SCCS

STATE COMMITTEE ON COMPUTER SCIENCE

IN PARTNERSHIP WITH THE OHIO DEPARTMENT OF EDUCATION AND OHIO DEPARTMENT OF HIGHER EDUCATION

Making Ohio a National Leader in Computer Science Education

Organizational Meeting

Committee Facilitator Kelly Gaier Evans - Battelle

Chair: Mike Duffey, Ohio Department of Higher Education

Vice Chair: John Wiseman, Ohio Department of Education

November 17, 2021 from 9:30-11:30 a.m.

Welcome from the State Superintendent

Stephanie K. Siddens, Ph.D.

Interim Superintendent of Public Instruction

Mike Duffey, Chair

Welcome!

PreK-12	Post-Secondary	Nonprofit	Business	Federal
John Wiseman, Vice Chair Ohio Dept. of Education	**Mike Duffey**, Chair Ohio Dept. of Higher Education	**Autum Barry** Project Lead the Way	**Tonjia Coverdale** Nationwide	**Lisa Nolan** Air Force Research Lab
Tim Conley Bloom Vernon Schools	**Debbie Jackson** Cleveland State University	**Lisa Chambers** TechCorps	**Courtney Falato** JP Morgan Chase	
Chelsea Cook Kohn Cleveland Metro Schools	**Tsavo Knott†** Founder, Pieces.app	**Ted Griffith** JobsOhio	**Sean Lane** Olive	
Mike Eilerman Tri-Star Career Center	**Jong Kwan Lee** Bowling Green State University	**Katie Hendrickson** Code.org	**Doug McCullough** Color Coded Labs	
Patricia Murakami Dayton Reginal STEM School	**Rebekah Michael** University of Cincinnati/Cyber-Range	**Kelli Shrewsberry** Teaching & Learning Collaborative		
Paula Naa Quartey* Student, KIPP Columbus	**Tom Newman** Cincinnati State			
Bryan Stewart Warren/Montgomery ESC	**Tasha Penwell** CSTA Designee/Hocking College			
Brent Wise Mariemont Schools	**Paul Sivilotti** The Ohio State University			

* Paula is a student at KIPP Columbus and special guest who can become a member of the committee in January 2022.

** Tsavo Knott is a recent college graduate and entrepreneur, representing post-secondary students.

*** Lisa Nolan is a non-voting federal government designee from Wright Patterson Air Force Base / Air Force Research Laboratory

Our Charge – HB 110 – the state budget

We have a unique opportunity to help make Ohio a national leader in computer science education and workforce pipeline.

(1) Best practices and challenges associated with the implementation of primary and secondary computer science curriculum in this state;
(2) Demographic data for students who receive instruction in computer science;
(3) Benchmarks to create a sustainable supply of teachers certified to provide instruction in computer science;
(4) Best practices to form public and private partnerships for funding, mentoring, and internships for teachers providing instruction in computer science;
(5) Requiring all students to complete a computer science course prior to high school graduation;
(6) Establishing a work-based learning pilot program that includes high schools, universities, and local industry and permits the department and the chancellor to develop pathways to align computer science education in the state with the state's workforce needs;
(7) Any other topic determined appropriate by the committee

HB 110: https://ohiohouse.gov/legislation/134/hb110 (Pages 703-705)

Our Charge – HB 110 - continued

(D) Within the plan, the committee … shall include all of the following:

(1) An examination of the challenges that prevent school districts from offering computer science courses;

(2) A requirement that the department of education collect any data regarding computer science courses offered by school districts and school buildings operated by school districts, including the names of the courses and whether the courses were developed using the standards and model curriculum ...and post the collected data on its web site.

(3) A requirement that the committee determine the best ways to compile data on computer science courses, teachers, and undergraduate students studying computer science in universities.

(4) Any findings the committee determines appropriate based on its consideration of the topics described in division (B) of this section.

Our Charge – HB 110, recap

Importantly, the committee is given latitude to consider any idea that might help make Ohio a national leader in computer science education and workforce pipeline.

Please *seize the day* and *think big* about our charge.

Our goals should be aspirational but realistic.

We should also consider how implementation might work.

John Wiseman, co-chair

Suggested Timeline and Future Meetings

November	Organizational Meeting
December	Discussion of First Round of Recommendations
January	Discussion, Evaluate/Review, Recommendations
February	Prioritization, Elimination, Evaluate/Review, Discussion
March	Finalizing Recommendations, Evaluate/Review
April	[As needed]
May	[As needed]

** Note: HB 110 gives us until October 2022, but plan to finish in spring.*

Meetings Cadence and Scheduling

Suggested future meeting dates (3rd Wed of each month):

- Wednesday, December 15, 2021
- Wednesday, January 19, 2022
- Wednesday, February 16, 2022
- Wednesday, March 16, 2022
- Wednesday, April 20, 2022 (if needed)

Would this time of day (9:30-11:30) work for most attendees?

***December will likely be challenging for many members, but we would like to have a meeting to stay on task. Consensus?

We will publish the final committee schedule after this meeting.

Our Facilitator: Kelly Gaier Evans

- Director of the Ohio STEM Learning Network
- 10 years on Battelle's education team
- Leading Battelle's K-12 CS education efforts in Ohio since 2015.
- Former math teacher, former ODHE alumn

Today's Agenda

9:30 -9:50 a.m.	Welcome • *Dr. Stephanie K. Siddens, Interim Superintendent* • *Mike Duffey, Chair* • *John Wiseman, V. Chair* • *Our Charge* • *Timeline*
9:50-10:10 a.m.	Getting to Know the Committee • *Introduction to Kelly Gaier Evans, Facilitator* • *Agenda* • *Who's in the Room* • *Expectations and Norms*
10:10-10:20 a.m.	Break
10:20-10:50 a.m.	State of CS in Ohio Today
10:50-11:20 a.m.	Open Discussion • *Breakout groups and charting (4 min per poster)* • *Gallery Walk*
11:20-11:30	Homework and Wrap up

Building Community

PreK-12	Post-Secondary	Nonprofit	Business	Federal
John Wiseman, Vice Chair Ohio Dept. of Education	**Mike Duffey**, Chair Ohio Dept. of Higher Education	**Autum Barry** Project Lead the Way	**Tonjia Coverdale** Nationwide	**Lisa Nolan** Air Force Research Lab
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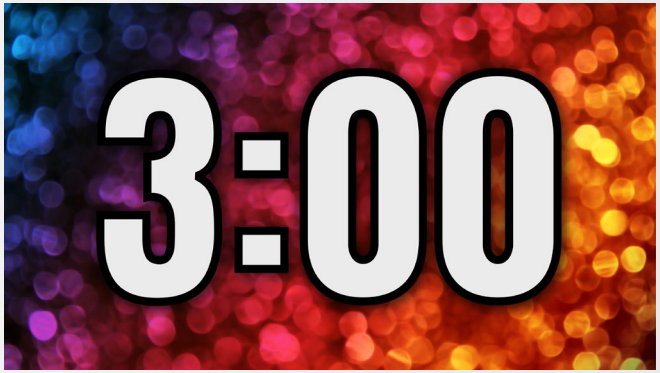
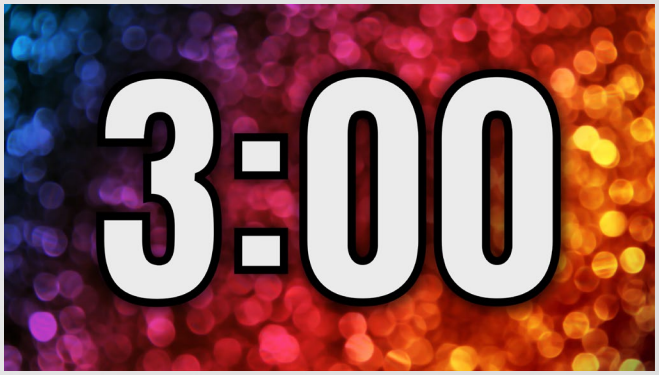
What is the best thing that has happened to you so far today?



What is a problem you wish you could solve?

What did you want to be when you grew up?



What are you most looking forward to as a member of this committee?

SCCS

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Email:

I’m going to be late.
Something has come up.

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Email:

I’m going to be late.
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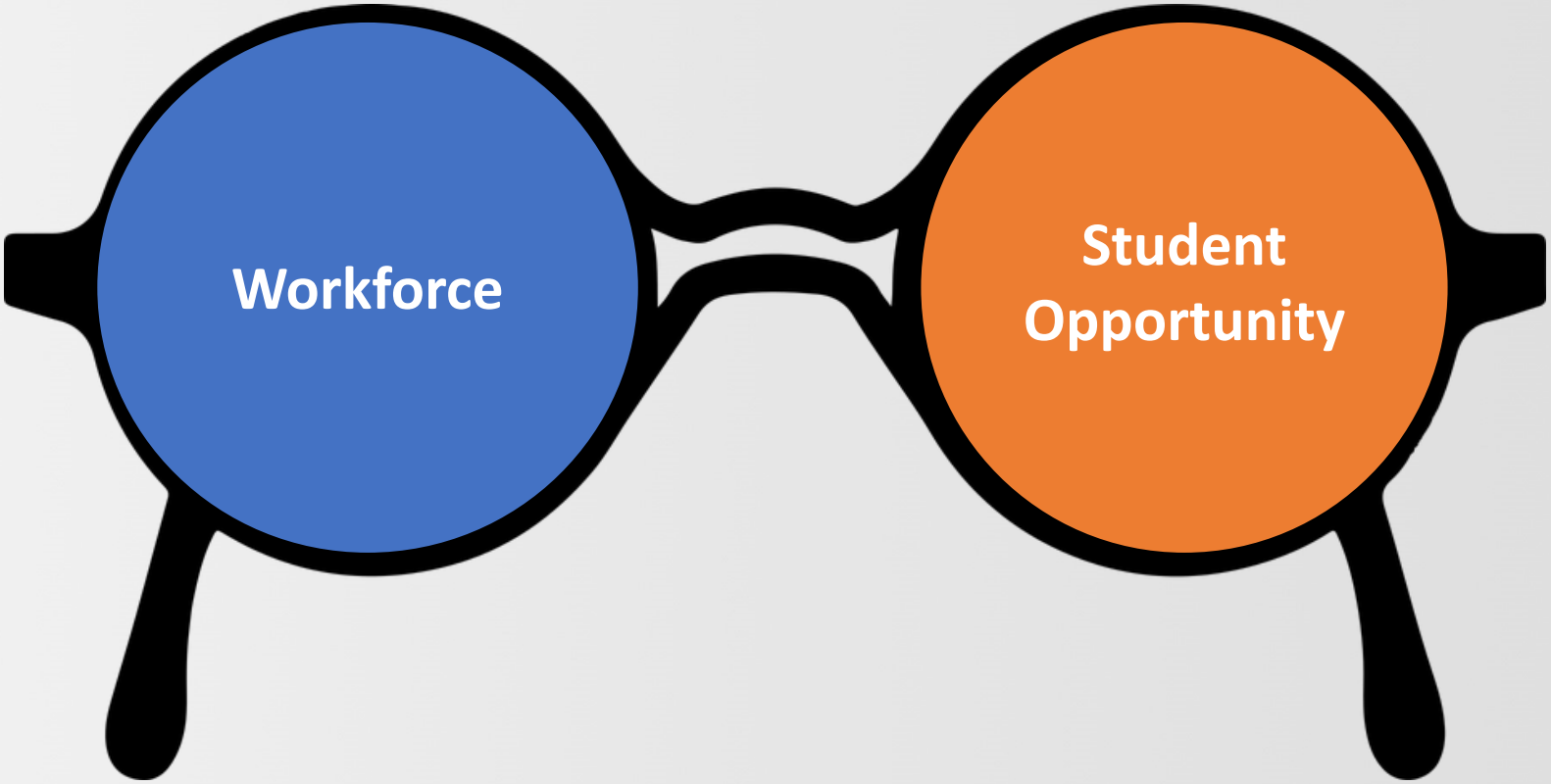
Filters

Have you ever witnessed two people who saw the same thing, but had dramatically different interpretations of the event?

It’s because we each have our own filters.

Reflect: Do you wear one of these filters?



- How do we ensure industry stays in Ohio?
- Is our current talent pipeline meeting workforce needs?

- Will kids have the skills they need for economic opportunity/social mobility?
- Which students have access to high quality Computer Science courses?

Norms

- We all have different filters, share yours
- Always assume positive intent
- Be curious and ask questions
- Be here now
- Communicate respectively
- Safe space to contribute ideas (disagree w/content not the person)
- Treat everyone with courtesy and respect
- Embrace data, where it is and isn't available
- Come to meetings fully prepared which includes any homework or review of materials sent prior

Expectations

- Meet [*proposed: Monthly*] for 90 to 120 minutes in person
- Work asynchronously between meetings for 60 to 120 minutes
- Be an active participant
- Work to meet our milestones in six-months

Break – 10 minutes

State of CS in Ohio | Current landscape

Connecting data and our charge

H.B. 110 Charge

When developing the plan, the committee shall consider …

- **Demographic data for students** who receive instruction in computer science
- Benchmarks to create a **sustainable supply of teachers** certified to provide instruction in computer science
- Establishing a work-based learning pilot program that includes high schools, universities, and local industry and permits the department and the chancellor to develop pathways to align computer science education in the state with the **state's workforce needs**;

The plan shall include…

- the **best ways to compile data** on computer science courses, teachers, and undergraduate students studying computer science in universities.

Data we'll discuss today

- K-12 Student and Course data
  - Access to CS courses
  - Enrollment in CS courses
- Teacher data
- Workforce needs and talent development

Simple framework for landscape overview

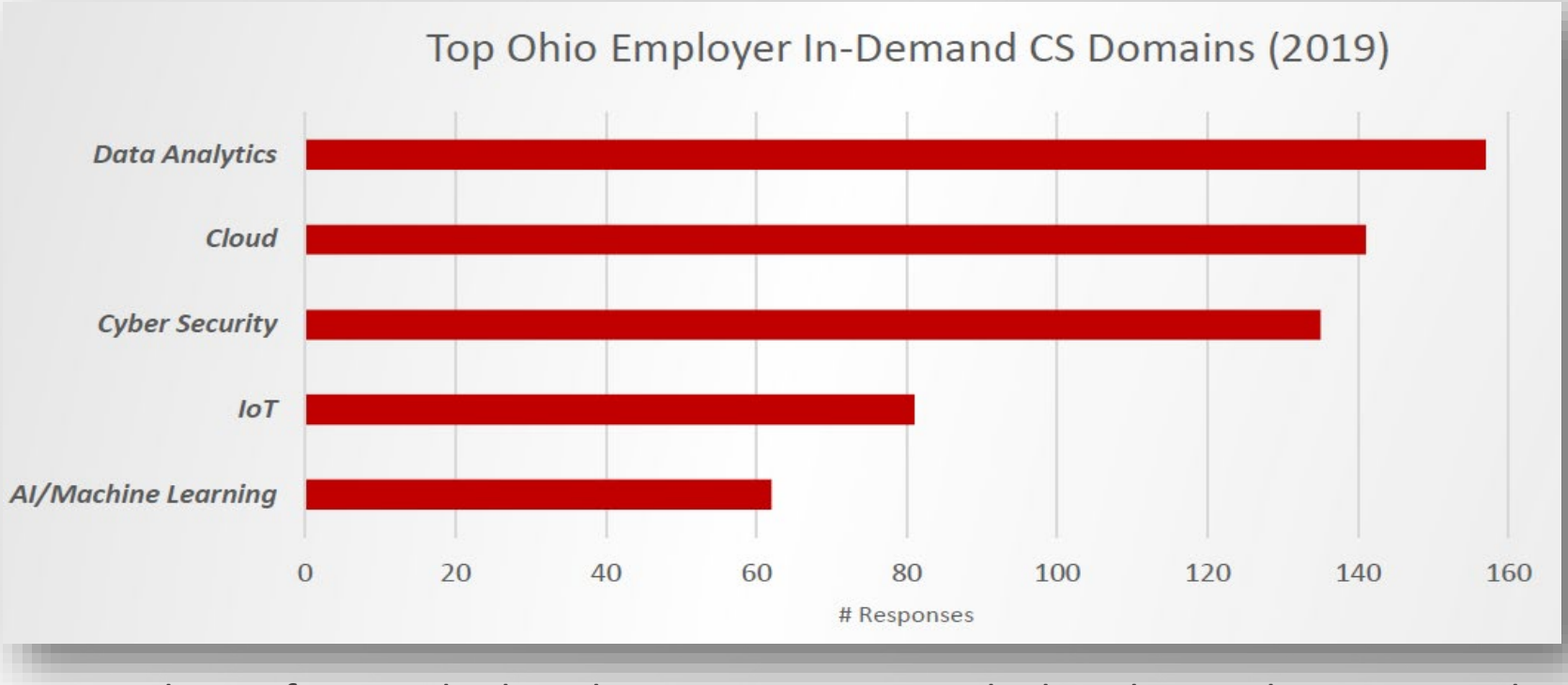
Framework	Landscape we'll look at today
Employers need workers	Workforce data
Workers need skills	Workforce data
Skills are built by teachers	Teacher data
Teachers teach courses and content	Course access and participation
Courses offered depend on policy (state and local)	State level policy
Policies determine access	State level policy

State of CS in Ohio | By the Numbers

Talent

What is the talent industry needs?

Number of times employers report the Domain is in high-demand and/or difficult to fill…

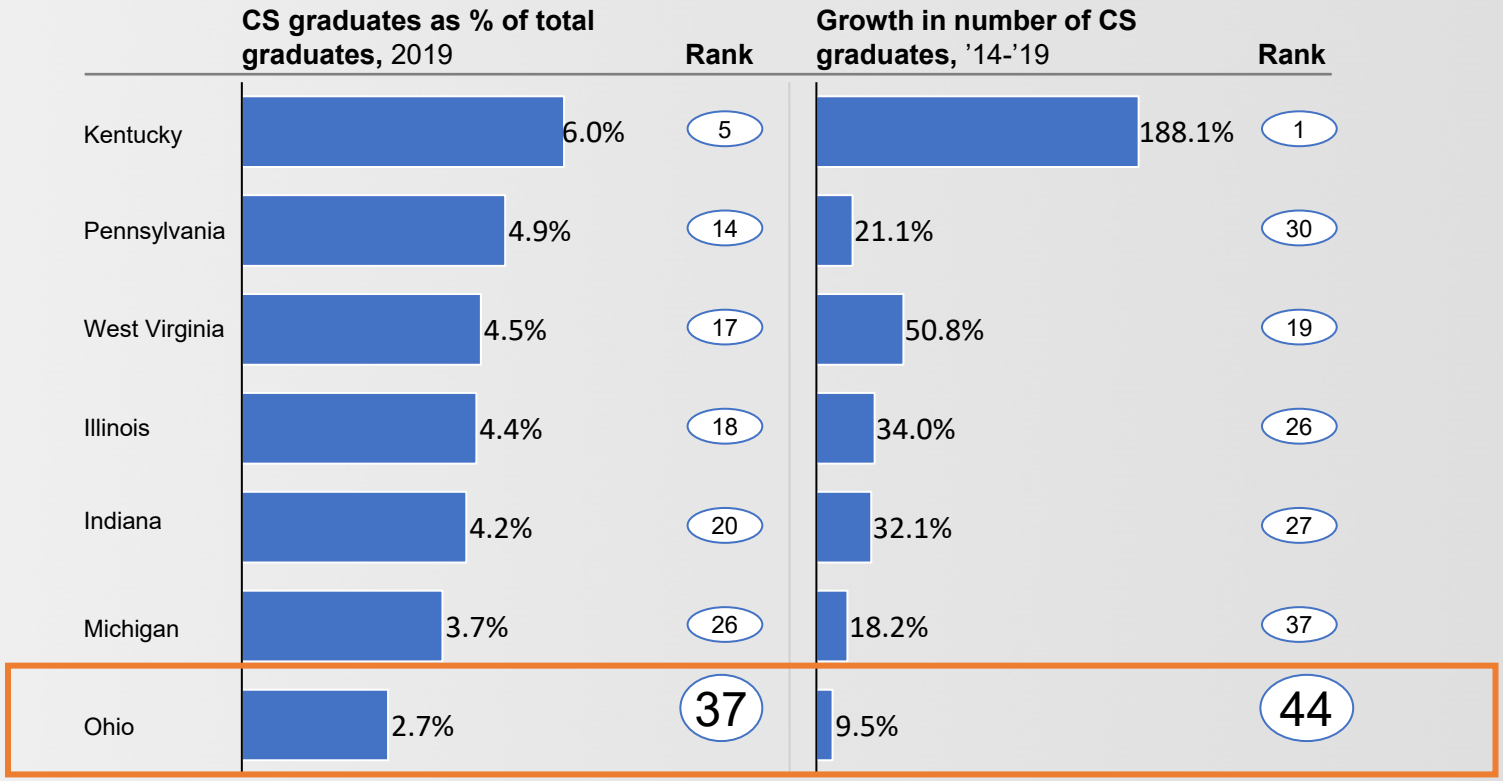


~90 employers from multiple industry sectors were asked to choose their top 3 tech domains and skills, and were allowed to place additional "votes" beyond their top 3.

What is potential earning power?

Average annual salary for occupations classified in Computer Science	**$86,781**
Median Household income in 2019	$56,602
Ohio's living wage (family with one working adult and one child)	$53,976

Where is Ohio currently with developing CS talent?

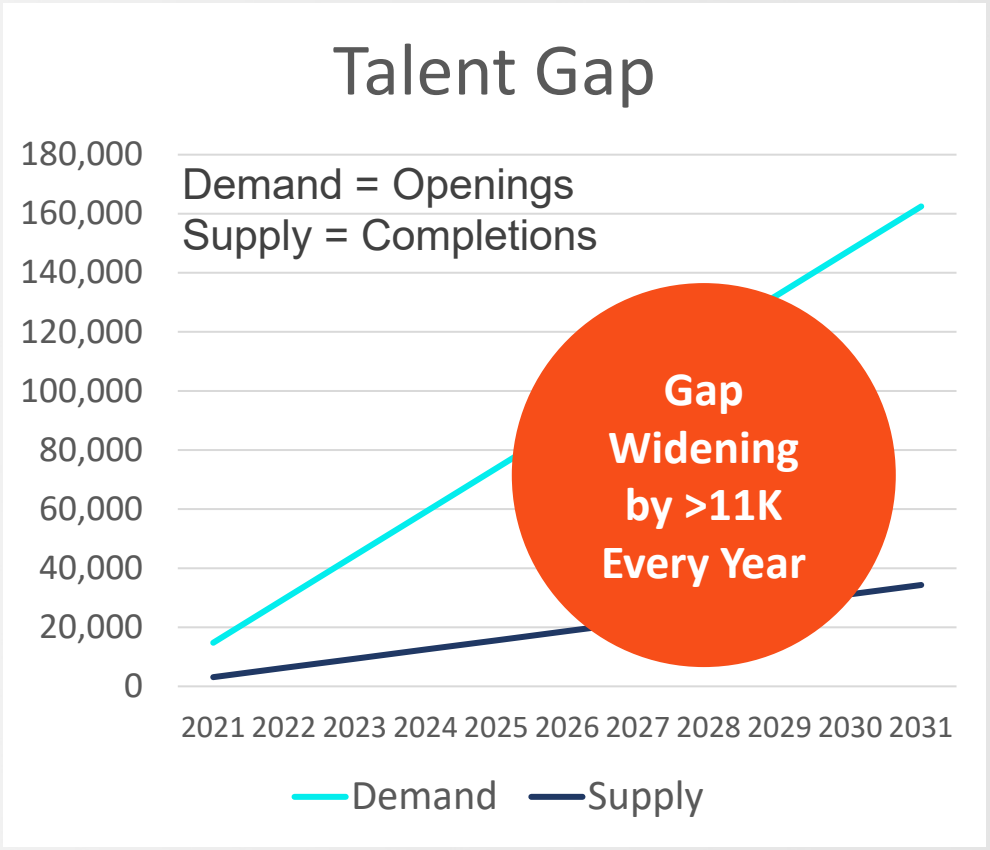


1. Includes associate's, bachelor's, master's, and doctorates

Source: NCES, EMSI, U.S Census Bureau, 2019 American Community Survey 1-Year Estimates

Ohio has a gap, and it's growing

Selected JobsOhio Priority Computer Science Occupations and Relevant Higher Education Programs



Year	Demand	Supply	Gap
2021	14,771	3,117	11,654
2022	29,542	6,235	23,308
2023	44,314	9,352	34,961
2024	59,085	12,470	46,615
2025	73,856	15,587	58,269
2026	88,627	18,704	69,923
2027	103,399	21,822	81,577
2028	118,170	24,939	93,231
2029	132,941	28,057	104,884
2030	147,712	31,174	116,538
2031	162,484	34,291	128,192

Sources: EMSI, BLS/IPEDS, data are cumulative. Assumption -current trends continue.

State of CS in Ohio | By the Numbers

Talent

Elbow buddy:

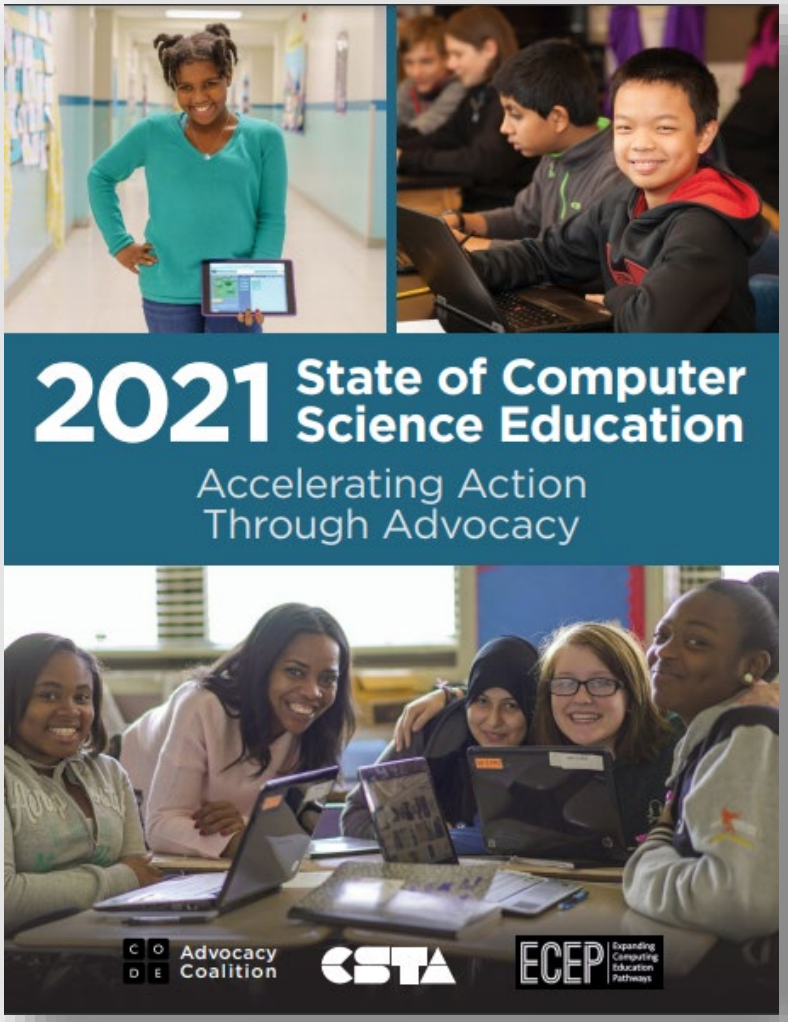
- How is Ohio doing?
- Questions you want to explore more?

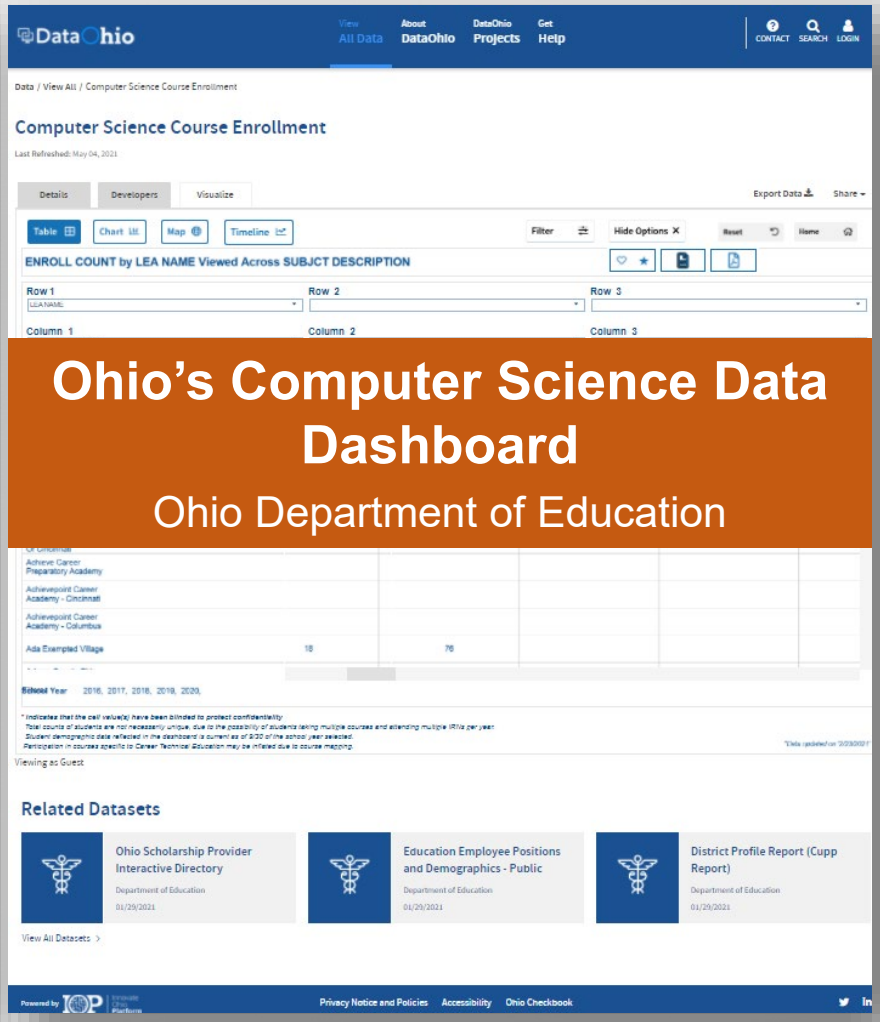
State of CS in Ohio | By the Numbers

Student

Tension in the data

K-12 Student Data: Two Sources





Ohio's Computer Science Data Dashboard

Ohio Department of Education

Computer science means…

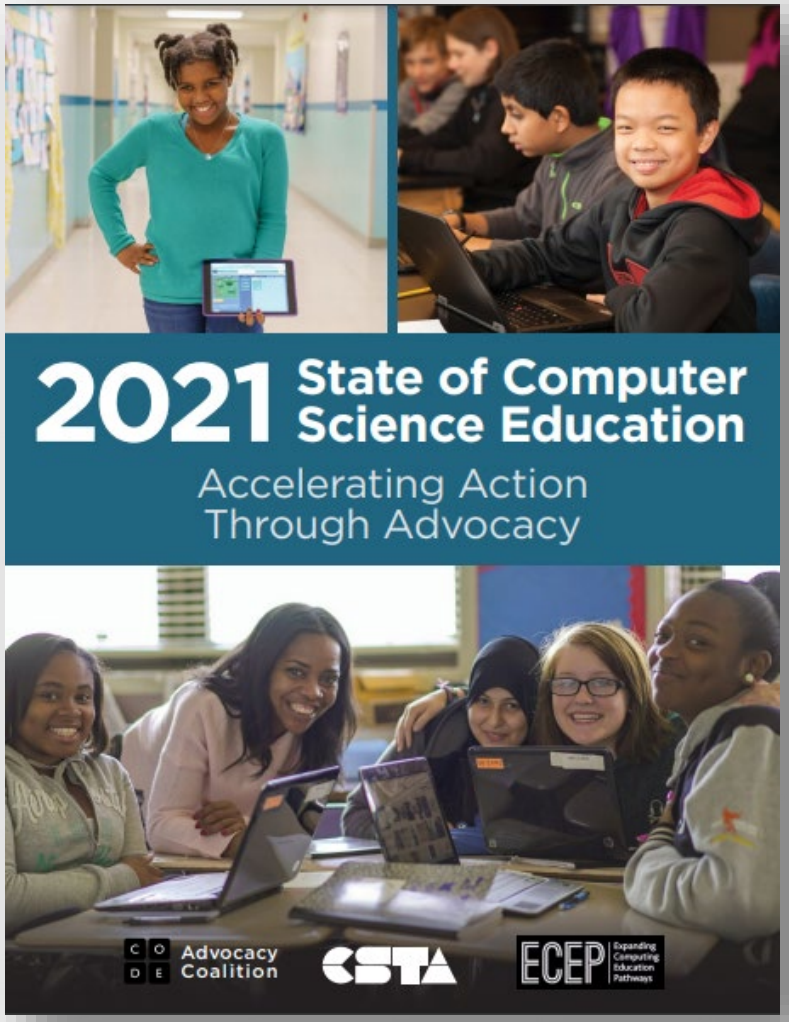
“the study of computers and algorithmic processes, including their principles, their hardware and software

“means logical reasoning, computing systems, networks and the internet, data and analysis, algorithms and

These definitions and how they are interpreted matter. It impacts how organization’s measure access and participation data.

https://codes.ohio.gov/ohio-revised-code/section-3301.012

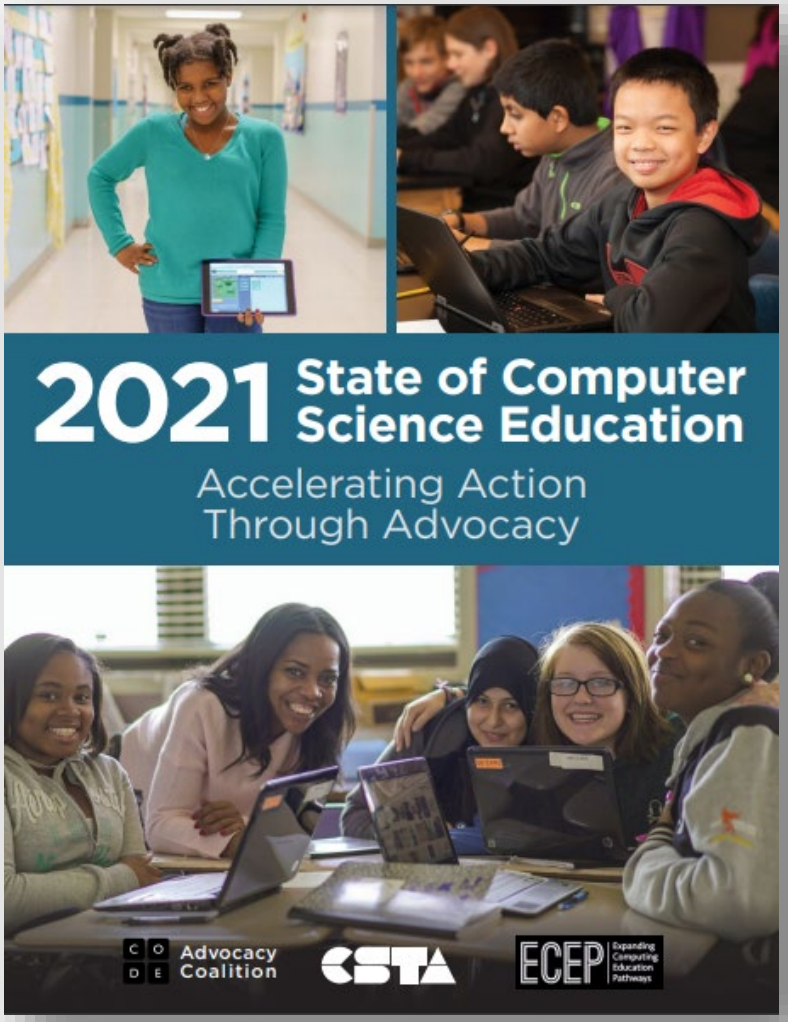
2021 State of Computer Science Education



Must include instruction in foundational computer science (as defined by CSTA and the K-12 CS framework[1]).

Must include a minimum amount of time applying learned concepts through programming (at least 20 hours of programming/ coding for grades 9–12 high schools).

2021 State of Computer Science Education



Total courses included:

12

Grades included: 9-12

2021 State of Computer Science Education

Course Examples
(examples identified by highest enrollment)

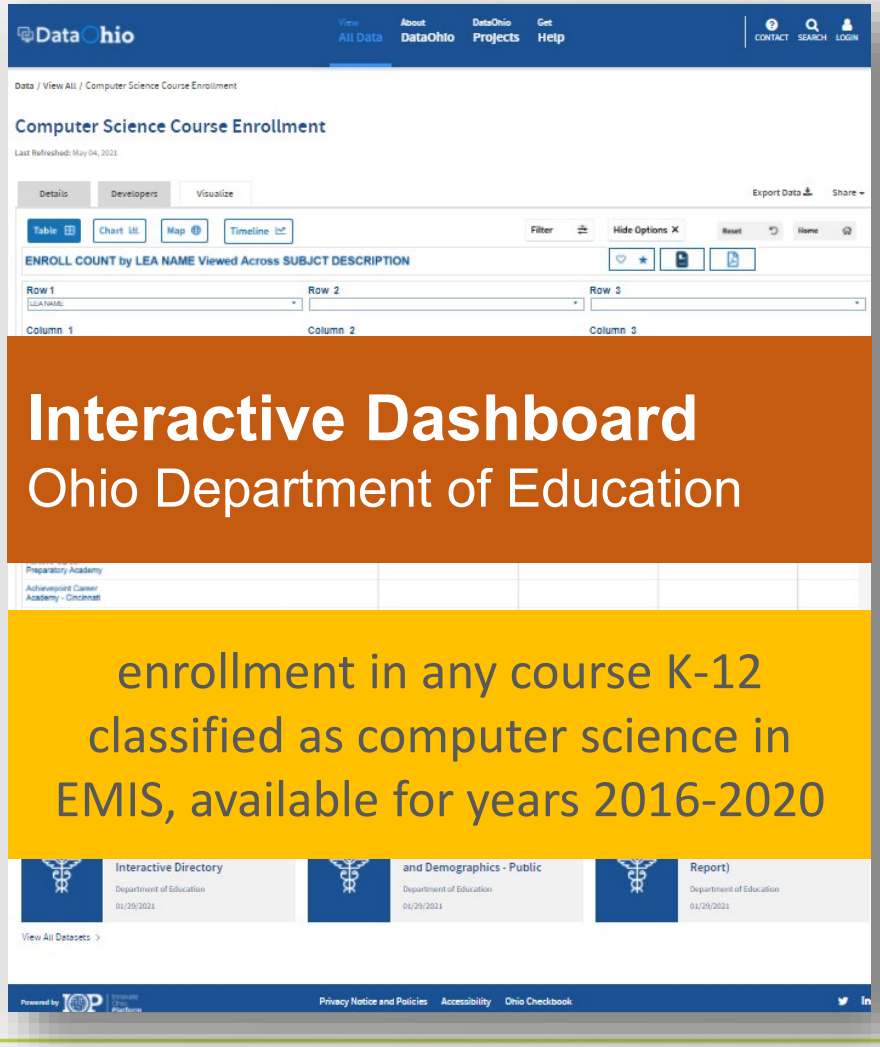
Computer Programming and Software Development
Students **design, develop, test and implement computer programs** using structural/procedural, objective oriented, data description, scripting/control, and/or mark-up languages. Content should be based on National Business Education Association (NBEA) content standards. Only grade 9-12 courses based on standards from the 9-12 grade band of NBEA Standards are eligible for high school credit. (031700)

Computer Science
Course includes **study and use of programming languages**, i.e., BASIC, COBOL, DOS, Visual BASIC, C++, HTML, XML, MSDN, etc. Topics also include operating systems, servers, networks, etc. (290200)

12 courses [enrollment in SY2020]

1. Computer Programming and Software Development [6,662]
2. Computer Science [6,037]
3. Programming [5,767]
4. Robotics [2,821]
5. Computer Science A [1,859]
6. Computer Science Principles [1,696]
7. Game Design [1,180]
8. Computer and Mobile Applications [695]
9. Object Oriented Programming [531]
10. Visual Programming [495]
11. Computer Science AB (290320) [219]
12. IB Computer Science (321600) [59]

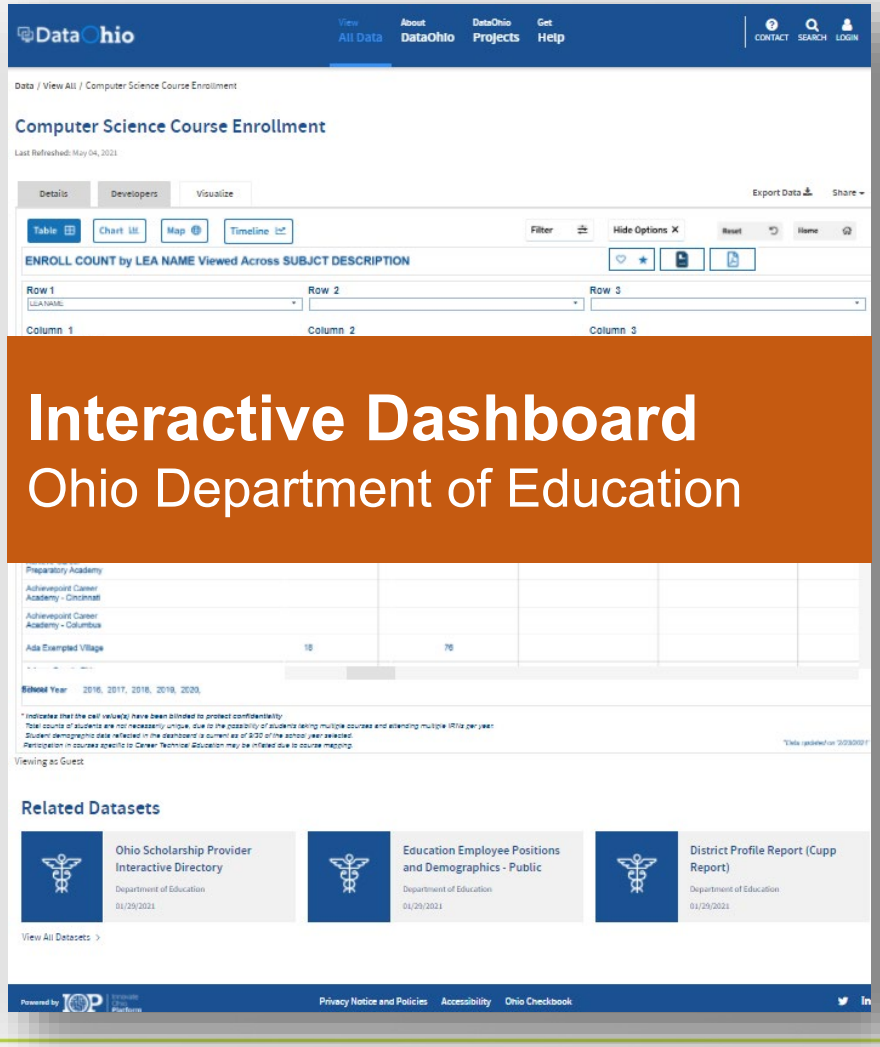
Ohio's Computer Science Data Dashboard



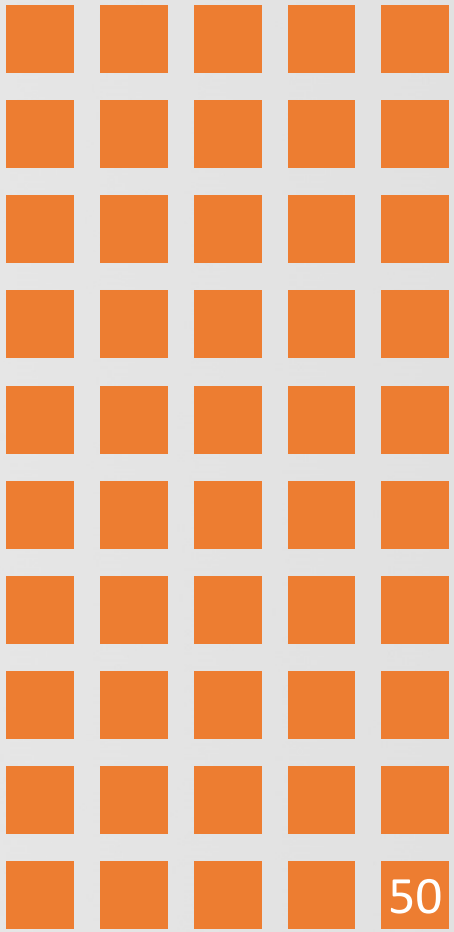
All courses the Ohio Department of Education has classified as computer science based on the definition of Computer Science identified in legislation for Ohio[2].

Total counts of students are not necessarily unique due to the possibility of students taking multiple courses and attending multiple IRNs per year.

Ohio's Data Dashboard



Total courses included:



*Note: recent updates in EMIS are not yet reflected in this historical data

Ohio's Data Dashboard

Course Examples
(examples identified by highest enrollment)

Computer/Multimedia Literacy 4-6 (290040)
Includes content in the 4-6 portion of Ohio's academic content standards for technology that focuses on the use of **educational technology** for learning.

Computer/Multimedia Literacy K-3 (290035)
Includes content in the K-3 portion of Ohio's academic content standards for technology that focuses on the use of **educational technology** for learning.

Computer/Multimedia Literacy 7-8 (290035)
Includes content in the 7-8 portion of Ohio's academic content standards for technology including **keyboarding, word processing, productivity, communication and information tools.**

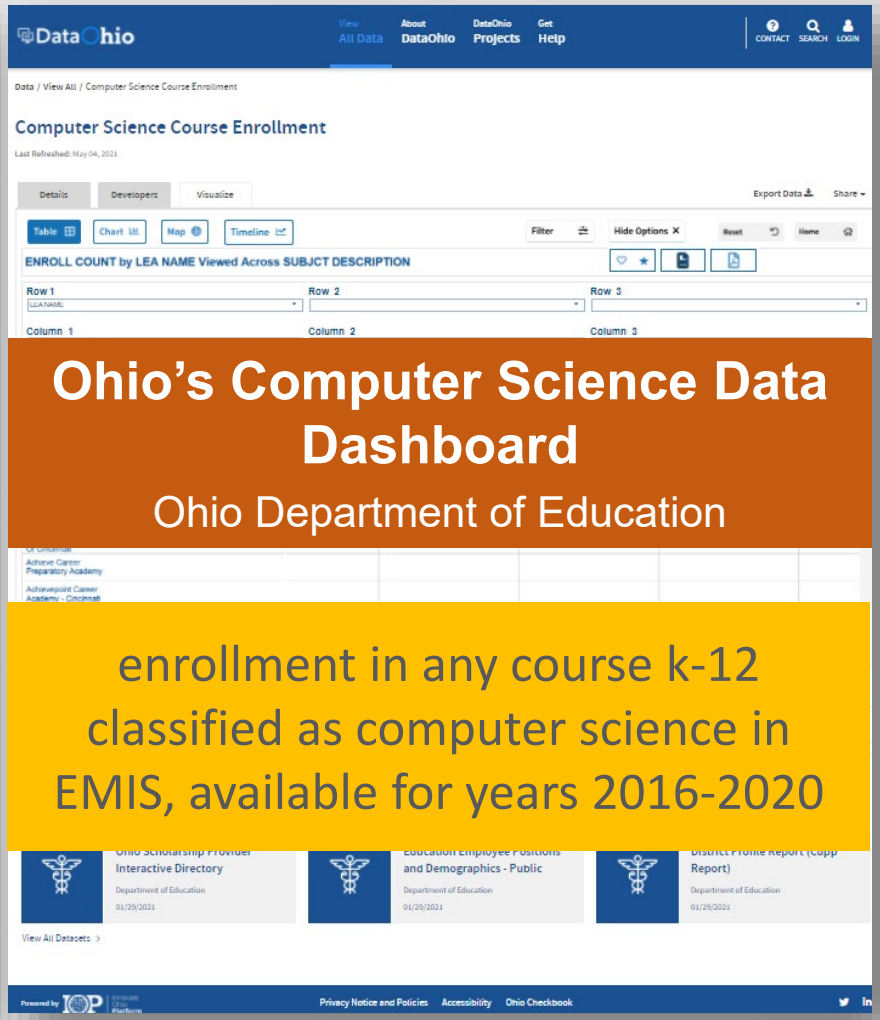
Top 12 courses by enrollment in SY2020

1. Computer/Multimedia Literacy 4-6 [77,544]
2. Computer/Multimedia Literacy K-3 [73,700]
3. Computer/Multimedia Literacy 7-8 [50,821]
4. Information Technology [25,037]
5. Technology-Productivity Tools [22,656]
6. Computer/Multimedia Literacy [11,689]
7. Other Computer Technology [11,110]
8. Computer Programming and Software Development [6,662]
9. Computer Science [6,037]
10. Programming [5,767]
11. Computer Hardware [3,986]
12. Technology- Communication Tools [3,778]

See note section for all courses including enrollment in SY2020

Two Sources | Questions

access to foundational computer science in high school



enrollment in any course k-12 classified as computer science in EMIS, available for years 2016-2020

State of CS in Ohio | By the Numbers

Access Data

SCCS

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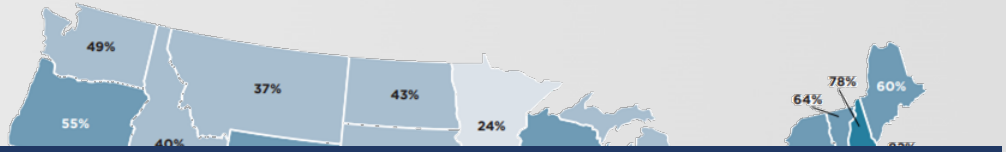
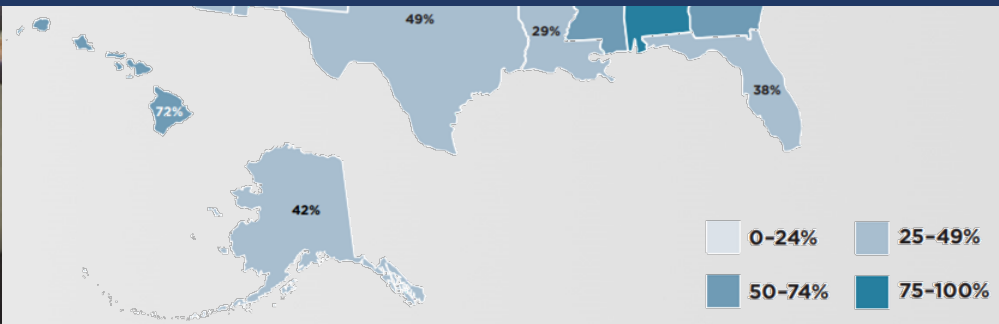
Why use this data?

Percent of Public High Schools Offering Foundational Computer Science



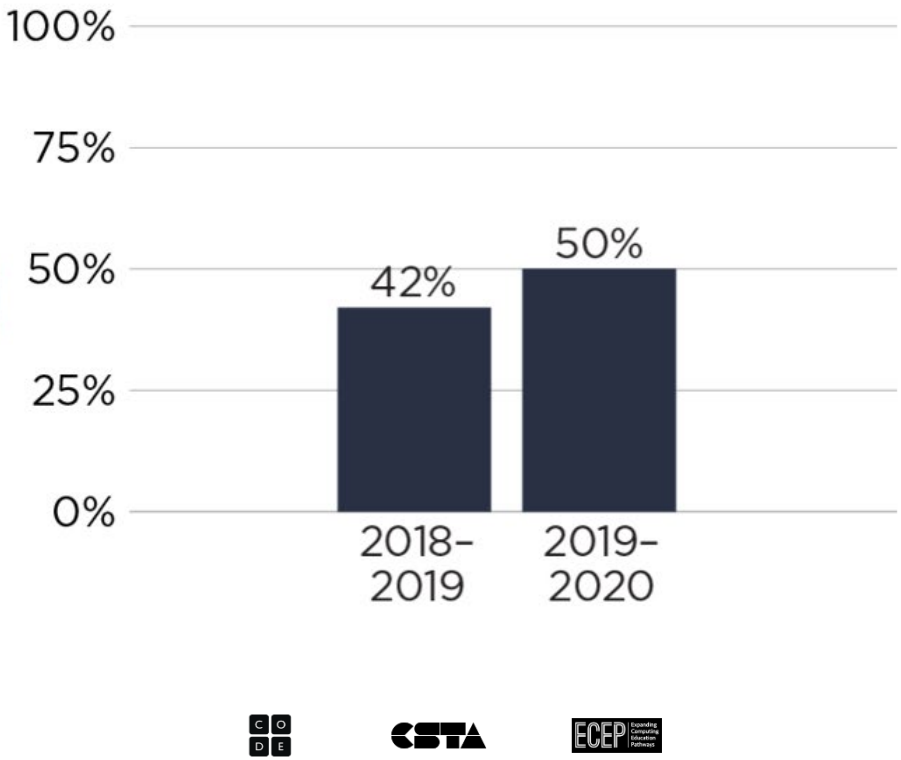
Provides for national comparison



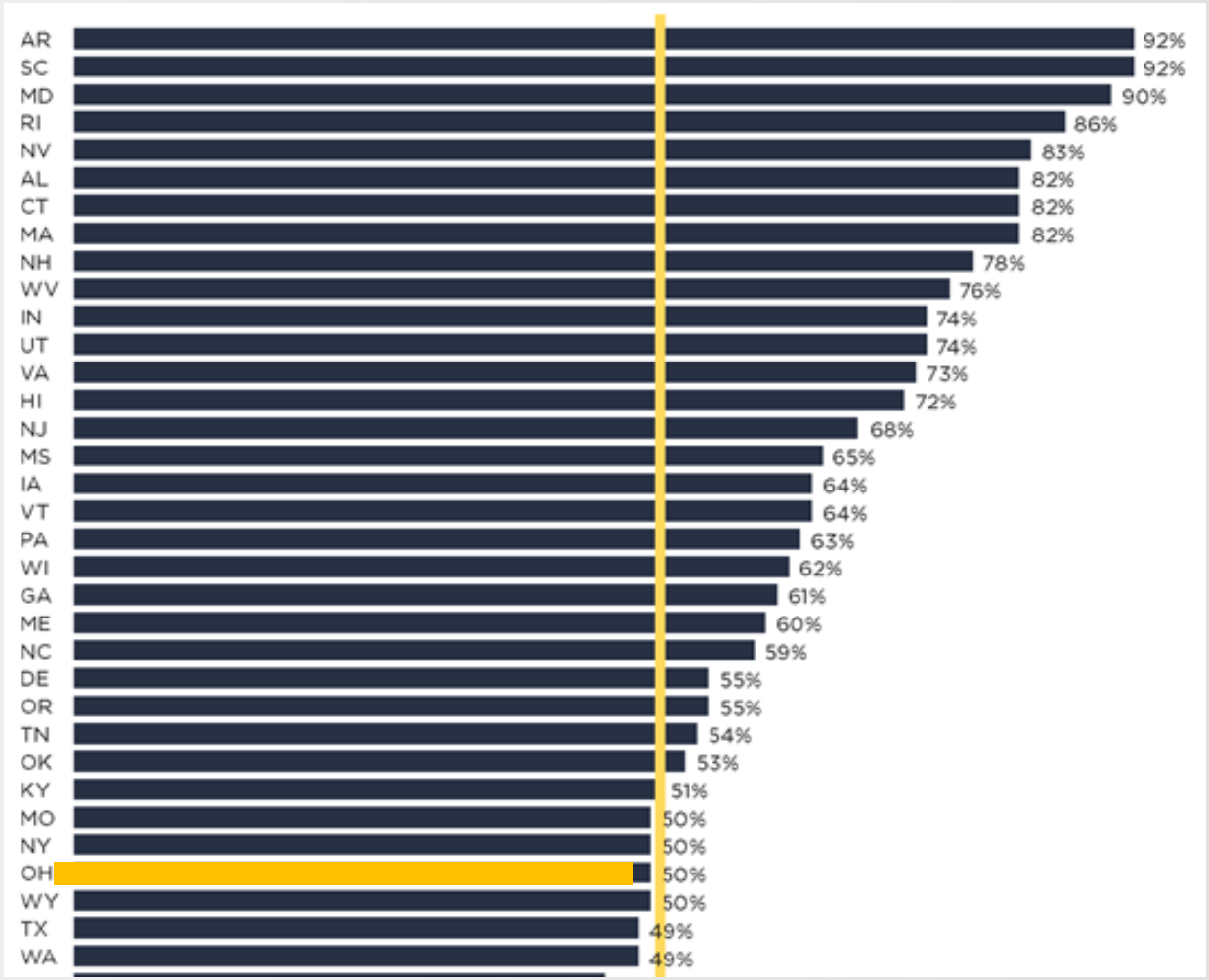
Access: Percentage of Public High Schools Offering Foundational Computer Science

Ohio High Schools Offering Computer Science

Percentage Access by School Year

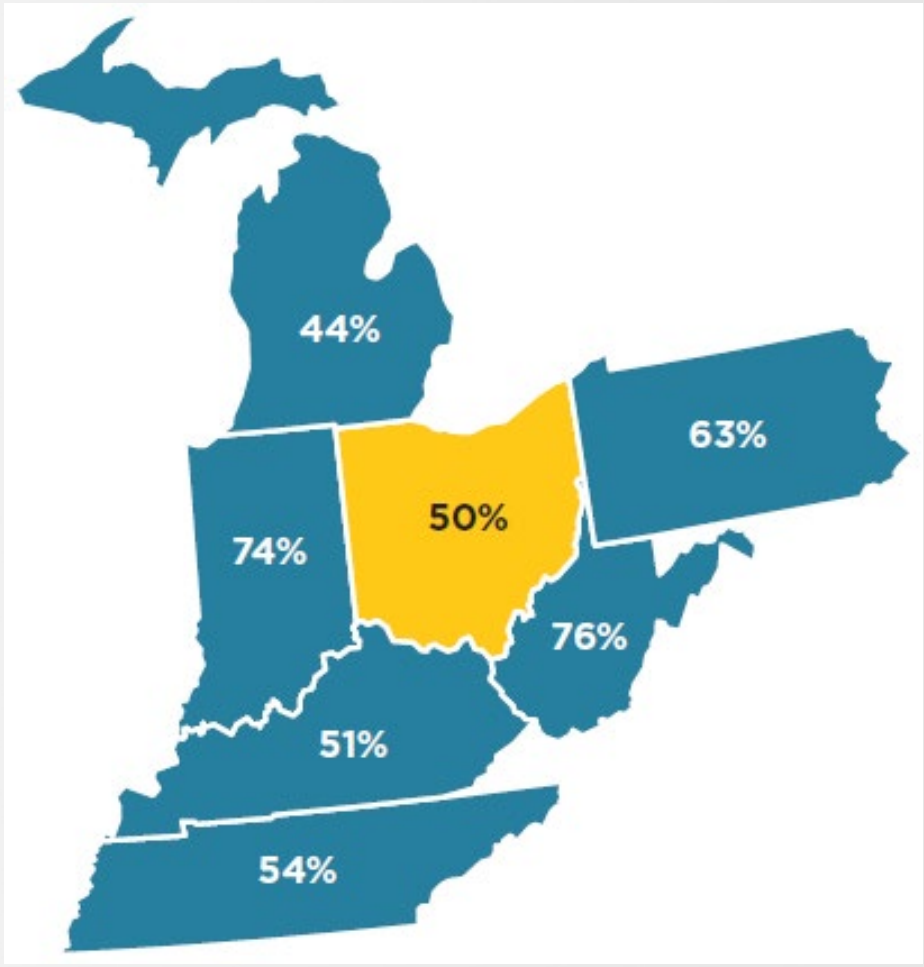


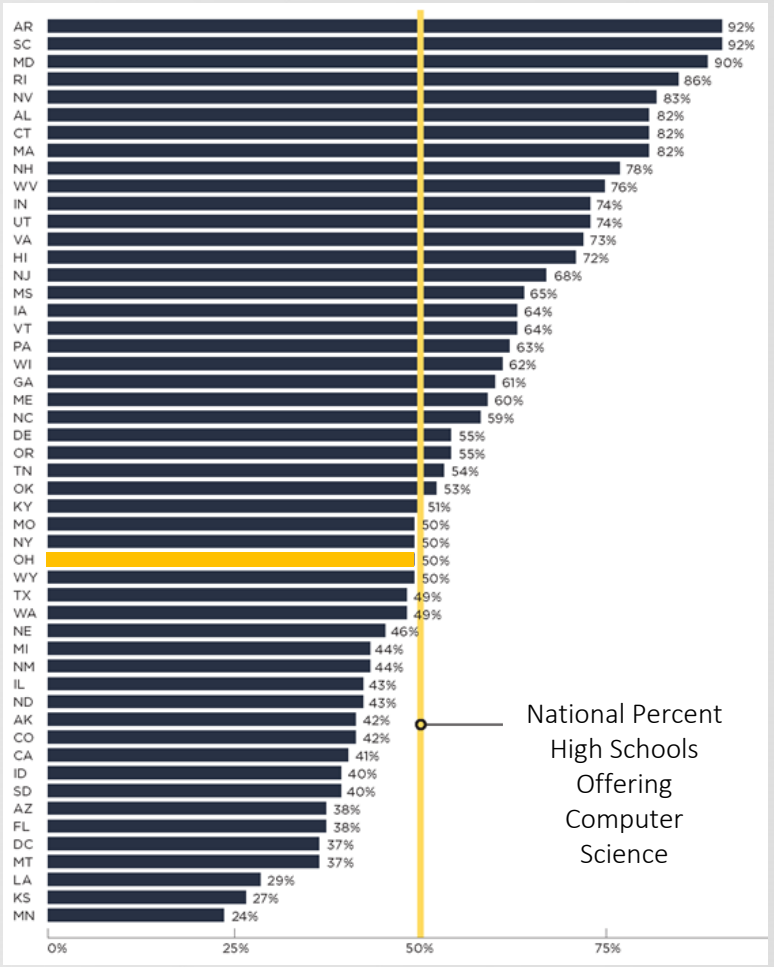
31st in High Schools Offering Computer Science



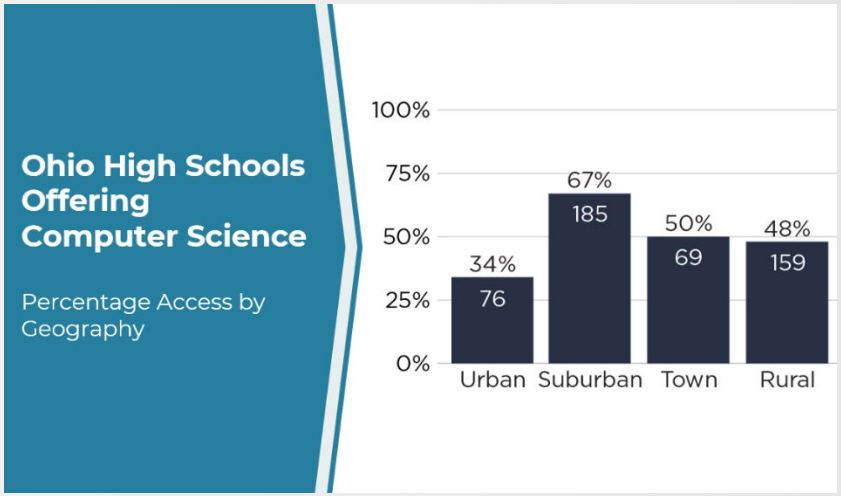
National Percent High Schools Offering Computer Science

Access : How does Ohio compare?

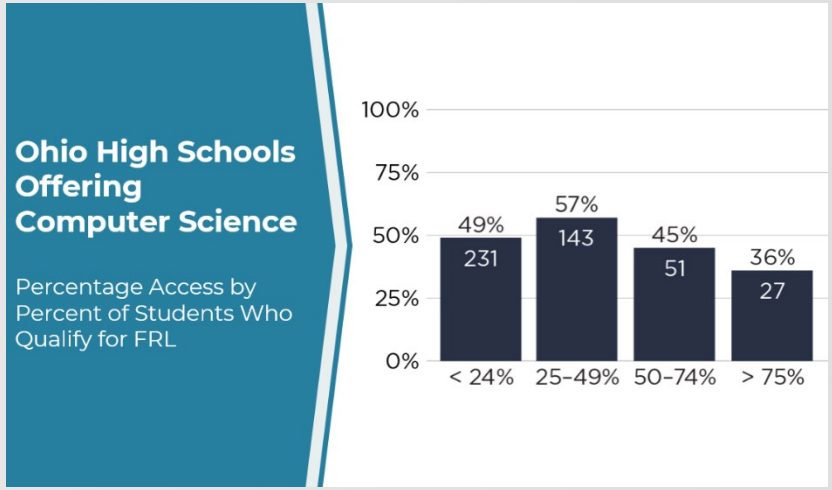




Access: Percentage of Public High Schools Offering Foundational Computer Science

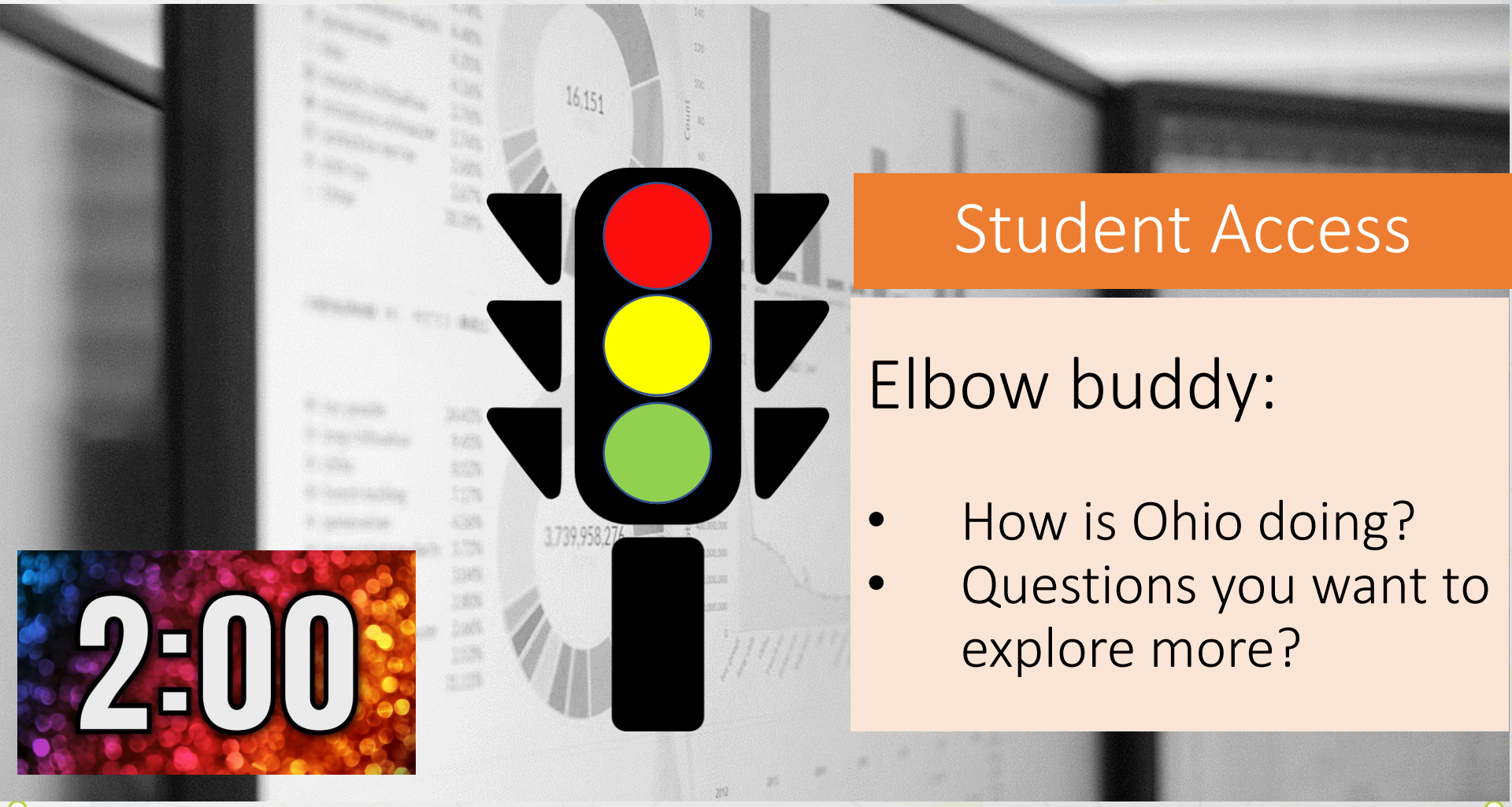


NCES Education Demographic and Geographic Estimates (2019–20) report



NCES Digest of Education Statistics Table 204.10 (2018–19)

State of CS in Ohio | By the Numbers



Student Access

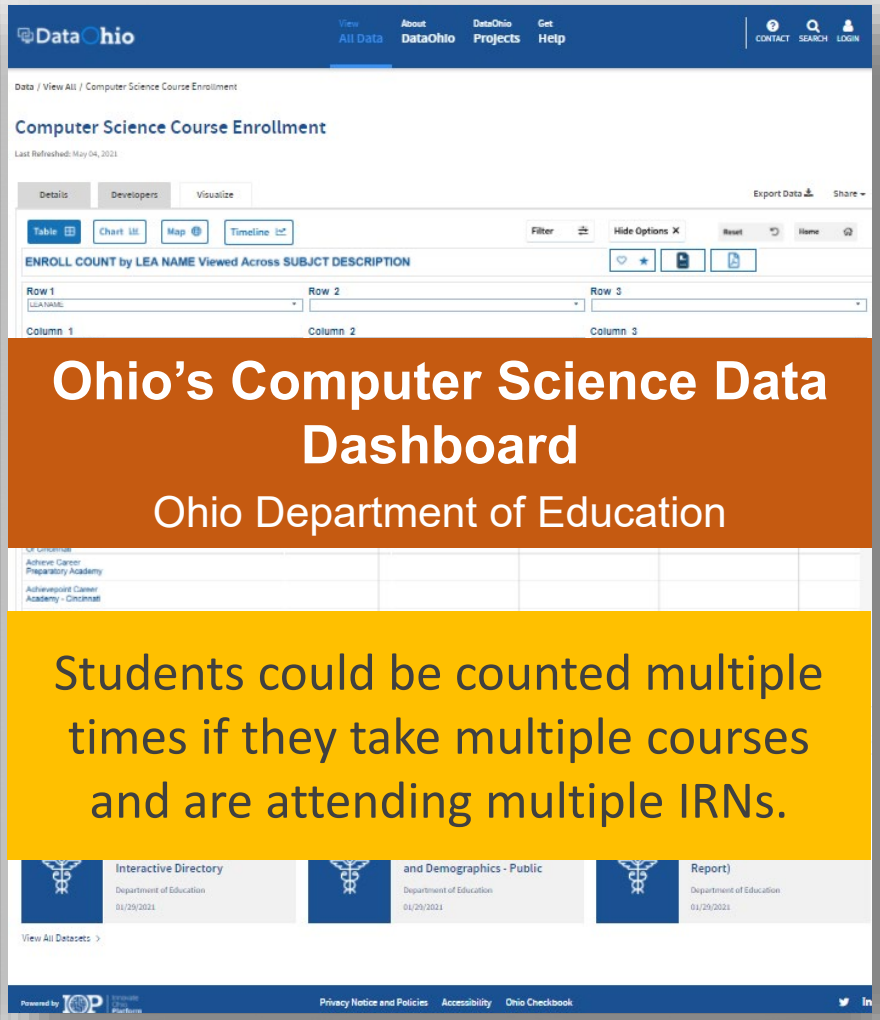
Elbow buddy:

- How is Ohio doing?
- Questions you want to explore more?

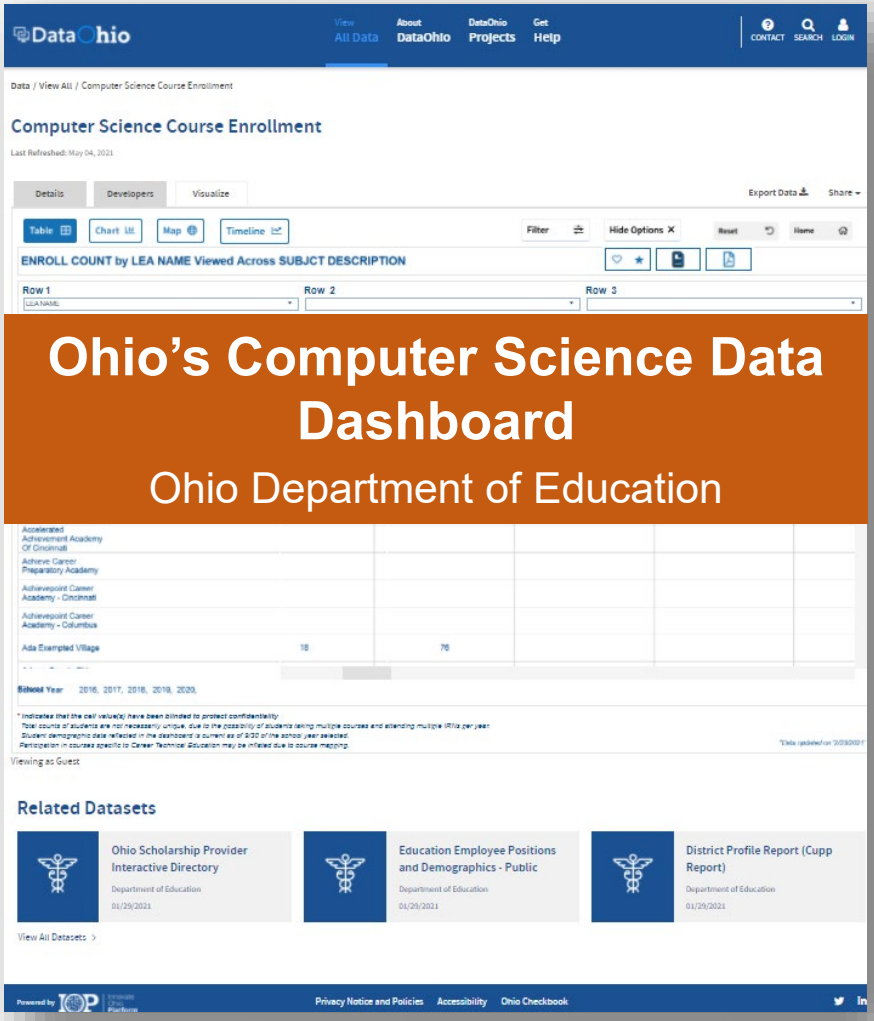
State of CS in Ohio | By the Numbers

Participation Data

Participation: Key difference between two data sets



Why use this data?

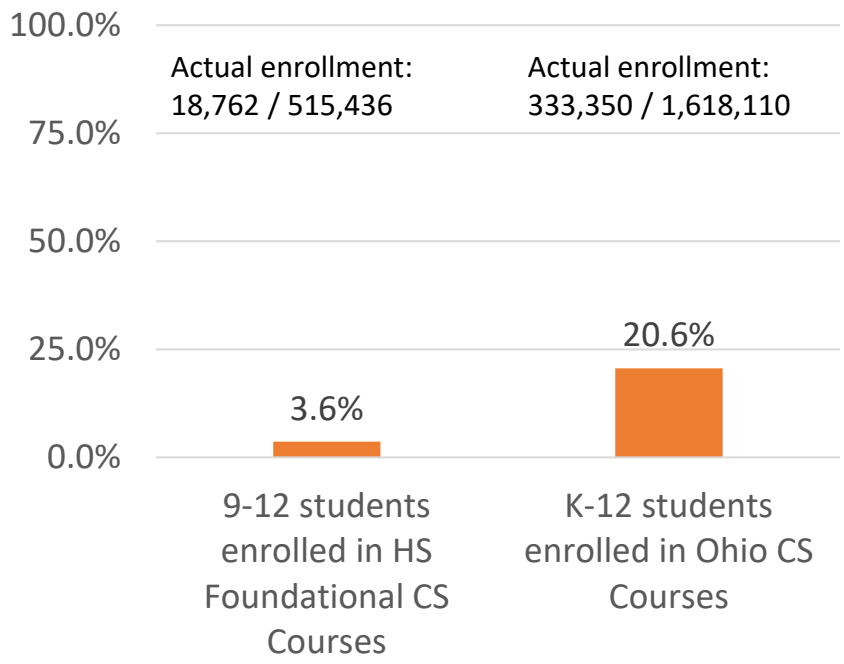


Benefits: Provides more information to us than just CS AP data.

Participation: In Computer Science

Data Dashboard

2020 Ohio Participation in Computer Science



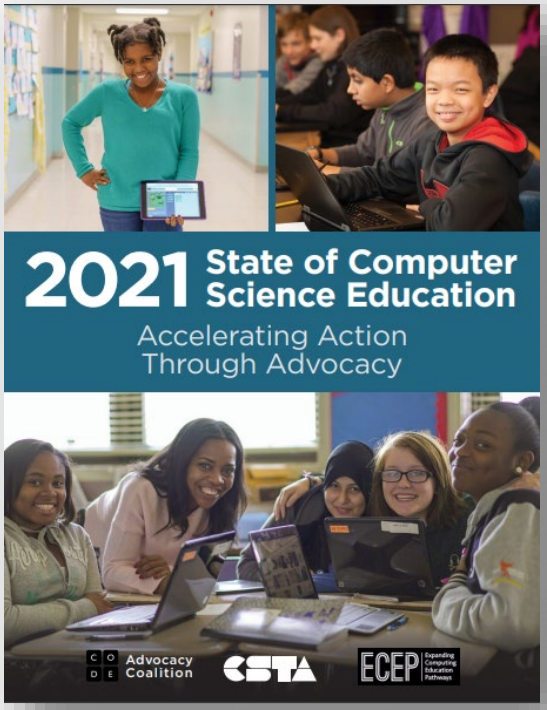
Total student enrollment in SY2020 comes from ODE Report Card Data

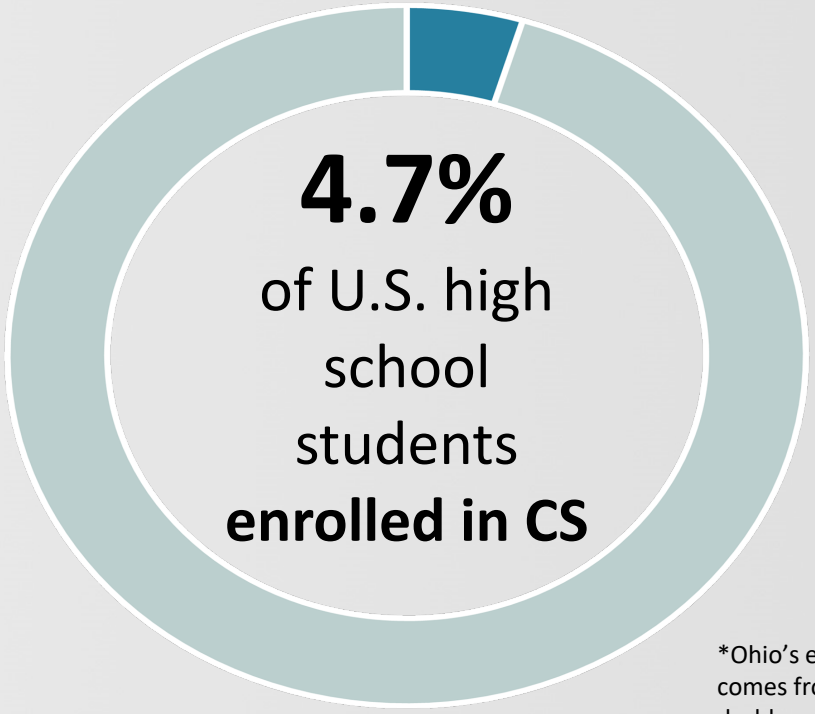
Foundational Courses includes all 12 courses as identified in the 2021 State of Computer Science Education Report

Ohio CS Courses includes all 50 courses classified as CS in Ohio's Education Management Information System (EMIS)

How does Ohio compare?

Policy	OH	IN	PA	IL	TX
Student Participation in Foundational CS in HS	3.6%*	4.7%	3.4%	4.1%	3.8%





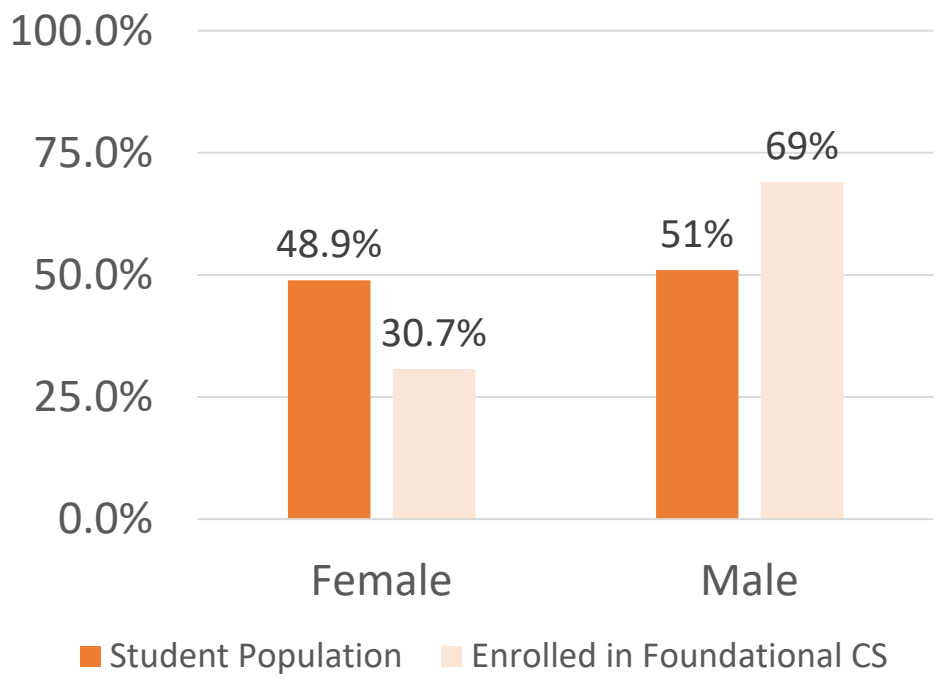
*Ohio's enrollment number comes from the Ohio data dashboard.

Participation: In Computer Science

Data Dashboard

2020 Ohio Participation in Computer Science

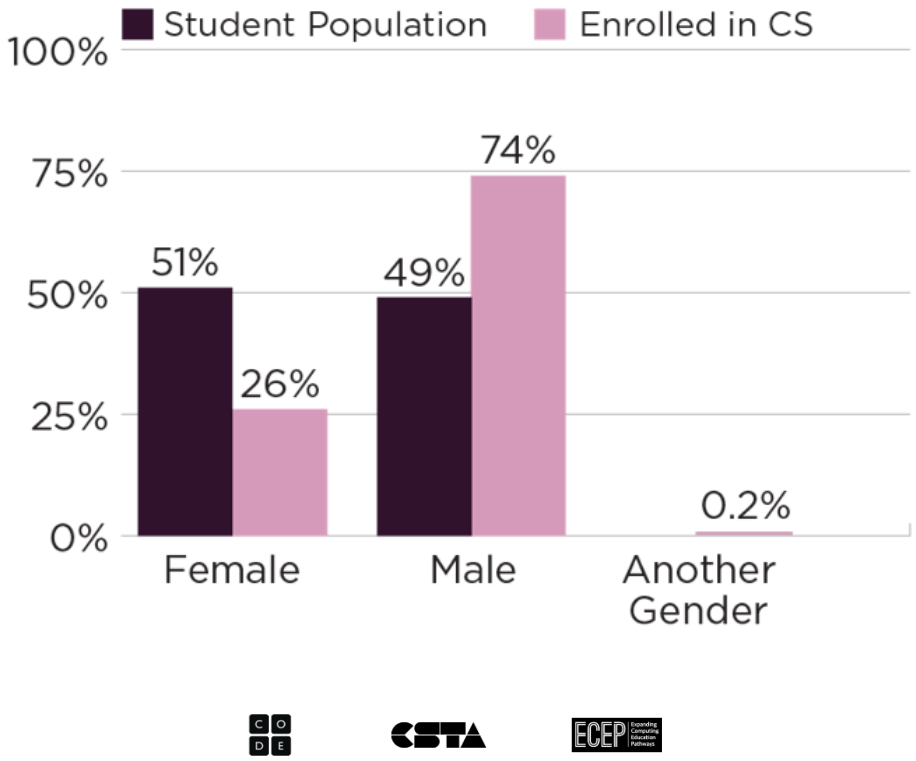
Enrollment by Gender



Participation: In AP Computer Science

Ohio Participation in AP Computer Science

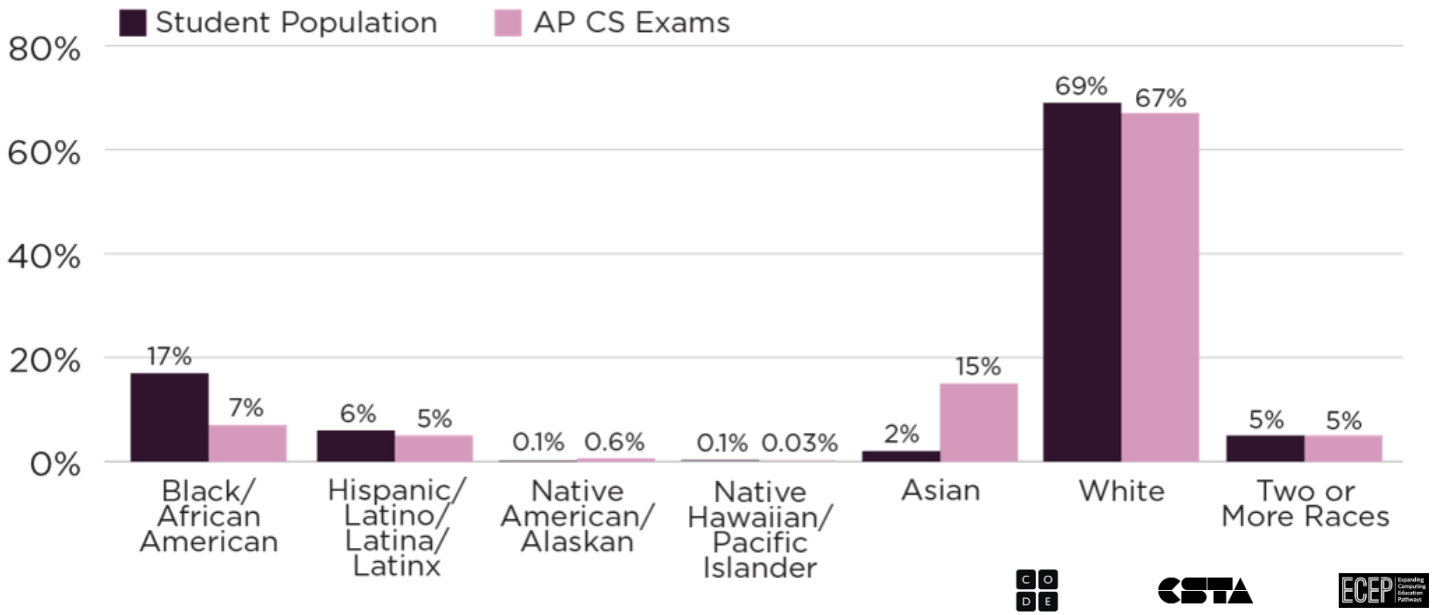
Percentage of Exams by Gender



Participation: In AP Computer Science

Ohio Participation in AP Computer Science

Percentage of Exams by Race/Ethnicity



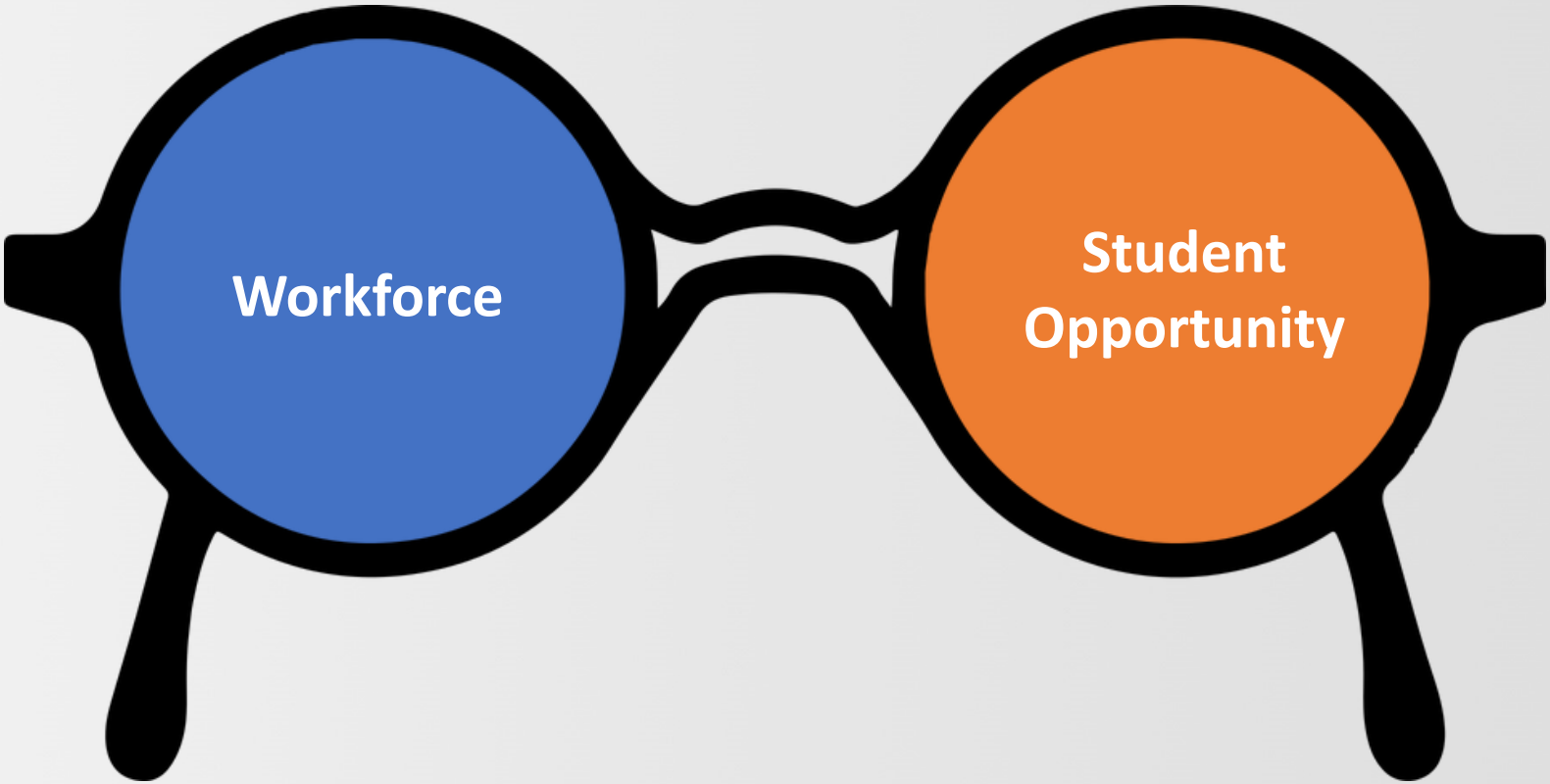
State of CS in Ohio | By the Numbers

Participation

Elbow buddy:

- How is Ohio doing?
- Questions you want to explore more?

Consider your filters



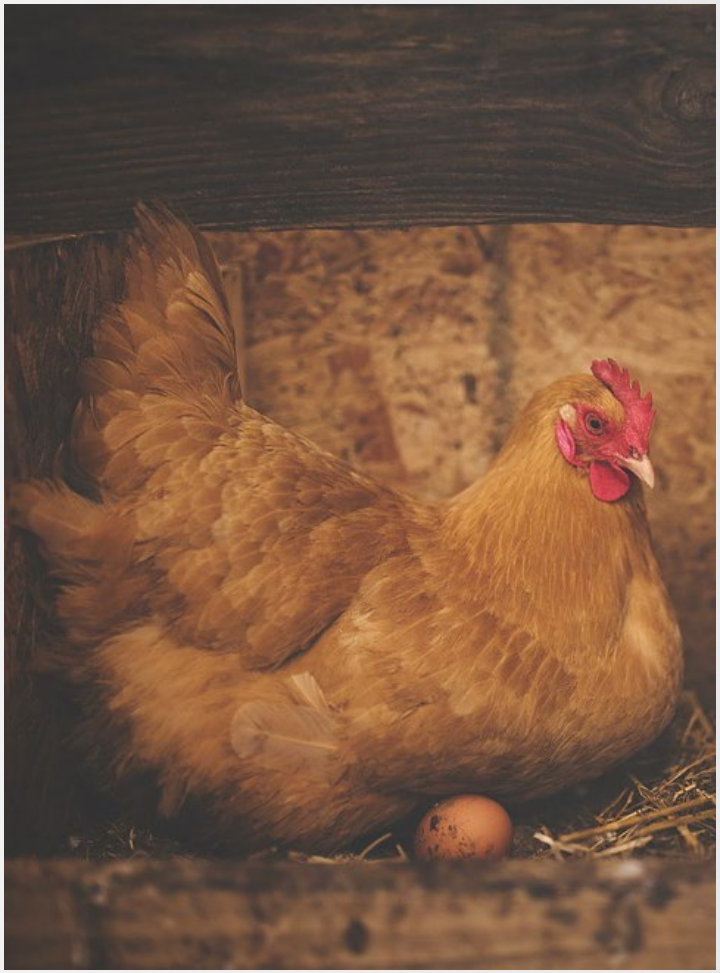
State of CS in Ohio | By the Numbers

Teacher Pipeline

National State of Teacher Shortages

- Public schools have struggled for years with teacher shortages, particularly in math, science, special education and languages.
- The coronavirus pandemic has exacerbated the problem.
  - According to a June survey of 2,690 members of the National Education Association, 32% said the pandemic drove **teachers to plan to leave the profession earlier than expected.**

Computer Science Teachers



- What is the current demand?
- What is the current supply?
- Coming soon: Ohio supply side data from ODE

Ohio Policy | Teacher Licensure

The three most common pathways are to:

1. Hold a full teaching license in computer science;

2. Hold a computer technology endorsement and have successfully passed the computer science Ohio Assessments for Educators (OAE) exam (currently OAE #054); or

3. Hold a full teaching license in any area and add computer science through a **supplemental pathway** (OAC 3301-24-14) that includes passing the computer science OAE exam.

State of CS in Ohio | State Policy

SCCS

STATE COMMITTEE ON **COMPUTER SCIENCE**

IN PARTNERSHIP WITH THE **OHIO DEPARTMENT OF EDUCATION** AND **OHIO DEPARTMENT OF HIGHER EDUCATION**

Computer Science Policy | 2017-2019

December 2017 | HB 170

- Defined CS & req state board to create K-12 CS standards
- Allowed Adv. CS to count for one (1) unit of math/science
- Created CS licensure, including a CS supplemental license
- Allowed CS to count toward graduation in more subjects
- Authorized schools, ESCs, etc to establish CS and Tech funds and accept donations

2018

- ODE created a CS education Program Specialist Position
- State BOE adopted K-12 CS Standards
- State BOE adopted CS Licensure exam

April/May 2019

- ODHE proposed new K-12 CS Endorsement programs

Computer Science Policy | 2019 - 2021

July 2019 | HB 166

- Appropriated $1.5 M for FY2020 for teachers to cover content and exams, but fund use was severely limited by rules
- Established 2-year moratorium on teacher certification (CS) requirement to address qualified teacher shortage
- CS can count towards world language when required for graduation

September 2021 | ODE

- ODE updates EMIS codes to add courses aligned to state CS standards

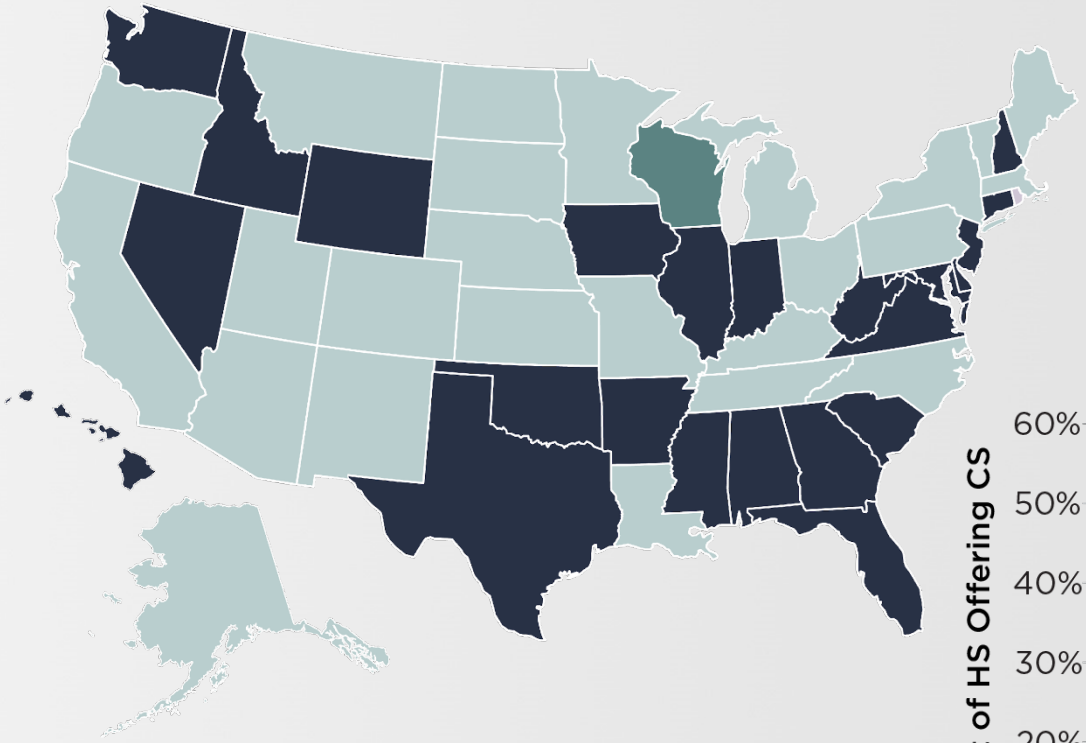
June 2021 | HB 110

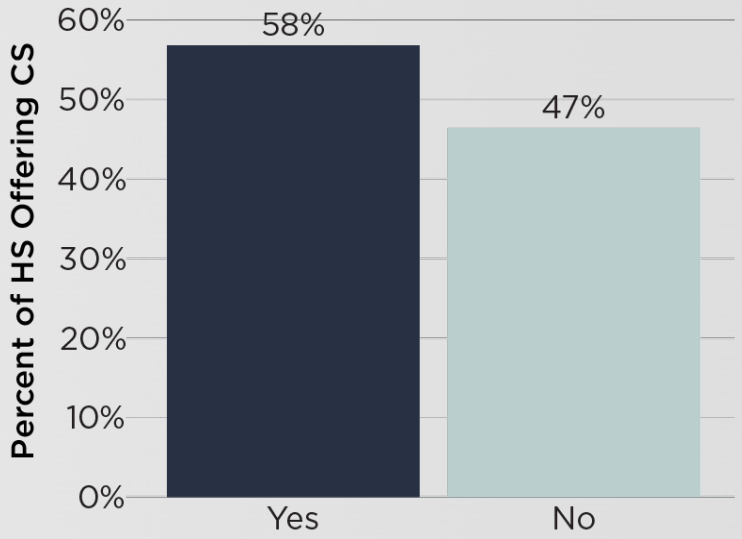
- **Requires ODE and ODHE to establish a committee to develop a K-12 state plan for CS education**
- Extended moratorium by 2 years through 2023
- Requires ed prep programs to require candidates to receive instruction in computer science & computational thinking
- Specifies that each state university shall recognize the successful completion of a course in advanced CS (aligned to state standards) in high school.

Ohio Policy | How does Ohio compare?

Policy	OH	IN	PA	IL	TX
State CS Plan	In progress	✓			
K-12 CS Standards	✓	✓	✓	In progress	
Funding for Teacher PD	$1.5M	$12.6M	$56M		$2.6M
Teacher Certification	✓	✓	✓	✓	✓
Preservice Programs	✓	✓	✓		✓
State CS Supervisor	✓	✓	✓		
All High Schools Offer		✓		✓	✓
Graduation Credit	✓	✓	✓	✓	✓
Higher Ed Admission	✓	✓		✓	✓

23 states require all HS to offer Computer Science





National Policy Landscape
CS graduation requirement laws

State	Student Requirements	Funding	Course Requirements
Arkansas	Act 414 (2021) required all students to take CS to graduate.	$21M for CS since 2015	All elementary, middle, and high schools must offer CS.
South Carolina	All students must take one credit of CS to graduate. Multiple CS courses are approved to meet the credit.	$3.1M for CS since 2017.	The SC Department of Education requires all high schools to offer at least one CS course.
Nevada	All students are required to receive instruction in computer education before 6th grade. All students must earn one half-credit in computer education and technology.	$4M for CS since 2017.	All high schools are required to offer a CS course by the 2022–23 school year.

Of note from these states

- 2021 State of Computer Science Education (code.org report)
  - 21% of South Carolina students are enrolled in foundational computer science education courses, the highest rate in the country
  - South Carolina tied with Arkansas for the highest rate of high schools offering computer science courses, with 92%

Small Group Discussion

Talent:
Industry Need
+ Supply of CS Graduates
(slides 28-32)

K-12 Student Access:
Do schools offer
Computer Science
(slides 45-50)

K-12 Student Participation:
Are students enrolled in
Computer Science
(slides 52-59)

Teacher Pipeline:
Supply of teachers
prepared to teach CS
(slides 62-65)

Structured Discussion

Step 1: Choose one of the four focus areas:

1. Talent: Industry Need + Supply of Graduates
2. K-12 Access: Do schools offer Computer Science
3. K-12 Student Participation: Are students enrolled in Computer Science
4. Teacher Pipeline: Supply of teachers prepared to teach Computer Science

Step 2: Ensure each group has at least one individual from PreK-12, Post-Secondary, Business, Nonprofit

Step 3: 16 total minutes (Spend about 4 minutes per poster)

Small Group Discussion

1. Capture questions you have about your topic (*may include data questions*)
2. Opportunities and Challenges you see for this topic *(remember to consider various stakeholder group filters: students, teachers, schools, industry, communities, etc)*
3. Additional data sources on this topic you can bring to this landscape study
4. Capture your groups vision for CS education for Ohio

Chalk Talk / Gallery Walk

What is it?

- A way to do reflection, generate ideas, and solve problems.
- Can be done in silence to encourage thoughtful contemplation.

Process

- Read what is posted
- Add “+1” for items you agree with and want to emphasize
- Add additional thoughts, questions and comments to the blank sheet next to the groups work.

Our Charge – HB 110 - continued

(D) Within the plan, the committee … shall include all of the following:

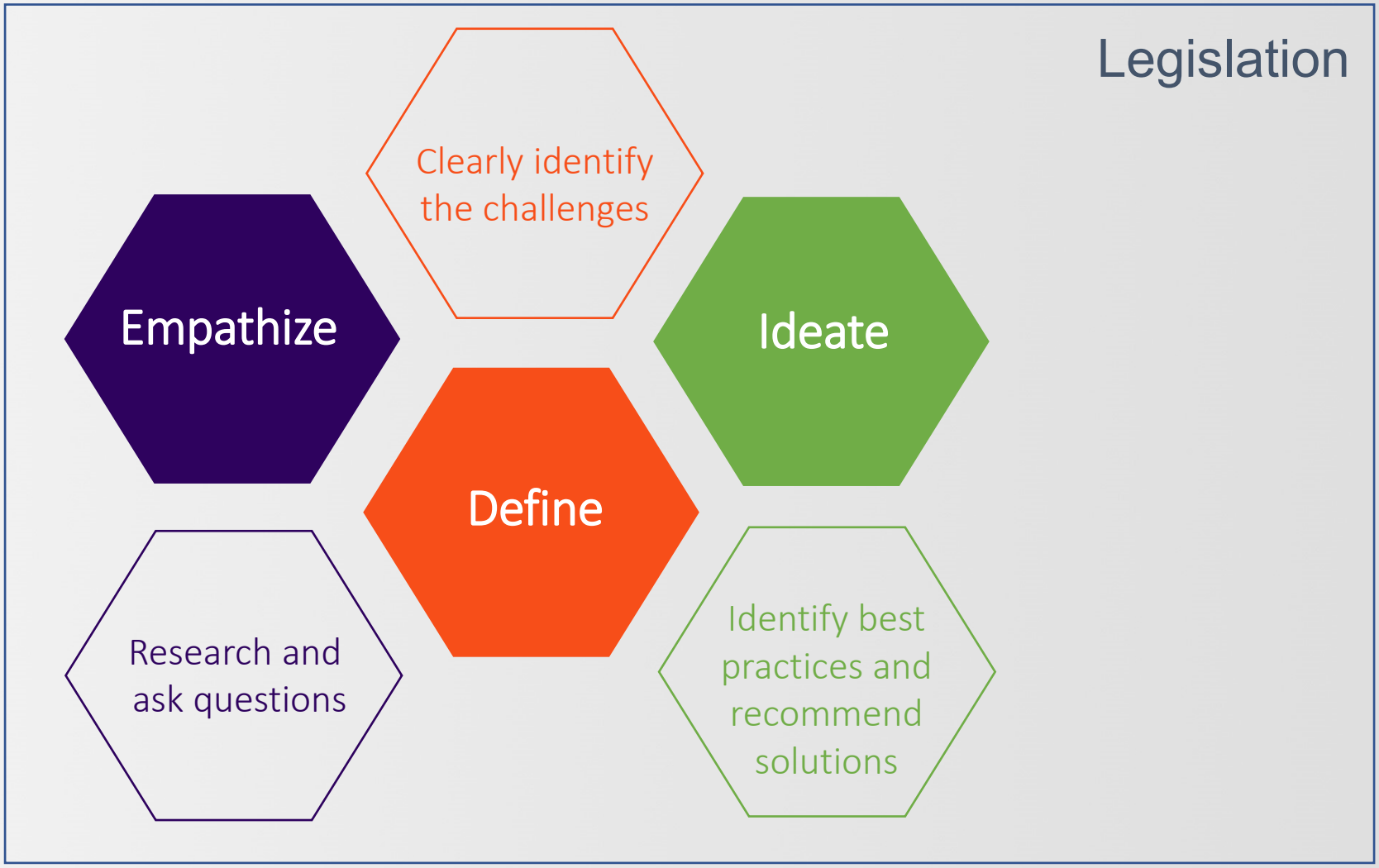
(1) An examination of the challenges that prevent school districts from offering computer science courses;

(2) A requirement that the department of education collect any data regarding computer science courses offered by school districts and school buildings operated by school districts, including the names of the courses and whether the courses were developed using the standards and model curriculum ...and post the collected data on its web site.

(3) A requirement that the committee determine the best ways to compile data on computer science courses, teachers, and undergraduate students studying computer science in universities.

(4) Any findings the committee determines appropriate based on its consideration of the topics described in division (B) of this section.

Next few meetings



Homework

Identify three opportunities or challenges that if addressed could make Ohio a leader in computer science.

Opportunity or Challenge	Connection to charge or Ohio's goal to be a national leader?	**Rationale:** **Why is this a challenge or opportunity we should have at the top of our list? Do you have additional data sources that would be useful?**	**Initial ideas on how to solve this problem**	**Questions you have?**

DUE DATE: EOB Thursday, December 2, 2021
Submit via form you will receive from Samantha Fallucco

Closing