STEM/STEAM & Computer Science: National Trends

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Your education policy team.

Jennifer Zinth

Who we are

The **essential**, **indispensable** member of any team addressing education policy.

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What we do

We believe in the power of **learning from experience** and we know informed policymakers create **better education policy**.

How we do it

RESEARCH

REPORT

COUNSEL

CONVENE

Overview of Presentation

- National trends re: STEAM and CS
  - ◆ Esp. increasing female, minority participation
  - ◆ CS as HS grad. requirement
  - ◆ AP CS to fulfill math grad. requirement
- Work-based learning opportunities

Strategies to increase female, minority participation

- Little evaluation data from state-level programs

- Some programs: Positive outcomes for female, minority students

Iowa: STEM Scale-Up

- Provides grants to support approved K-12 STEM programming

- Approved Scale-Up programs
  - On annual "menu" (here's 2018-19)
  - May be offered during school day or via extended day programs

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Iowa STEM Scale-Up: Programs demonstrate:

- Appeal to diverse youth

- Positive impact on academic performance

- Integration of STEM concepts

- School-business-community partnerships

- Financial sustainability (Iowa Governor's STEM Advisory Council STEM Scale-Up Program webpage)

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Iowa: STEM Scale-Up

- Grantees may be:
  - PK-12 public, private school teachers
  - Youth organization leaders
  - Home school associations
  - Informal education professionals
  - Others who provide STEM programming

- ≈ $3 million/year annually since FY14

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Iowa: STEM Scale-Up

STEM Scale-Up participants scored an average of 3 points higher in National Percentile Rank in math and reading, and 4 points higher in science, compared to all students statewide.

For minority students, the difference is greater: Scale-Up participants scored an average of 6 points higher in National Percentile Rank in math, 7 points higher in science and 6 points higher in reading compared to minority students who did not participate.
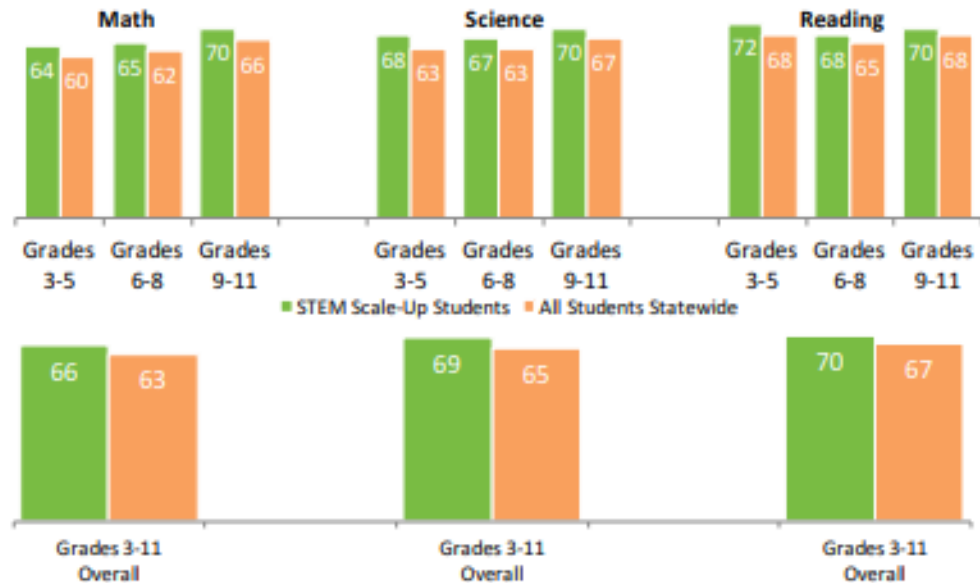
Source: 2016-2017 Iowa STEM Evaluation Report

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Iowa: STEM Teacher Externships

- Full-time, 6-week summer placements

- Secondary math, science, tech teachers

- ≤ $4,800 stipend + 1 graduate CE credit

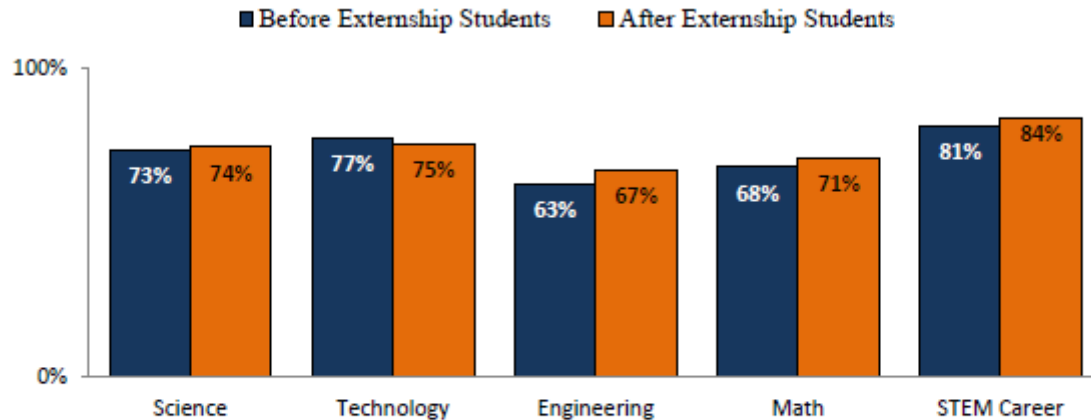# Iowa: STEM Teacher Externships

Figure 18: Students before and after a teacher extern's experience reporting that they were *somewhat* or *very interested* in STEM topics

Source: *Real-World Externships for Teachers of Math and Science: 2014-2015 Report of Findings*

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Iowa: STEM Teacher Externships

* Indicates significant difference at $p < .05$

- □ Before Externship Females
- ■ After Externship Females
- □ 2013-2014 Statewide Females
- ■ 2014-2015 Statewide Females

Science: 67%, 75%, 79%, 78%
Technology: 64%, 66%, 77%, 78%
Engineering: 42%, 48%, 65%, 60%
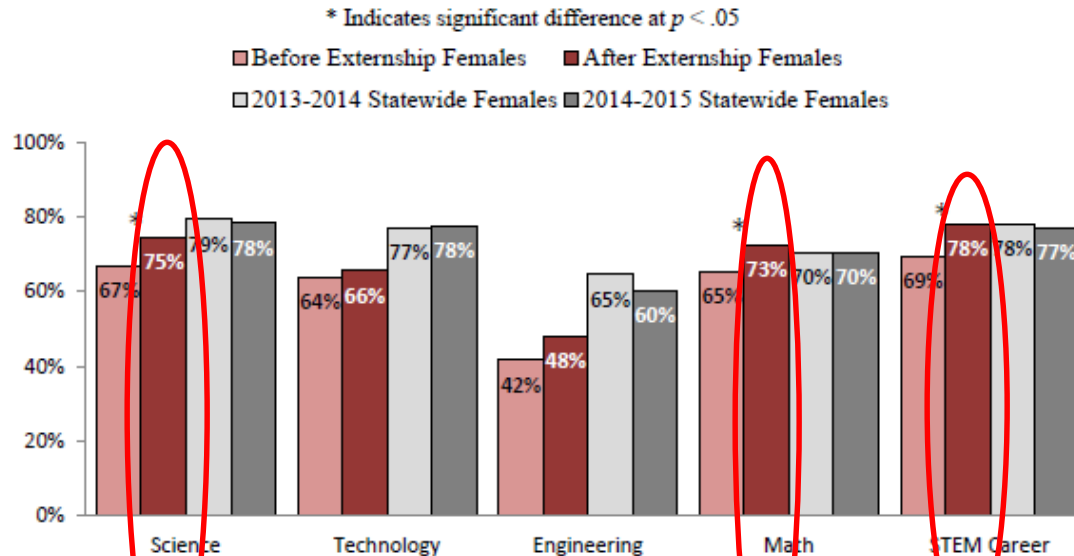**Math:** 65%, 73%, 70%, 70%
STEM Career: 69%, 78%, 78%, 77%

Figure 19: Female students in classes before and after the extern's experience and female students statewide reporting that they were *somewhat* or *very interested* in STEM topics or STEM careers

Source: *Real-World Externships for Teachers of Math and Science: 2014-2015 Report of Findings*

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Students solve game-based missions exposing them to an array of STEM careers

Why missions?

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Career awareness: Learning Blade

From [STEM in the Middle](#):

"Girls especially respond more to careers that help others"

"Women are attracted to engineering through the altruistic work that engineers do ... Yet high school girls often do not know what engineering is..."

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Career awareness: Learning Blade

Participating students indicate increased:

- STEM career awareness
- Awareness of relevance of learning to careers
- Interest in STEM careers and advanced coursetaking (TSIN Learning Blade Initiative Year One Final Report and related Battelle Report, STEMWorks evaluation)

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Career awareness: Learning Blade

- **Tennessee and Arkansas**: Statewide Learning Blade licenses

- **Idaho**: Competitive grants for licenses

- **Georgia** and **Ohio**: Piloting state initiatives

Computer Science

- How to expose to all students in a school?

- How are states integrating CS into high school graduation requirements?

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Arkansas: K-8 Embedded CS Standards

CS standards for K-4 and 5-8 to:

- Be embedded across other content areas.

- Be taught in an integrated manner, not in isolation.

- Support what is already being done in the classroom.

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No requirement for teacher of K-8 standards to have statewide CS endorsement.

Numerous PD opportunities statewide.

Source: ADE Computer Science Fact Sheet

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Arkansas: Coding Block for Grades 7 or 8

- All students receive instruction to meet [Coding Block for Grades 7 or 8 Standards](#)

- Teachers must hold AR state licensure in any content area

- School/teacher responsible for ensuring instructor has requisite knowledge.

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Schoolwide CS Exposure: AR Coding Block

- Standards in this block may be taught as:
  - 4-5 week module in keyboarding, business elective or career development
  - 4-5 week module in another course or time period
 - Part of HS-level programming course that school has been approved to teach to 7th & 8th graders

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States requiring all students to take CS

Key:
Purple: Statewide
Yellow: Technology may include CS course
Gray: Policy silent

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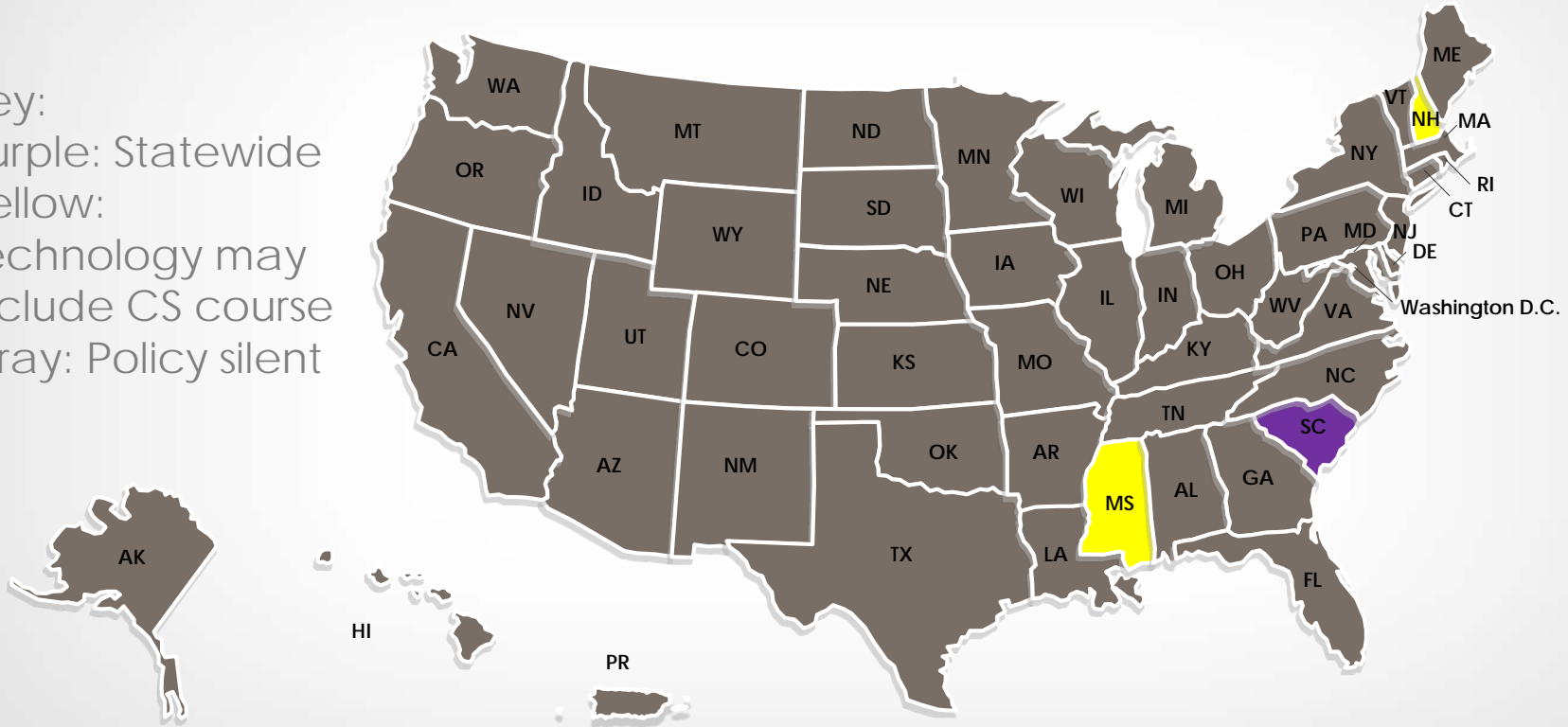
States allowing CS to fulfill core grad. credit reqt.

Key:
Purple: Statewide
Yellow: District decision
Gray: Policy silent

Source: Code.org, ECS

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www.ecs.org | @EdCommission
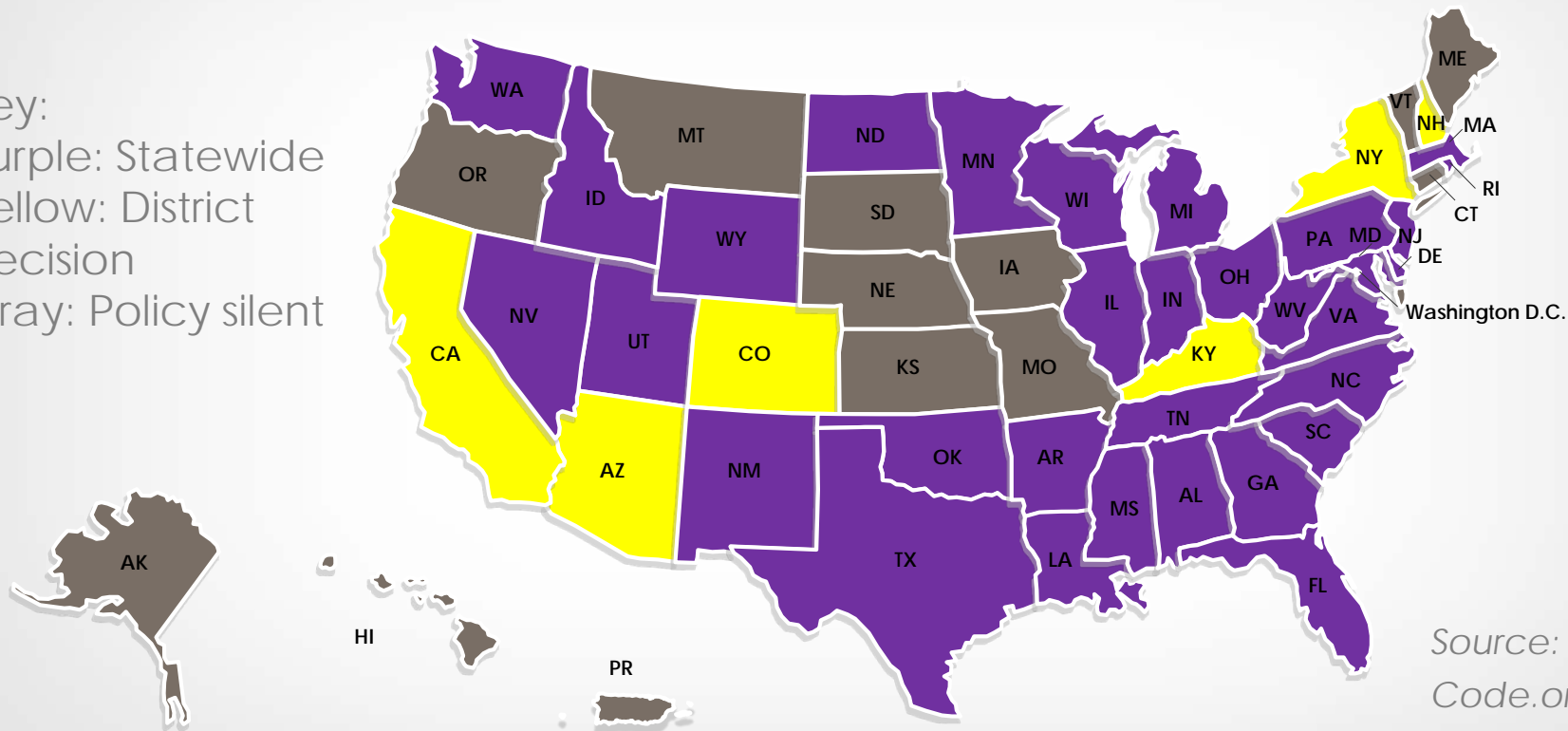
States allowing CS to fulfill math credit reqt.
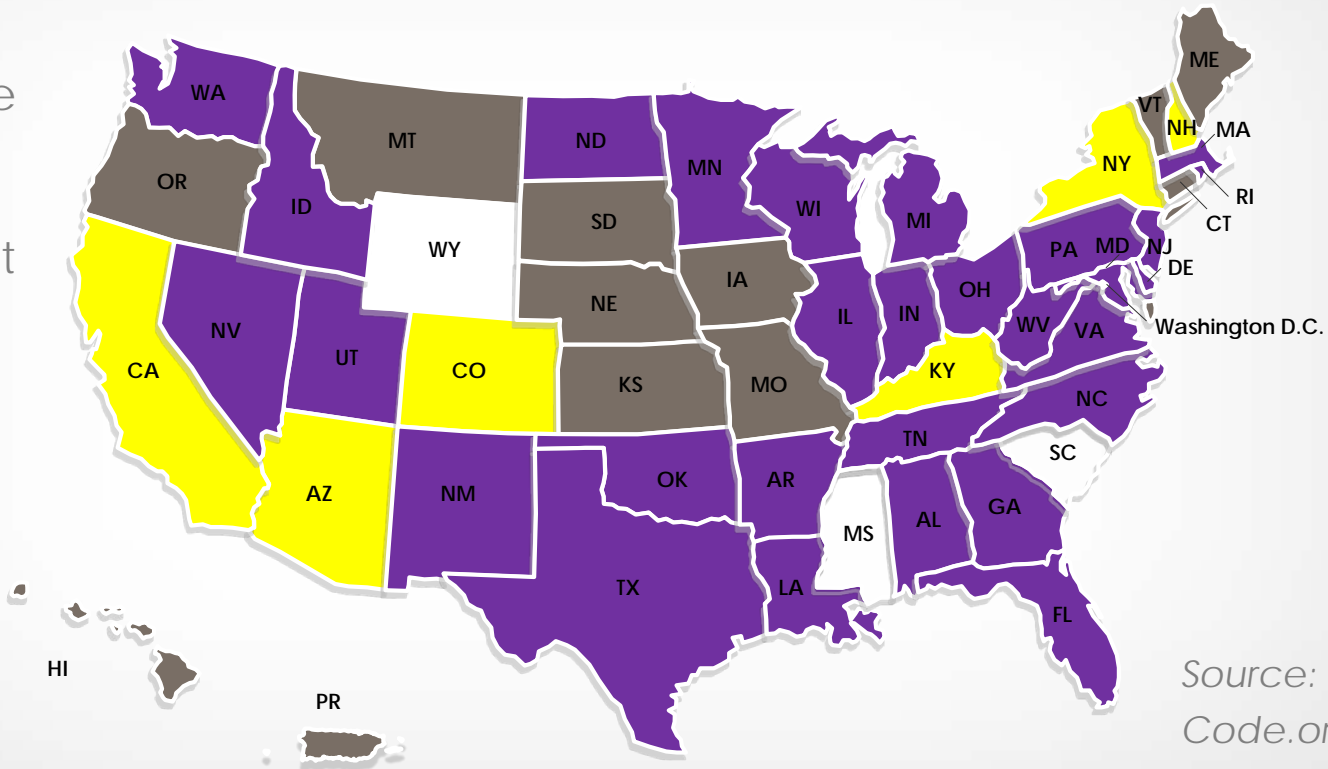
Key:
Purple: Statewide
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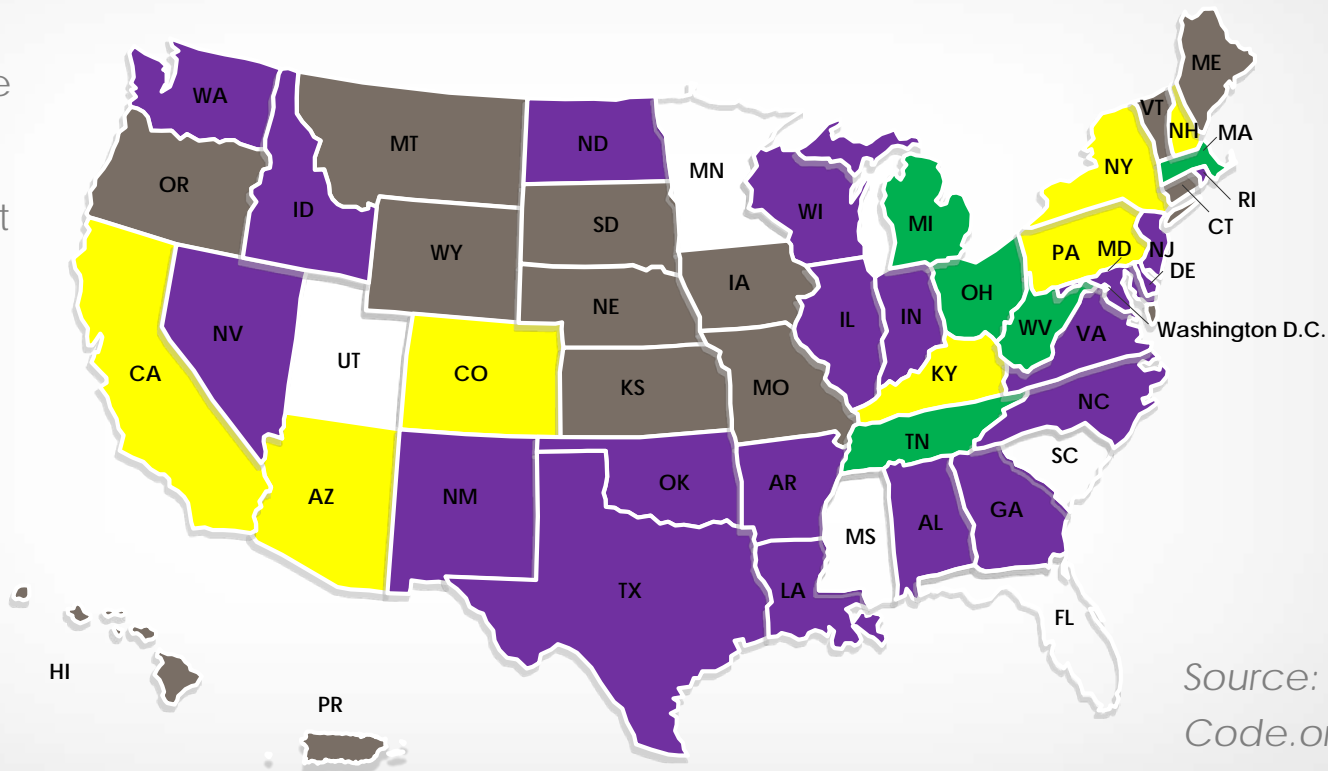White: CS may count as core credit, but not math credit

Source: Code.org, ECS

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States allowing AP CS to fulfill math credit reqt.

Key:
- Purple: Statewide
- Yellow: District decision
- Gray: Policy silent
- White: CS may count as core credit, but not math credit
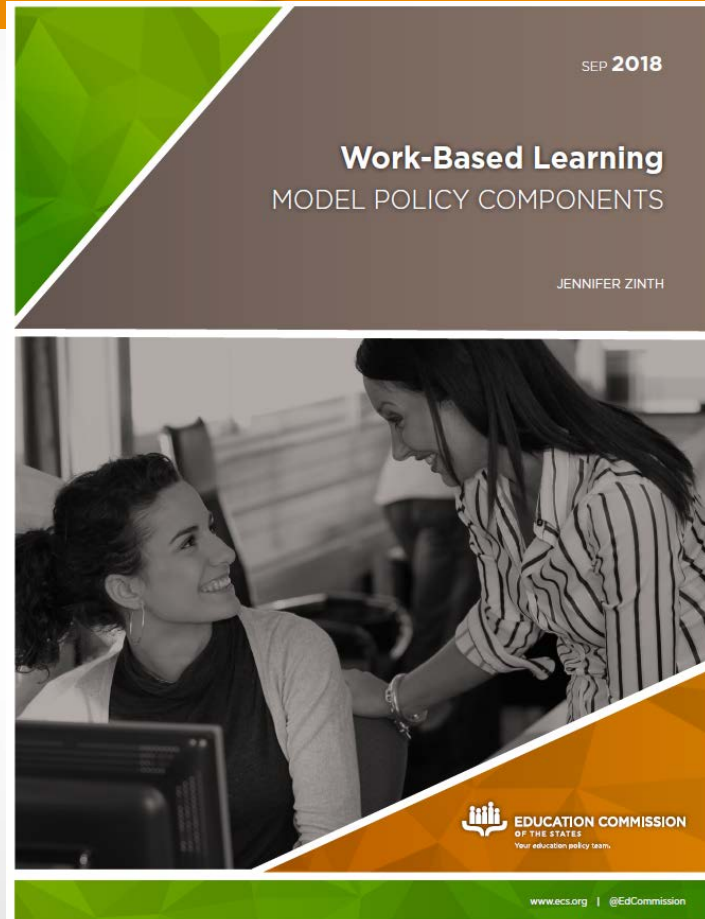- Green: Unclear

Source: Code.org, ECS

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Limits on allowing AP CS to fulfill math reqt.

Examples:

- Delaware: Except Algebra I, Geometry, Algebra II or equivalent (14 Del.C. § 4139)

- Idaho: If student has completed Algebra II standards

- Kentucky: May count as 4th math course

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Policies in five "buckets":

- State and regional coordination
- Access
- Finance
- Program quality
- Graduation credit

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Conclusion

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