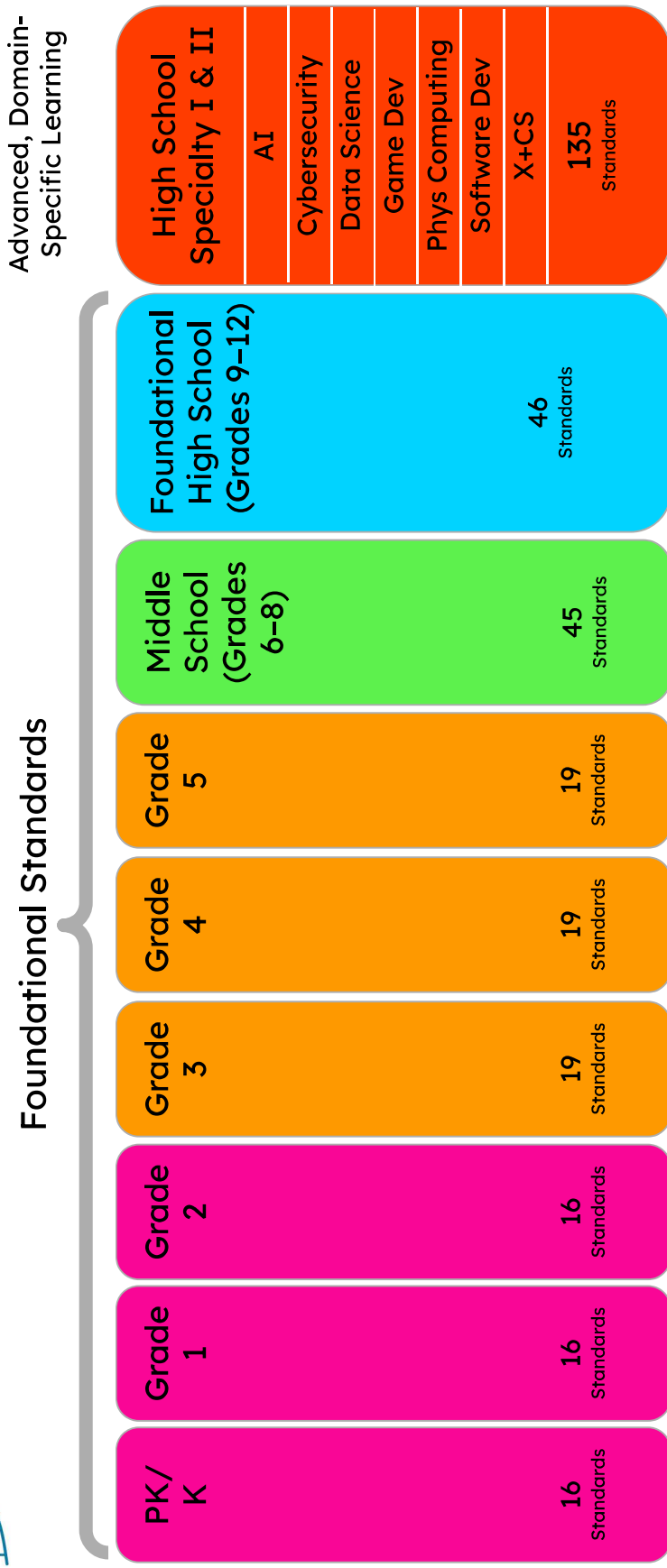
Foundational PK-12 CS Education



[Link to original presentation](#)



2026 CSTA PK-12 Standards by Level



[Link to original presentation](#)

AI in the 2026 CSTA PK-12 Standards

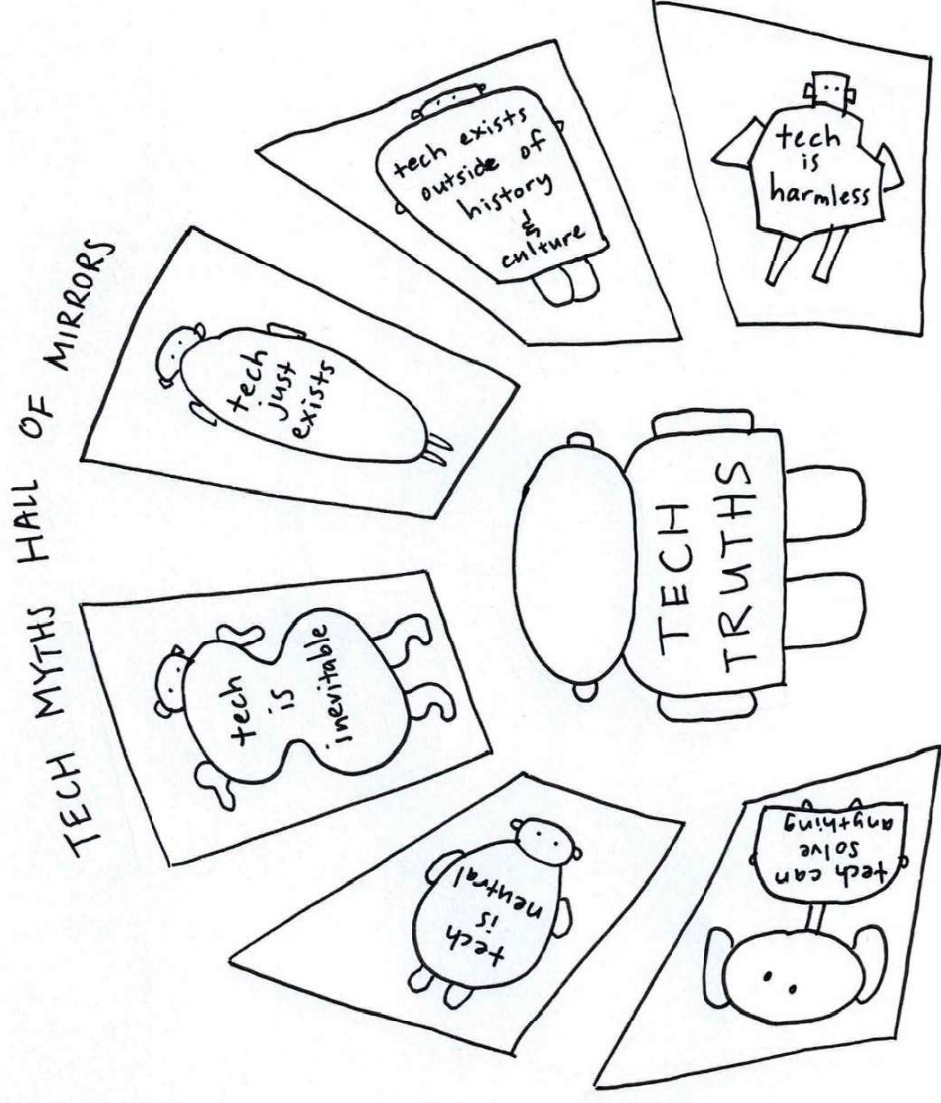
	Algorithms & Design	Rule-based vs. data-driven approaches, machine learning, & societal impacts (e.g., bias)
	Programming	Reading & evaluating AI-generated code
	Data & Analysis	Data fluency & societal impacts (e.g., large-scale data collection)
	Systems & Security	Security implications & environmental impacts
	Computing & Society	History of computing, emerging technologies, relationship between humans and AI, and how people decide whether/when/how to use these technologies responsibly

[Link to original presentation](#)

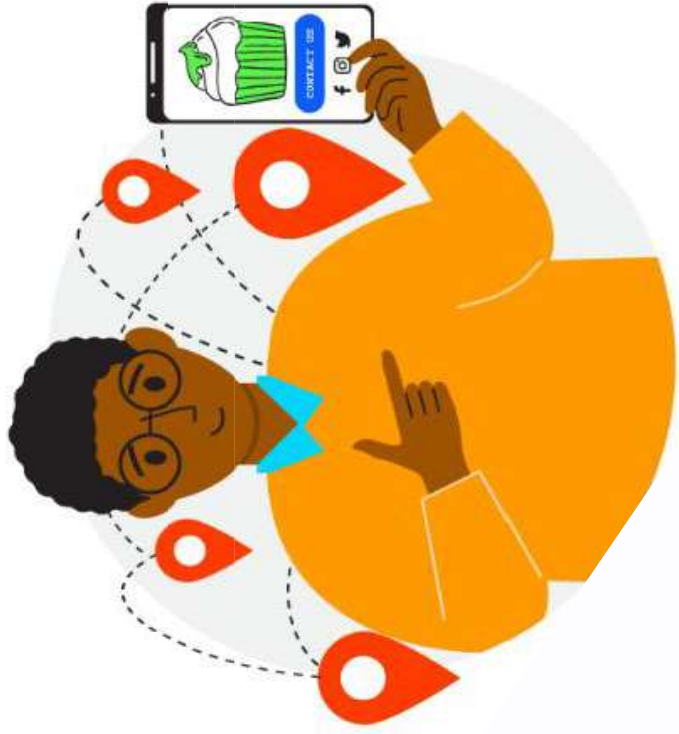
Techno-myths

Technology...

- can solve anything
- is neutral
- is inevitable
- just exists
- exists outside of history and culture
- is harmless



Illustrations
by Dr. Jean
Ryoo as
part of the
Amplifying
Social
Impacts of
Computing
Standards
(ASICS)
initiative, in
collaboratio
n with Telos
Learning,
MSU, UCLA,
and Kapo
Foundation



**An ad just recommended
that bakery. Is something
tracking my location?**

- What data is collected?
- How is it represented?
- Did I consent?
- What algorithm makes the recommendation?
- How does it vary by person?
- Who benefits?
- Who is harmed?
- What values are embedded in the design?
- What would responsible design require?

Exploring the interactive web display

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View the Standards

Filters ?

RESET

16 Results

SORT BY

CONCEPT

VIEW PINNED (0)

CLEAR PINS

DOWNLOAD

SETTINGS

Search Standards

Search...

Q

Level

PK-12 Foundational (16)

PK/Kindergarten (0)

Grade 1 (0)

☒ Grade 2 (16)

Grade 3 (0)

Grade 4 (0)

Grade 5 (0)

Middle School (Grades 6-8) (0)

High School (Grades 9-12) (0)

	E2-ALG-PS-01	Grade 2	Algorithms & Design	Algorithmic Problem Solving		▼
Create an <u>algorithm</u> that includes <u>sequence</u> , <u>events</u> , and <u>iteration</u> to solve a problem or express an idea.						
	E2-ALG-IM-03	Grade 2	Algorithms & Design	Impacts of Algorithms & Design		▼
Describe how an <u>algorithm</u> might <u>impact</u> peers in varied situations.						
	E2-ALG-ML-02	Grade 2	Algorithms & Design	Machine Learning		▼
Examine how <u>data</u> is used to <u>train</u> a <u>machine learning model</u> .						
	E2-PRO-PD-04	Grade 2	Programming	Program Development		▼
Create <u>code</u> from an <u>algorithm</u> that includes <u>sequence</u> , <u>events</u> , and <u>iteration</u> to solve a problem or express an idea.						





Can filter “Interdisciplinary Connections” by Science

Interdisciplinary Connections

☐ Arts (39)

☐ Career Exploration (2)

☐ Early Childhood Education (17)

☐ ELA (169)

☐ Health and Physical Education (6)

☐ Library (3)

☐ Math (162)

☒ Science (180)

☐ Social Studies (90)

Artificial Intelligence

E1-ALG-IM-03 Grade 1 Alg

Explain how a change

E2-ALG-IM-03 Grade 2 Alg

Describe how an algo

E3-ALG-IM-03 Grade 3 Alg

Compare how different needs.

E4-ALG-IM-03 Grade 4 Alg

Evaluate how different



PK–12 CS Education Glossary



Filters



RESET

1032 Results

↑ COLLAPSE ALL

VIEW PINNED (0)

CLEAR PINS



DOWNLOAD

Search Glossary ?

Search



A B C D E F
G H I J K L
M N O P Q R
S T U V W X



Grade Level Introduced



Foundational Concept



High School Specialty Standards

A/B test

A method of experimentation where two variants (A and B) are compared to determine which performs better.

Source(s): [CSTA Writing Team](#)

Abstract Data Type

A mathematical model for a certain kind of data structure that specifies the data stored and the operations that can be performed on the data, but not how they are implemented.

Source(s): [CSTA Writing Team](#)

Abstraction

The process of reducing complexity by focusing on the main idea. By hiding details irrelevant to the question at hand and bringing together related and useful details, abstraction reduces complexity and allows one to focus on the problem. Also a new representation of a thing, a system, or a problem that helpfully reframes a problem by hiding details irrelevant to the question at hand.

Source(s): [K12 CS Framework](#)

Guided Walk through

1. Open the [interactive web display](https://csteachers.org/pk12standards/view). (csteachers.org/pk12standards/view)
2. Complete the following:
 - Filter for standards in the grade level(s) you teach/support
 - Expand the card for a standard that sounds interesting to you and scan through the components
 - Click an underlined term to view the embedded glossary
 - Limit what displays on each standard card using the show/hide toggles (under the *Settings* menu)
3. **Explore additional display functionality**
(e.g., download, pin, filter, search, sort)
4. Be sure to explore the “resources” section

[Link to original presentation](#)

CS Resource Exploration

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In the room...

micro:bit

- physical programmable mini-computer with built-in buttons, sensors, processor, etc
- easy to pick up and program within minutes, endless possibilities of complex projects
- programmable with blocks, Python, and JavaScript

Vex 1,2,3 robot

- Robot for younger learners
- Programmable with buttons, included tablet, or online app

Online resources

[K-8 CS-Integrated Lesson Repository](#)

- Collection of lesson plans from various reputable sources
- Focuses on free resources, or no devices necessary

[Scratch](#)

- Open-ended creation platform with block-based coding
- One of the most widely used CS tools
- Easy to start, “high ceiling” of possibilities
- Students can create animations, stories, games, apps, simulations, etc

[Scratch Jr](#)

- Scratch version for younger learners
- Blocks are icon-based to eliminate reading barriers
- Intended for use on tablets

More Online resources

Barefoot Computing

- Unplugged activities, computational thinking resources
- Free, but requires account login

Code.org

- Largest online coding non-profit organization
- [Huge catalog or curriculum options](#)
- [Open-ended tools for creating projects](#)

CS Unplugged

- Collection of unplugged activities to teach CS concepts

Get started with **micro:bit**

- [Link to learn more about the micro:bit](#)
- [Link to programming platform: MakeCode for micro:bit](#)
 - Scroll down to see tutorial projects
- [How to transfer your program to the micro:bit](#)
- [List of micro:bit project ideas](#)
 - Can filter by Science or other subject areas



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Get started with Vex 1, 2, 3

- [Link to video to get started](#)
- Physical directions also on posters



Get started with Scratch

- [Link to Scratch Educator resources](#)
 - [Educator accounts](#) are available, but takes a few days to get approved
- [Link to Scratch](#)
 - Try a tutorial project!
 - In the “Create” page, click the “Tutorials” button on top
 - [Link to tutorials project list](#)
- Scratch Integration project ideas:
 - [Students could create a simulation](#)
 - [Create an interactive model](#)



Get started with Scratch Jr

- [Link to Scratch Jr homepage](#)
 - [Getting started activities](#)
 - [Teacher Resources](#)



***Even more resources to
check out***

Slides:
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[MakeCode Arcade](#)

- Creation platform that focuses on making simple games

[Edison Robot](#)

- Inexpensive robot (~\$50) that is compatible with Legos

[Northern Lights Collaborative for Computing Education Resources](#)

- Curricular units, book lists, reports, etc

[TinkerCAD](#)

- Beginner friendly CAD software for creating 3D models, 3D printing, etc



Save the date!

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[EmpowerMN CS+AI 2027](#)

- Aug 3 - 5, 2027
 - Twin Cities UMN Campus
- Choose one from a selection of 3-day workshops
- 2026 workshop offerings:
 - Intro to CS/CT, CS integration with Physical Computing, Introduction to AI, AI in CS, Data Science, Cybersecurity, Raspberry Pi Foundation Experience CS
- [Join the NLC mailing list for news and updates!](#)

Thank you!



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[LinkedIn: Northern Lights Collaborative](#)

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Color Accessibility:
 B - OK to use with black text
 W - OK to use with white text
 G - OK to use with UMN Gold text (#ffcc33)
 M - OK to use with UMN Maroon text (#7a0019)

Check other combinations at
<https://webaim.org/resources/contrastchecker/>

W, M, G	B, M (W-WCAGAA only)	B, M		
W, G	B, M, G			
W (G-WCAG AA only)				
W only (small text does not pass WCAG AAA)	B only	W-large text B-small text	W only (small text does not pass WCAG AAA)	B only

