K-12 Computer Science Standards Comparison Report

Examining the Similarities and Differences in State-Adopted K-12 Computer Science Standards and the *CSTA K-12 Standards, Revised 2017*

CSTA

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- Joe Kmoch, Marquette University and CSTA Wisconsin Dairyland
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Acknowledgements

We authored this report as an extension of *Reimagining CS Pathways: High School and Beyond,* a community-wide project that explores how CS learning opportunities can be reenvisioned for high school students. CSTA and IACE co-led the project, in partnership with ACM, Code.org, College Board, CSforALL, and ECEP Alliance. This project resulted in a definition of foundational high school computer science content and resulting pathways. View the *Reimagining CS* report and supporting materials at ReimaginingCS.org.

We extend our gratitude to nine state and regional education officials who participated in interviews about their state standards writing process. We also wish to thank our project's advisory board: Dr. Adrienne Decker, Deborah Seehorn, and Delmar Wilson.

Funding Support

This project is supported by the National Science Foundation (NSF) under Grant No. 2311746. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the NSF.

Suggested Citation

CSTA & IACE. (2024). *K-12 Computer Science Standards Comparison Report: Examining the Similarities and Differences in State-Adopted K-12 Computer Science Standards and the CSTA K-12 Standards, Revised 2017.* New York, NY: Association for Computing Machinery.

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Note: This document has been updated since its initial release. See Standards Crosswalk Report Changelog for details.

1 Introduction

As of the summer of 2024, there are 42 US states with K-12 computer science standards, with a combined total of nearly 10k standards. In preparation for CSTA's revision of its own standards, our project team engaged in a detailed analysis of state and CSTA standards. This report provides an overview of the state CS standards and examines the similarities and differences between the state standards and the 2017 CSTA K-12 Standards. This analysis includes basic information about the standards (such as counts by state and level) along with their similarity to the CSTA standards and their cognitive complexity, as well as more detailed information about their relationship to the CSTA standards.

Methodology Notes

(1) Three subject matter experts manually assessed each state standard. They logged each standard's grade level or band, assigned course (if any), state identifier, state-assigned category, and whether it was identical to or similar to a CSTA standard (and, if so, which CSTA standard). The raw file is available in State Standards (for Distribution) along with a Python notebook that may be useful for data analysis.

(2) We had to make some decisions about what to include or exclude as a state standard. For example, North Dakota labels some standards as "continued growth" (e.g., North Dakota 7.HS.2). Other states sometimes use language such as "continuation of this standard is not specifically included or excluded," "this standard is not specifically required until . . .," or "begins in grade 6." We did not include any of these standards in our analysis.

(3) We did not include career and technical education (CTE) standards *unless* they were the only high school CS standards in a state.

(4) We attempted to follow a systematic process for categorizing each state standard. However, there was some subjectivity in the process. For example, we tagged each state standard as being either (a) identical to, (b) very similar to, (c) loosely based on, or (d) entirely different from a CSTA standard. The boundaries for these four categories can involve a judgment call by the person categorizing the standard.

(5) Each state organizes its standards by grade levels and/or bands. For some of the analysis, we created a uniform set of grade bands (K-2nd, 3rd-5th, 6th-8th, 9th-12th).

These are not always the same grade bands used by a state. (For example, Connecticut's 9th-10th and 11th-12th standards are assigned to our 9th-12th band.) This uniform set of grade bands also includes standards assigned to specific grade levels within that band. (For example, all of Kentucky's 5th grade standards are assigned to our 3rd-5th band.)

(6) We conducted a series of interviews with state and regional education officials who have responsibility for computer science education. We incorporated their insights throughout this document, including via quotations in green boxes.

2 How many CS standards do the states have?

Key Idea

The median state has about 160 CS standards, with more standards at higher grade bands.

We calculated the number of standards that each state has. On average, a state with CS standards has 231 CS standards; the median state has 161 CS standards. The table below shows the states with the highest and lowest number of CS standards. (See SCR Count by State for a list of all states.)

Note that course-based CS standards belong to a particular course (e.g., Cybersecurity), while general CS standards are articulated for the subject of computer science but not for one particular CS course.

State	Total CS Standard Count	General CS standards count	Course-based CS standards count
Arkansas	1436	324	1112
Texas	802	259	543
Ohio	428	428	0
South Carolina	425	425	0
State	**Total CS Standard Count**	**General CS standards count**	**Course-based CS standards count**
Rhode Island	116	116	0
Kentucky	96	96	0
New Jersey	87	87	0
Colorado	83	83	0

Colorado, the state with the lowest number of standards, has only high school CS standards. Interestingly, however, New Jersey – the state with the next lowest count – has standards for four grade bands (K-2nd, 3rd-5th, 6th-8th, and 9th-12th) but a total of only 87 standards, just four more than Colorado. This may indicate unique approaches to standards adoption that could be further explored.

The table below shows the average and median number of standards per state by grade band.

Grade Band	General CS standards		Course-based CS standards	
	Mean	**Median**	**Mean**	**Median**
K - 2nd	37	28	–	–
3rd - 5th	43	34	–	–
6th - 8th	44	29	19	30
9th - 12th	53	58	352	150

Most state standards are for the 9th-12th grade band, as the table below shows.

Grade Band	General CS Standards		Course-based CS Standards	
	Count	**Percent**	**Count**	**Percent**
K-2nd	1568	21%	0	0
3rd - 5th	1800	24%	0	0
6th - 8th	1865	25%	113	5%
9th - 12th	2237	30%	2112	95%
Total	**7470**		**2225**	

For more details about standard counts, see SCR Standards Counts.docx, which, for each state, shows how many standards it has according to its own system of grade bands/levels as well as according to our system of grade bands.

3 How are state standards organized?

3.1 Grade Bands and Levels

Key Idea

Many states have grade bands for 6th - 12th and then either grade level or grade band standards for the earlier grades.

All states use grade levels (e.g., 1st, 2nd) and/or grade bands (e.g., K-2nd, 3rd-5th) to organize their CS standards. The tables on the two following pages show how each state organizes their standards by grade levels and/or by grade bands; a summary of the organizational structure is presented in the tables below.

Levels	Count of States
PK	1
K	19
1	19
2	19
3	19
4	19
5	19
6	12
7	12
8	12
9	1
10	1
11	1
12	1

Bands	Count of States
K - 1st	1
K - 2nd	21
2nd - 3rd	1
3rd - 5th	21
4th - 6th	1
6th - 8th	29
7th - 8th	1
9th - 10th	17
HS L1*	2
9th - 12th	22
9th - 12th Speciality	1
9th - 12th Advanced	1
9th - 12th Extension	1
HS L2*	2
11th - 12th	16
* Alaska uses L1 to indicate “grades HS entry level employment competence” and L2 for “grades HS post-secondary education” (source). Wyoming uses HS Level 1 “to represent the introductory level” and HS Level 2 for content that “reaches a deeper level” (source).	

A common state organizational pattern is that used by CSTA: K-2nd, 3rd-5th, 6th-8th, 9th-10th, and 11th-12th. Some states combine the two high school levels into one 9th-12th band. Another common pattern is for K-5th or K-8th standards to be by grade level, with the high school standards by grade band. Note that only Kansas has pre-kindergarten CS standards. In general, states tend to use the same organizational structure for their CS standards as their state has used for standards for other disciplines.

State	Grade Levels														Grade Bands															
	PK	K	1	2	3	4	5	6	7	8	9	10	11	12	K-1	K-2	2-3	3-5	4-6	5-8	6-8	7-8	9-10	HS L1	9-12	A	B	C	HS L2	11-12
Alabama		✅	✅	✅	✅	✅	✅	✅	✅	✅															✅					
Alaska		✅	✅	✅	✅	✅	✅	✅	✅	✅														✅					✅	
Arizona		✅	✅	✅	✅	✅	✅	✅	✅	✅															✅					
Arkansas		✅	✅	✅	✅	✅	✅	✅	✅	✅										✅					✅					
California																✅		✅			✅				✅	✅				
Colorado																									✅					
Connecticut																✅		✅			✅		✅							✅
Florida																✅		✅			✅				✅					
Georgia																✅		✅			✅		✅							
Hawaii																✅		✅			✅		✅							✅
Idaho																✅		✅			✅		✅							✅
Illinois																✅		✅			✅		✅							✅
Indiana																✅		✅			✅				✅					
Iowa																✅		✅			✅		✅							✅
Kansas	✅	✅	✅	✅	✅	✅	✅														✅		✅							✅
Kentucky		✅	✅	✅	✅	✅	✅														✅				✅					
Maryland		✅	✅	✅	✅	✅	✅	✅	✅	✅													✅							✅
Massachusetts																✅		✅			✅				✅					
Michigan																✅		✅			✅		✅							✅
Mississippi		✅	✅	✅	✅	✅	✅														✅		✅							✅
Missouri		✅	✅	✅	✅	✅	✅														✅		✅							✅

Note: A is “9th - 12th Speciality” | B is “9th - 12th Advanced” | C is “9th - 12th Extension”

	Grade Levels														Grade Bands															
State	PK	K	1	2	3	4	5	6	7	8	9	10	11	12	K-1	K-2	2-3	3-5	4-6	5-8	6-8	7-8	9-10	HS L1	9-12	A	B	C	HS L2	11-12
Montana		✅	✅	✅	✅	✅	✅														✅				✅					
Nevada		✅	✅	✅	✅	✅	✅														✅				✅		✅			
New Hampshire																✅		✅			✅		✅							✅
New Jersey																✅		✅			✅				✅					
New Mexico																✅		✅			✅		✅							✅
New York															✅		✅		✅			✅			✅					
North Carolina																✅		✅			✅				✅					
North Dakota		✅	✅	✅	✅	✅	✅	✅	✅	✅	✅	✅	✅	✅														✅		
Ohio		✅	✅	✅	✅	✅	✅	✅	✅	✅															✅					
Oklahoma		✅	✅	✅	✅	✅	✅	✅	✅	✅													✅							✅
Pennsylvania																✅		✅			✅				✅					
Rhode Island																✅		✅			✅				✅					
South Carolina		✅	✅	✅	✅	✅	✅	✅	✅	✅															✅					
Tennessee		✅	✅	✅	✅	✅	✅														✅				✅					
Texas		✅	✅	✅	✅	✅	✅	✅	✅	✅															✅					
Utah		✅	✅	✅	✅	✅	✅	✅	✅	✅													✅							✅
Virginia		✅	✅	✅	✅	✅	✅	✅	✅	✅											✅				✅					
Washington																✅		✅			✅		✅							✅
West Virginia																✅		✅			✅				✅					
Wisconsin																✅		✅			✅		✅							✅
Wyoming																✅		✅			✅			✅					✅	

Note: A is “9th - 12th Speciality” | B is “9th - 12th Advanced” | C is “9th - 12th Extension”

3.2 Concept Groups

Key Idea

Many states use CSTA's concept groups, with or without adjustments.

CSTA organizes its standards into concept groups, based on the *K-12 Computer Science Framework* (2016):

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

Almost all states also organize their standards into concept groups. While a few states (Texas, Pennsylvania, Florida, and Georgia) use an organizational system entirely different from CSTA's, the other states follow CSTA's structure, either directly or with some modifications. For example, Utah adds Computational Thinking. Other states incorporate adjacent concepts such as Digital Citizenship. Some will rename a CSTA group: in Alaska, CSTA's 'Impacts of Computing' is 'Community, Global and Ethical Impacts.' (See SCR Categories of State Standards.docx for a list of all concept groups by state.) The table below shows the most common additions to the CSTA organizational structure.

Concept	Count of States
Computational Thinking	10
Digital or Information Literacy	4
Digital Tools	3
Digital Citizenship	3

While not as common, other noteworthy additions include (1) Emerging and Future Technologies and (2) Artificial Intelligence.

3.3 Courses

> **Key Idea**
>
> Few states articulate CS standards for different CS courses.

In our dataset, six states organize their standards into distinct courses, usually at the high school level. For example, West Virginia offers Computer Science & Mathematics, Introduction to Geographic Information Systems, Discovering Computer Science, and Computer Science in the Modern World. Virginia offers a 6-, 9-, 18-, and 36-week middle school computer science elective. (See SCR Courses Offered by State.docx for a list of all courses by state.) The table below summarizes standards organized by course.

State	6th - 8th Courses	9th - 12th Courses	Total Courses
Arkansas	1	27	28
Georgia	4	15	19
Indiana	0	4	4
Texas	0	9	9
Virginia	4	3	7
West Virginia	1	3	4

4 How similar are state and CSTA standards?

In general, there is a high degree of similarity between state CS standards and the current CSTA standards. This section explores that similarity from several perspectives, including at the level of (sub)practices, (sub)concepts, individual standards, and the cognitive complexity of the standards. (See also the subsection *Type of Use* below for more evidence of similarity.)

4.1 Practices and Subpractices

Key Idea

Most states include all or nearly all of the CSTA subpractices.

As articulated in the [K-12 Computer Science Framework](), the current CSTA standards include the following practices:

- 1: Fostering an inclusive computing culture
- 2: Collaborating around computing
- 3: Recognizing and defining computational problems
- 4: Developing and using abstractions
- 5: Creating computational artifacts
- 6: Testing and refining computational artifacts
- 7: Communicating about computing

(See Practices and Subpractices for a list of the subpractices associated with each of these practices.) Each CSTA standard is mapped to one or more of these practices and subpractices.

Methodology Notes

(1) In the mapping of the current CSTA standards to the practices and subpractices, no standard is mapped to subpractice 1.3. We therefore exclude 1.3 from the analysis below.

(2) The CSTA standards are usually mapped to subpractices; however, some standards are mapped to practice 4 or practice 7. In the analysis below, we treat 4 and 7 as if they were subpractices.

(3) We refer to 'included subpractices' and 'included subconcepts' below. Subpractices and subconcepts are considered included when a state has a standard that (a) is related to a CSTA standard that (b) includes the CSTA sub- practice or concept. Our methodology is likely to *undercount* inclusion since it is possible that a sub- practice or concept is included in a state standard that is not related to a CSTA standard.

The average state includes 96% of the CSTA subpractices. The table below indicates which states do not include which subpractices at any level, as well as the percent of subpractices that are included. The 24 states that include all subpractices at any level are not listed in the table.

State	Subpractices Not Included (at any Level)	Percent Included
Idaho	2.2, 4.3, 7.1, 7, 4	79%
Wyoming	7	96%
Colorado*	1.1, 2.1, 2.2, 2.3, 4.3, 6.2, 7.1, 7	67%
North Dakota	2.3, 2.4, 4.3, 4	83%
Arkansas	2.3	96%
Georgia	2.3, 4.3	92%
Indiana	2.3, 4.3, 7	88%
Kansas	4.3	96%
Tennessee	2.2, 7	92%
Texas	2.1, 2.2, 4.3	88%
Pennsylvania	4	96%
Maryland	7	96%
Ohio	2.3	96%
Rhode Island	2.2, 4	92%
New York	4	96%
South Carolina	2.2	96%
New Jersey	2.1, 2.2, 2.4	88%
Massachusetts	2.3	96%
* Note that Colorado has standards for high school only.		

We also calculated what percent of states have standards that cover each subpractice at each grade band; see Subpractices by Level.

4.2 Concepts and Subconcepts

The current CSTA standards have the following concepts and subconcepts:

> **Key Idea**
>
> Most states include virtually all of the CSTA subconcepts.

- Computing Systems
    - Hardware & Software
    - Troubleshooting
    - Devices
- Networks & the Internet
    - Cybersecurity
    - Network Communication & Organization
- Data & Analysis
    - Storage
    - Collection Visualization & Transformation
    - Inference & Models
- Algorithms & Programming
    - Algorithms
    - Variables
    - Control
    - Modularity
    - Program Development
- Impacts of Computing
    - Culture
    - Social Interactions
    - Safety Law & Ethics

Very few states do not include one or more of the subconcepts at any level; on average, a state has 97% of the subconcepts. A list of the subconcepts that are not included, by state, is in the table below.

State	Not Included Subconcepts
Colorado	• Computing Systems: Troubleshooting • Data & Analysis: Inference & Models • Impacts of Computing: Social Interactions Computing Systems: Devices
Georgia	• Computing Systems: Hardware & Software
Tennessee	• Computing Systems: Hardware & Software • Networks & the Internet: Network Communication & Organization
Texas	• Impacts of Computing: Social Interactions • Computing Systems: Devices
Pennsylvania	• Data & Analysis: Storage
New Jersey	• Impacts of Computing: Social Interactions

We also calculated what percent of states included each subconcept at each level; results are in the table below, with values <80% highlighted.

Concept	Subconcept	Percent of States				
		Any grade band	K - 2nd	3rd - 5th	6th - 8th	9th - 12th
Algorithms & Programming	Variables	100%	78%	76%	95%	88%
	Algorithms	100%	95%	85%	90%	95%
	Control	100%	88%	95%	100%	98%
	Modularity	100%	81%	98%	95%	100%
	Program Development	100%	93%	100%	100%	100%
Networks & the Internet	Network Communication & Organization	98%	15%	83%	90%	95%
	Cybersecurity	100%	85%	90%	95%	93%
Data & Analysis	Collection Visualization & Transformation	100%	88%	93%	98%	95%
	Storage	98%	81%	20%	93%	91%
	Inference & Models	98%	85%	95%	88%	91%
Computing Systems	Troubleshooting	98%	88%	90%	95%	93%
	Devices	95%	85%	66%	81%	83%
	Hardware & Software	95%	93%	85%	83%	88%
Impacts of Computing	Social Interactions	93%	95%	83%	88%	76%
	Safety Law & Ethics	100%	76%	68%	83%	98%
	Culture	100%	90%	100%	100%	100%

4.3 Content Similarity

Key Idea
The states vary in terms of their average similarity to the CSTA standards, but in general, most states are quite similar.

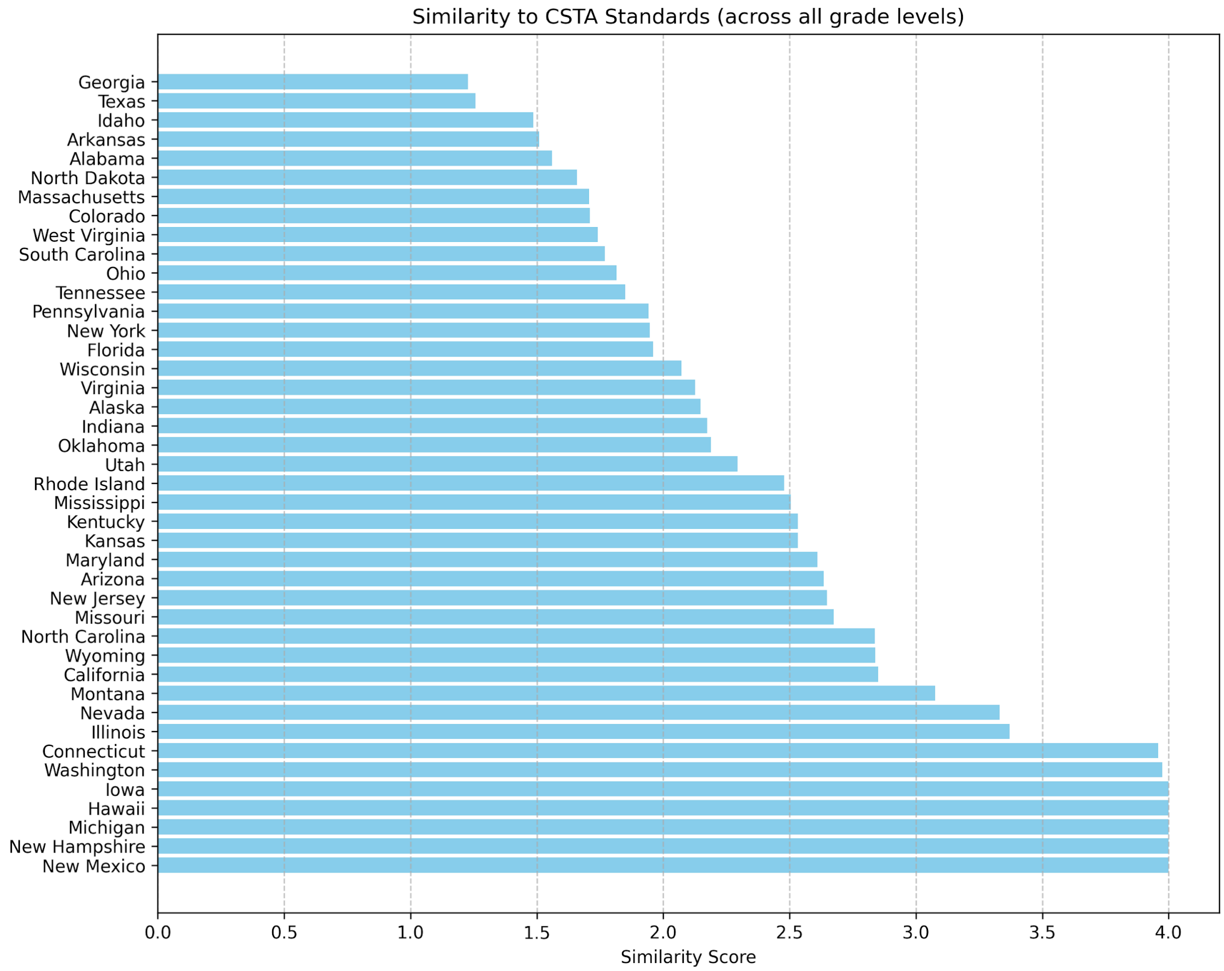
Methodology Note

We categorized each state standard as being either (a) identical to a CSTA standard, (b) very similar to a CSTA standard, (c) loosely based on a CSTA standard, or (d) entirely different from a CSTA standard. These categories were then mapped to a score:

- different → 1
- loosely based → 2
- similar → 3
- identical → 4

These scores are the basis for the analysis in this section.

The highest similarity scores were 4.0, for New Mexico, New Hampshire, Michigan, Hawaii, and Iowa. This score indicates a direct adoption of CSTA standards. The lowest scores were under 1.3 for Texas and Georgia, indicating that these state standards are quite different from CSTA standards. The average state score was 2.5. This average means that the CSTA standards are generally quite similar to the state standards, somewhere between "loosely based on" and "very similar to" each other, on average. The chart below shows the average similarity score for all states.

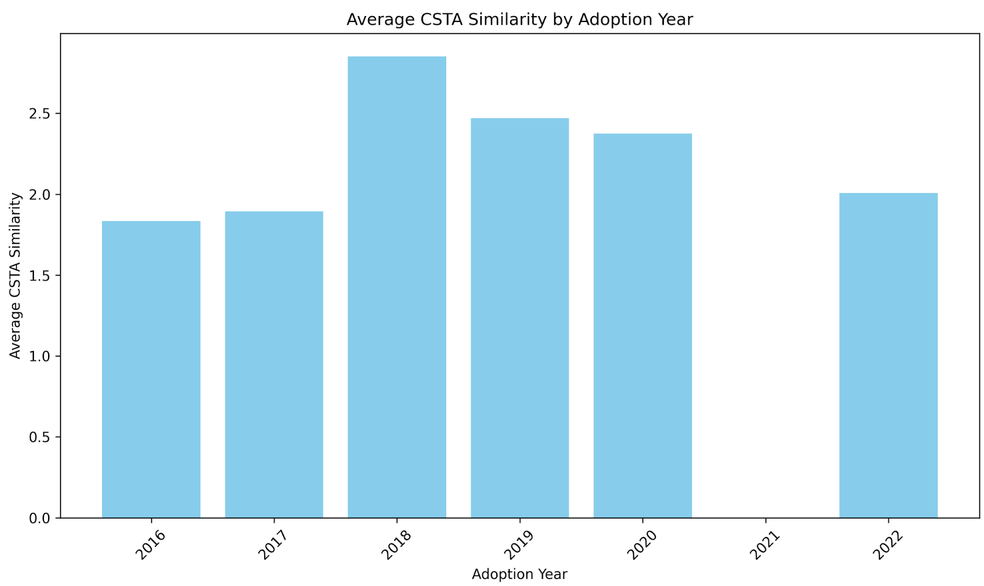


We repeated this analysis after separating the standards into two groups, K-8th and 9th-12th, and the results were largely similar. We also checked whether state standards for the various grade bands were more or less similar to the CSTA standards, but there were not important differences.

Six states have standards tied to specific courses. The table below shows the similarity scores for those states.

	Similarity Score		
State	**All standards**	**General standards**	**Course-based standards**
Arkansas	1.51	1.56	1.49
Georgia	1.23	1.34	1.19
Indiana	2.17	2.96	1.77
Texas	1.26	1.50	1.14
Virginia	2.13	2.02	2.29
West Virginia	1.74	2.09	1.61

We also checked whether there is a correlation between the year of adoption for a state's standards and their similarity to CSTA standards; the correlation is very low. As the chart below shows, the highest level of similarity was for standards adopted in 2018, and the similarity has been decreasing since that point. It is possible that the higher similarity in 2018 is due to the fact that the current CSTA standards (which are the basis for the similarity scores) were adopted in 2017, closely followed by states adopting standards shortly thereafter, with state standards becoming less similar as time passes. (Although firm conclusions should not be drawn from trends because (1) only a few states update their standards in any given year and (2) the other factors – such as the needs and preferences of the states adopting new standards in any given year – likely play a large role in shaping a set of state standards' similarity to CSTA standards.)



We also manually compared the state standards to similar CSTA standards. Overall, the most common change to the CSTA standards was the addition of examples to a given standard. For example, CSTA 2-CS-03 reads, "Systematically identify and fix problems with computing devices and their components." Different states include different kinds of examples with standards similar to this CSTA standard:

- Wisconsin includes examples of steps for a systematic process (e.g., "check connection")
- Indiana includes examples of cognitive tools for identifying problems (e.g., flowcharts)
- South Carolina includes examples of resources (e.g., user manuals)

(See Most Significant Changes to CSTA Standards for a summary of the most significant changes to each CSTA standard.)

4.4 Cognitive Complexity

Key Idea

Relative to the CSTA standards, the state standards tend a bit toward lower-order thinking skills, although there are differences by state.

Methodology Notes

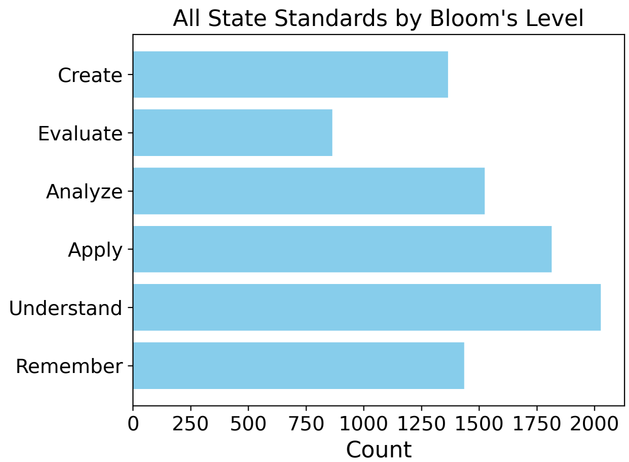
(1) We used Bloom's Revised Taxonomy to assess the cognitive complexity of the standards. While there are some criticisms of this taxonomy, it is nonetheless a useful starting point, and it benefits from having been systematically applied to computing content (See *Bloom's for Computing*).

(2) We had to clean and pre-process the standards in order to analyze their Bloom's level. This involved, for example, considering only the first verb in a standard that had multiple verbs.

(3) We used various reference lists to assign verbs to their corresponding Bloom's level. However, not all verbs were included, so some verbs (and, therefore, some standards) are not included in this analysis. The average number of unincluded standards by state was <7%.

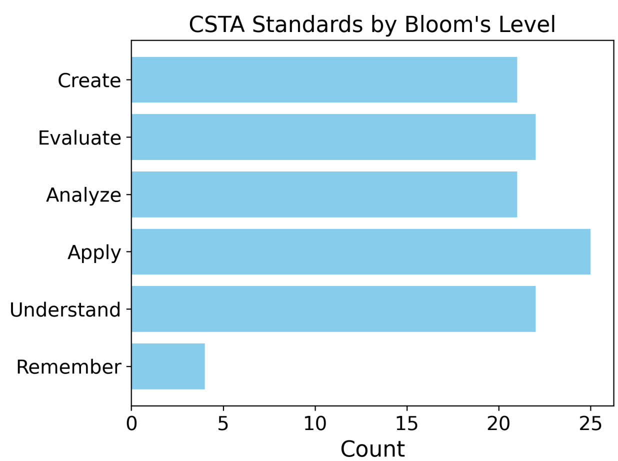
(4) In the analysis below, we sometimes refer to the 'average' Bloom's level, which is calculated based on assigning the numbers 1-6 to the Bloom's levels, with the smallest number mapped to the lowest level.

The chart below shows the count of standards by Bloom's level for all state standards. (We also analyzed the standards by grade band – using our uniform set of grade bands – and the results were very similar.)



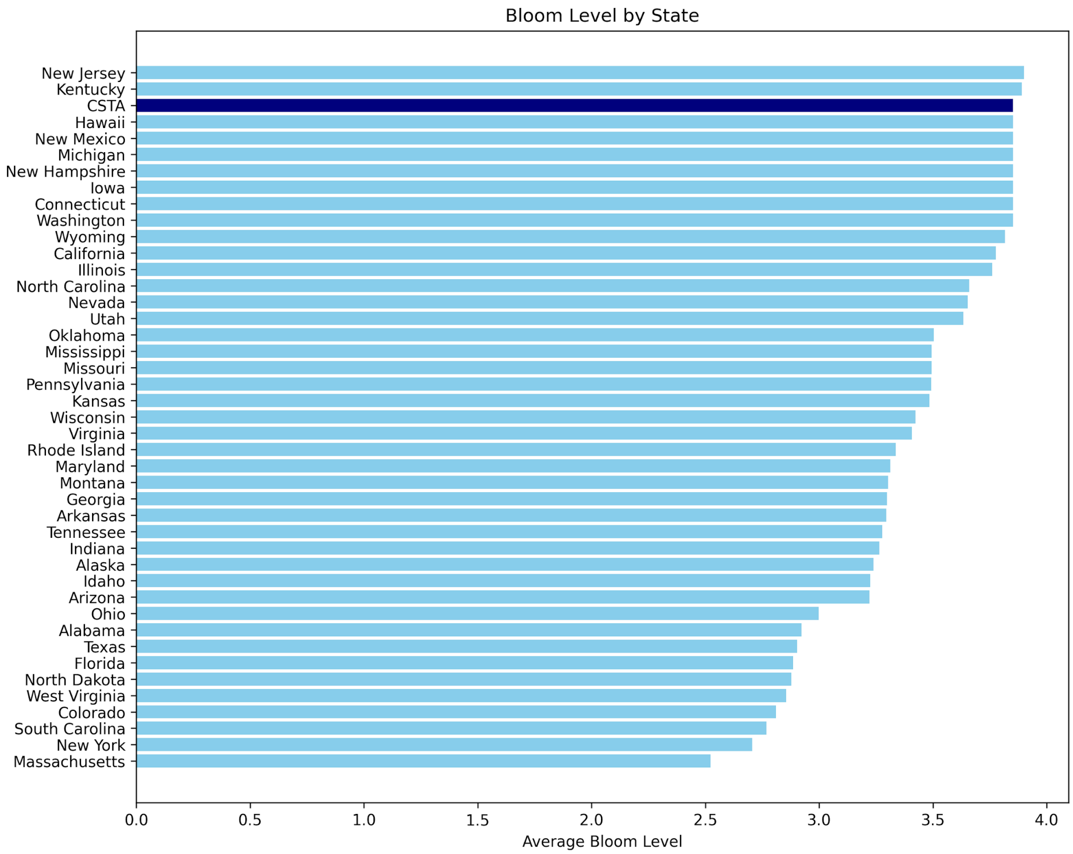
As the chart above shows, for all state standards, the most common Bloom's level is *understand*. Interestingly, *evaluate* standards are the least common. As a higher order thinking skill, the ability to evaluate is important. Further, all adults are likely going to face the need to evaluate computing-related technologies throughout their life span.

We also calculated the Bloom's level for the current CSTA standards, as shown in the chart below.



What is apparent from the chart above is that very few CSTA standards are at the *remember* level, while there are roughly even numbers of standards at the other taxonomy levels. In other words, the primary difference in cognitive complexity between the state standards and the CSTA standards is that the CSTA standards largely avoid the lowest level of Bloom's taxonomy and are more likely to be at the *evaluate* level.

The above analysis compares the cognitive complexity of the CSTA standards to the state standards as a whole. But states have different average Bloom's levels, as the chart below shows.

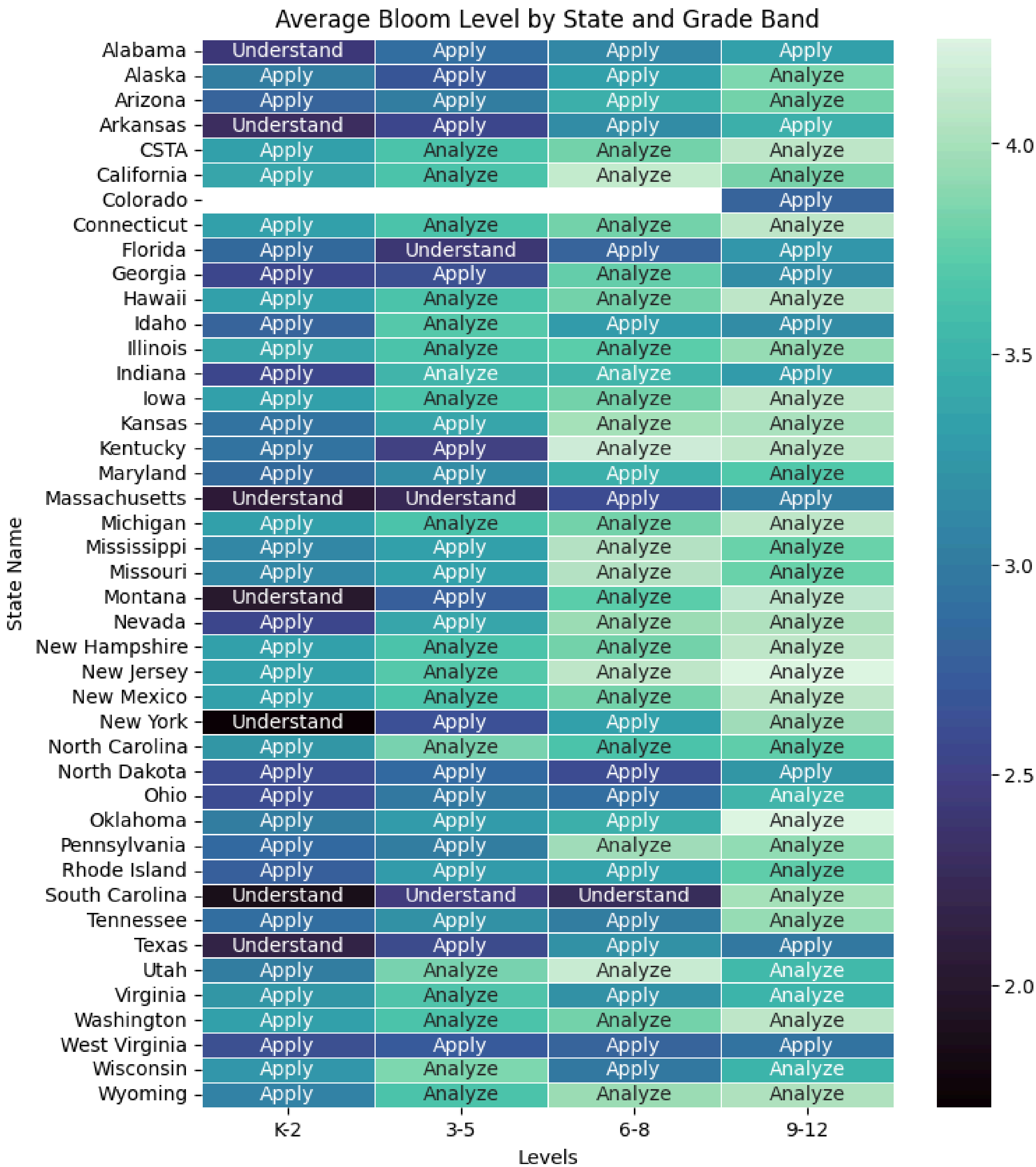


Most of the states with average Bloom's levels that are equal to CSTA's have identical (or near identical) standards to CSTA's; the notable exceptions to this pattern are New Jersey and Kentucky, which have standards that are both somewhat different from CSTA. CSTA's average Bloom's level is 3.9, and the average Bloom's level for the states is 3.3. Both the states and CSTA show a pattern of increasing cognitive complexity as students age, as shown in the table below.

Grade Band	State Average Bloom's Level	CSTA Average Bloom's Level
K-2nd	2.7	3.3
3rd - 5th	3.1	3.6
6th - 8th	3.3	3.8
9th - 12th	3.5	4.1

We considered the possibility that the lower average Bloom's level (relative to CSTA) of most states was due to those states creating additional standards at lower cognitive levels. So we tested whether there was a correlation between the number of standards that a state has and its Bloom's level. However, there is virtually no correlation.

Many states also have differences in their Bloom's level by grade band, as the chart below shows. With few exceptions, a state's Bloom's level increases as the grade band increases.



5 How is each CSTA standard used by the states?

Our interviews suggest that most state standards writers make reference to the CSTA standards at some point in their work, with some states directly adopting the CSTA standards and other states using them as a resource while writing their own standards. (Note that some states do not permit external standards to be adopted without modification.)

5.1 Frequency of Use

Key Idea

Each CSTA standard is related to, on average, 1.7 standards per state.

We calculated how many times each CSTA standard occurs in the state standards. The table below shows, on average, how many state standards use each CSTA standard for those with the most uses. (See SCR Instances per State by Standard for the averages for all CSTA standards.) The overall average instances per CSTA standard is 1.7.

CSTA Identifier	Average Instances (per state with standards similar to this standard)
1A-IC-17	3.9
2-AP-17	2.8
1B-DA-06	2.7
2-AP-10	2.7
2-AP-12	2.7
1A-CS-01	2.6

We repeated the above analysis after separating standards into two groups: those that are assigned by their state to a grade level or to a grade band. (It is likely that any CSTA standard would occur more often in standards assigned to grade levels than to grade bands.) The average instances per CSTA standard assigned to grade bands is 1.4; for grade levels, it is 1.8. (See SCR Instances per State by Standard (Levels) and SCR Instances per State by Standard (Bands) for the average instances per standard for all standards.)

5.2 Type of Use

Key Idea

While there is some variation by standard, most CSTA standards have a related standard in each state.

We calculated, for each CSTA standard, what percent of states had identical standards, similar standards, or based-on standards. The following three tables show the top standards and bottom standards for each of these three categories. (See SCR Percent Related Standards for the percentages for all CSTA standards. To see the data sorted by percentages instead of in order by CSTA standard, see SCR Percent Identical Standards, SCR Percent Similar Standards, and SCR Percent Based Standards.) Note that the percentages are based on the percent of states with CS standards – not on the percent of all 50 states.

CSTA Identifier	Percent Identical
3B-AP-21	50%
3A-IC-28	48%
2-AP-17	48%
1A-AP-14	21%
1A-AP-15	21%
1A-IC-18	21%
1B-AP-16	21%

CSTA Identifier	Percent Similar
1B-AP-11	38%
1A-AP-08	36%
1B-IC-18	33%
1B-AP-10	33%
3B-AP-21	2%
3B-AP-18	0%
3B-DA-07	0%

CSTA Identifier	Percent Based
1A-DA-06	62%
2-NI-05	60%
1B-DA-07	60%
1B-NI-05	60%
1A-IC-17	57%
3B-AP-14	12%
3B-AP-19	12%
3B-IC-28	10%
3B-AP-09	10%

We also calculated, by grade band, what percent of state standards were identical, similar, based on, or different from a CSTA standard. The results are in the table below.

Grade Band	Percent of state standards that are ______ a CSTA standard			
	Identical to	very similar to	loosely based on	different from
K - 2nd	12%	19%	47%	22%
3rd - 5th	14%	17%	43%	25%
6th - 8th	16%	12%	45%	27%
9th - 12th	19%	7%	36%	38%

As the table shows, standards at higher grade bands are more likely to be different from CSTA standards but also more likely to be identical to CSTA standards.

We also calculated the percentages by CSTA subcategory. Results are in the table below.

Category	Subcategory	Percent of state standards that are ______ a CSTA standard		
		identical to	very similar to	loosely based on
Computing Systems	Hardware & Software	20	18	61
	Troubleshooting	22	17	61
	Devices	23	18	59
Networks & the Internet	Cybersecurity	22	13	65
	Network Communication & Organization	21	15	64
Data & Analysis	Storage	23	17	60
	Collection Visualization & Transformation	18	17	66
	Inference & Models	21	16	63
Algorithms & Programming	Algorithms	23	20	57
	Variables	24	26	50
	Control	18	17	65
	Modularity	27	20	52
	Program Development	28	20	52
Impacts of Computing	Culture	25	15	60
	Social Interactions	17	12	71
	Safety Law & Ethics	29	14	57

We also calculated, for each CSTA standard, what percent of states with CS standards had any standard that had any relation (i.e., based on, similar to, or identical to) to it. The table below shows the CSTA standards with the highest and lowest percentages of states using it. (See FINAL CSTA Standards by State Inclusion for the complete list of all CSTA standards.) On average, for all CSTA standards, the percent of states using that standard in some way is 78%. In general, standards at the lower bands are used by a higher percentage of states than standards at the higher bands.

CSTA Identifier	Percent of States Using
1B-IC-18	98%
3A-IC-24	95%
2-IC-20	95%
2-AP-12	95%
1A-AP-15	57%
3B-IC-25	55%
3B-AP-19	55%
3B-AP-09	48%

5.3 Changes to Grade Level/Band

> **Key Idea**
>
> Sometimes, states add standards similar to a CSTA standard to a different grade band than CSTA's.

In most cases, states that adopt standards that are identical, similar, or related to CSTA standards assign those standards to the same grade band (or corresponding grade level) as CSTA. The table below shows the most common instances where states assigned a CSTA standard to a different level/band. Note that in all instances in the table, the states assign the CSTA standard to a higher level. (See Different Grade Bands for a complete list of instances where the states assign a CSTA standard to a different level or band.)

State Band/Level	CSTA Band	Count
3rd	K - 2nd	34
6th	3rd - 5th	25
4th	K - 2nd	23
7th	3rd - 5th	22

5.4 What are the changes to cognitive complexity?

Key Idea

The average CSTA standard reflects higher-order thinking skills more than related state standards do.

Methodology Note

This section explores the differences in cognitive complexity between the CSTA standards and state standards that are very similar to or loosely based on those standards. In some cases, one state standard was deemed to be related to more than one CSTA standard, so some state standards are counted more than once in this section.

The table below shows the CSTA standards that have the largest differences in cognitive complexity when compared to related state standards. Note that a positive number in the table indicates that the CSTA standard has a higher cognitive complexity; a negative number indicates that the related state standards have higher cognitive complexity. (See SCR Bloom Comparison for Related Standards for a list of all CSTA standards.) The average difference in cognitive complexity across all of the CSTA standards is 0.46, meaning that the CSTA standard is about one-half of a Bloom's level higher than its related state standards.

CSTA Identifier	Difference in Bloom's Level
3B-DA-06	-2.56
1A-DA-07	-1.83
3B-AP-09	-1.62
3B-AP-16	-1.61
2-CS-03	-1.37
2-AP-11	2.07
3A-IC-30	2.13
2-AP-14	2.17
3A-AP-20	2.48
1B-CS-03	2.73

6 What are the characteristics of the 'different' standards?

Key Idea

State standards that are dissimilar to any CSTA standard tend to be for higher grade bands, focus on digital literacy or computer applications, and/or reflect lower-order thinking skills.

About one-third of state standards were labeled as different (that is, not identical, similar, or loosely based on a CSTA standard). This section describes some of the features of these 'different' standards. Of the different standards, 1,351 are linked to a specific course and 1,692 are general standards.

The table below shows common categories by grade band (using each state's categories, combining similar categories across states where possible) for the 'different' standards.

Category	K-2nd	3rd-5th	6th-8th	9th-12th
Impacts of Computing	31	46	57	205
Computers and Communications	13	16	19	125
Computational Thinking and Problem Solving			27	145
Algorithms & Programming				122
Data, Information, and Security		11	11	126
Artificial Intelligence	21	26	32	22
Computing Systems	27	18	20	40
Networks & the Internet	16	15		
Data & Analysis		12	16	12
Digital Literacy	18	25	17	
Employability skills				32
Technology & Engineering	13			

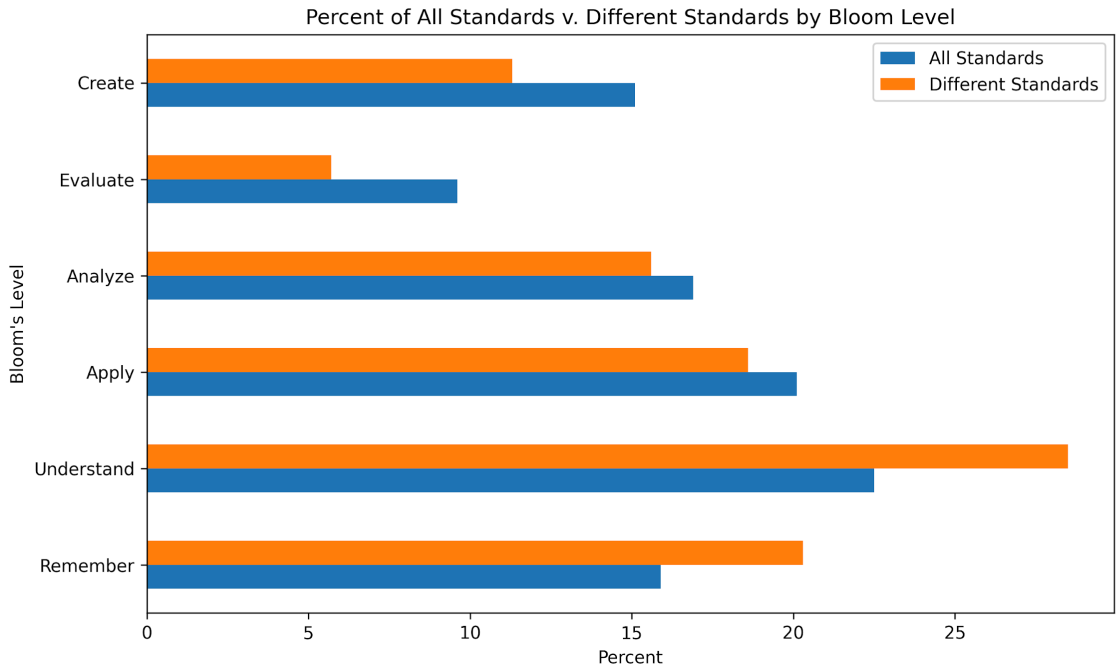
We also calculated in which states 'different' standards were most common; top states are shown in the table below. (See SCR Common States of 'Different' Standards for a list with additional states.) Note that Arkansas' and Texas' high counts are at least partially attributable to the fact that they have a lot of standards since they articulate standards for numerous different courses.

State Name	Count
Arkansas	727
Texas	643
Georgia	229
Alabama	161
Ohio	145
North Dakota	143
South Carolina	129
Idaho	82
Massachusetts	74

We also calculated the number of 'different' standards by grade band (using our uniform set of grade bands); results are in the table below.

Band	Count
9-12	1665
6-8	553
3-5	464
K-2	361

We also compared the Bloom's Level of the 'different' standards, relative to the Bloom's Level for all state standards; results are in the chart below.



As the chart shows, 'different' standards tend to have a lower Bloom's Level than average and to be particularly overrepresented at the *understand* level and underrepresented at the *evaluate* level.

We also determined the percent of standards at each Bloom's level for the 'different' standards; results are in the table below. As the table shows, the 'different' standards tend to have lower cognitive complexity than all state standards, and this is especially true at the younger levels.

		Different Standards			
Bloom Level	**All Standards**	**K-2nd**	**3rd-5th**	**6th-8th**	**9th-12th**
Remember	16%	41%	31%	29%	28%
Understand	23%	28%	28%	21%	20%
Apply	20%	16%	16%	18%	19%
Analyze	17%	8%	9%	15%	14%
Evaluate	10%	6%	9%	10%	13%
Create	15%	3%	6%	7%	6%
Columns may not total 100% due to rounding.					

Methodology Note

We used the Python library NLTK– with some tweaking of the output to account for the context – to analyze the common verbs and nouns in the ‘different’ standards.

We also calculated which verbs were most common in the ‘different’ standards; the top 10 results are in the table below. (See SCR Most Common Verbs in Different Standards for additional verbs.)

Verb	Count
Identify	359
Demonstrate	218
Describe	184
Create	182
Explain	175
Use	145
Compare	128
Research	115
Analyze	99
Discuss	98

We also calculated the most common nouns (as a proxy for topics) in the ‘different’ standards. (Note that the process for determining what ‘counts’ as a noun is imperfect.) The 10 most common nouns are in the table below. (See SCR Most Common Nouns in Different Standards for additional nouns.)

Noun	Count
data	454
use	301
information	270
devices	213
computer	192
software	164
problems	152

research	151
systems	147
technology	144

We also note that 52 of the 'different' standards refer directly to artificial intelligence; some other standards do not refer to it directly but are included in an "artificial intelligence" category by their state. (See SCR Different AI Standards for the full text and other details for these standards.)

We also analyzed a random sample of the 'different' standards, finding that:

- Many of these standards focused on the use of computer applications, including word processing (e.g., South Carolina 2.DL.1.1), productivity tools (Arkansas CSK8.G4.9.3), and email (South Carolina 4.NI.2.1).
- Some standards explored specific CS topics such as sensors (Ohio AI.P.6.a), binary numbers (Alaska 3.CS.HS.01), or network topology (South Carolina 8.NI.1.3).
- Another common topic is conducting searches (e.g., North Dakota 11.A.1).
- While not particularly common, there were a few standards referring to topics such as quantum computing (Ohio IC.Cu.9-12.A.d) and the history of computing (Arkansas CSK8.G5.10.4).
- Some standards were related to digital citizenship/literacy topics, such as cyberbullying (Texas 126.18.g7.c.10.b) or acceptable use policies (North Dakota 2.RU.4).
- A few standards covered topics from human-computer interaction (Georgia CSS.CT.6-8.40)
- A few standards explored the integration of CS with other disciplines (Kansas 4.IC.CP.01).

7 Detailed information for each CSTA standard

The table on the next page contains links to briefs for each CSTA standard. Each brief includes charts with the following:

1. the number of state standards related to (i.e., identical to, very similar to, or based on) this standard, by grade band/level
2. counts of the state standards that are identical, very similar, or based on this standard
3. a list of the states with identical standards, including grade level/band
4. a list of the states with very similar standards, including the text of the standard and grade level/band
5. a list of the states with standards based on this standard, including the text of the standard and grade level/band

Note that in some instances, a state's standard may be listed more than once in one brief – this is the result of the same standard appearing in multiple courses in the same state.

Additionally, the document Most Significant Changes to CSTA Standards summarizes the most significant changes made to the CSTA standards by similar state standards, with the 'most significant' changes defined as those that are made most often or, if they occur less frequently, reflect an important change to the content of the CSTA standard.

Category	K - 2nd Standards	3rd - 5th Standards	6th - 8th Standards	9th - 10th Standards	11th - 12th Standards
Computing Systems	1A-CS-01.docx 1A-CS-02.docx 1A-CS-03.docx	1B-CS-01.docx 1B-CS-02.docx 1B-CS-03.docx	2-CS-01.docx 2-CS-02.docx 2-CS-03.docx	3A-CS-01.docx 3A-CS-02.docx 3A-CS-03.docx	3B-CS-01.docx 3B-CS-02.docx
Networks and the Internet	1A-NI-04.docx	1B-NI-04.docx 1B-NI-05.docx	2-NI-04.docx 2-NI-05.docx 2-NI-06.docx	3A-NI-04.docx 3A-NI-05.docx 3A-NI-06.docx 3A-NI-07.docx 3A-NI-08.docx	3B-NI-03.docx 3B-NI-04.docx
Data and Analysis	1A-DA-05.docx 1A-DA-06.docx 1A-DA-07.docx	1B-DA-06.docx 1B-DA-07.docx	2-DA-07.docx 2-DA-08.docx 2-DA-09.docx	3A-DA-09.docx 3A-DA-10.docx 3A-DA-11.docx 3A-DA-12.docx	3B-DA-05.docx 3B-DA-06.docx 3B-DA-07.docx
Algorithms and Programming	1A-AP-08.docx 1A-AP-09.docx 1A-AP-10.docx 1A-AP-11.docx 1A-AP-12.docx 1A-AP-13.docx 1A-AP-14.docx 1A-AP-15.docx	1B-AP-08.docx 1B-AP-09.docx 1B-AP-10.docx 1B-AP-11.docx 1B-AP-12.docx 1B-AP-13.docx 1B-AP-14.docx 1B-AP-15.docx 1B-AP-16.docx 1B-AP-17.docx	2-AP-10.docx 2-AP-11.docx 2-AP-12.docx 2-AP-13.docx 2-AP-14.docx 2-AP-15.docx 2-AP-16.docx 2-AP-17.docx 2-AP-18.docx 2-AP-19.docx	3A-AP-13.docx 3A-AP-14.docx 3A-AP-15.docx 3A-AP-16.docx 3A-AP-17.docx 3A-AP-18.docx 3A-AP-19.docx 3A-AP-20.docx 3A-AP-21.docx 3A-AP-22.docx 3A-AP-23.docx	3B-AP-08.docx 3B-AP-09.docx 3B-AP-10.docx 3B-AP-11.docx 3B-AP-12.docx 3B-AP-13.docx 3B-AP-14.docx 3B-AP-15.docx 3B-AP-16.docx 3B-AP-17.docx 3B-AP-18.docx 3B-AP-19.docx 3B-AP-20.docx 3B-AP-21.docx 3B-AP-22.docx 3B-AP-23.docx 3B-AP-24.docx
Impacts of Computing	1A-IC-16.docx 1A-IC-17.docx 1A-IC-18.docx	1B-IC-18.docx 1B-IC-19.docx 1B-IC-20.docx 1B-IC-21.docx	2-IC-20.docx 2-IC-21.docx 2-IC-22.docx 2-IC-23.docx	3A-IC-24.docx 3A-IC-25.docx 3A-IC-26.docx 3A-IC-27.docx 3A-IC-28.docx 3A-IC-29.docx 3A-IC-30.docx	3B-IC-25.docx 3B-IC-26.docx 3B-IC-27.docx 3B-IC-28.docx

8 Recommendations for Standards Writers

8.1 Semantics and Phrasing

8.1.1 Semantics and Phrasing: Avoid overly general phrases such as "with teacher guidance;" use more specific scaffolding language where needed.

Some CSTA standards include language such as "with teacher guidance" (e.g., 1B-AP-16). We suggest removing this and similar language. It is and should be presumed that all instruction occurs with teacher guidance. However, this scaffolding language might then be confusing if mentioned in some standards and not in others. Also note that some states will remove the phrase (e.g., compare CSTA 1B-AP-16 with California 3-5.AP.18, Utah 3.AP.4, and Arizona 3-5.AP.18).

Where scaffolding language is needed, it should be more specific than "with teacher guidance." For example, CSTA 1B-IC-18 reads, "Discuss computing technologies that have changed the world, and express how those technologies influence, and are influenced by, cultural practices." The reference to the mutual influence that technologies and cultural practices have on each other is an example of specific scaffolding that supports students' learning. By way of contrast, had the standard read "With teacher support, discuss computing technologies that have changed the world," the intended type of scaffolding that teachers should provide to guide the discussion would have been less clear.

8.1.2 Semantics and Phrasing: Avoid references to what is age (or grade) appropriate.

As with scaffolding language, it should be presumed that standards and their content are age- and grade-appropriate. While CSTA standards do not use this language, some state standards do (e.g., West Virginia 2.AP.M.01). If there is concern about what precisely constitutes age- or grade-appropriate content, the content itself should be clarified. It may also be appropriate in some cases to specifically indicate what it is *not* appropriate to expect (i.e., provide boundary statements); for example, CSTA 1A-AP-13 ("Give attribution when using the ideas and creations of others while developing programs.") has a note explaining that formal citation in a bibliography is not expected at this level.

8.1.3 Semantics and Phrasing: Choose verbs carefully.

The main verb in a standard is significant because it suggests a level of complexity (e.g., "explore" versus "discuss" versus "implement"). One of the most common changes made to state standards that are otherwise similar to CSTA standards is that the main verb was changed. Standards writers should have clearly articulated processes for determining what verb to select and ensuring that it is measurable. They may consider using Bloom's Revised Taxonomy, including work on Bloom's specific to computing education (see *Bloom's for Computing*). Using a limited set of verbs will make it easier for materials based on the standards (including activities and assessments) to be aligned to the standards.

8.2 Content

8.2.1 Content: Provide examples.

The most common difference between CSTA standards and similar state standards is that state standards often provide examples, as shown in the following table.

CSTA 1B-NI-05	**Discuss real-world cybersecurity problems and how personal information can be protected.**
North Dakota 5.SE.1	Recognize that there are real-world cybersecurity problems (i.e., hacking) when interacting online.
Arkansas CSK8.G5.4.1	Identify real-world cybersecurity problems (e.g., malicious hacking) and apply strategies for protecting and securing personal digital information.
Maryland 5.NI.C.02	Discuss real-world cybersecurity problems and explain how personal information can be protected (e.g., antivirus software, backing up data, strong passwords).
Massachusetts 3-5.CAS.a	Describe the threats to safe and efficient use of devices (e.g., SPAM, spyware, phishing, viruses) associated with various forms of technology use (e.g., downloading and executing software programs, following hyperlinks, opening files).

"I know, as a former classroom teacher, those examples really helped me visualize how I wanted to actually write and create a lesson around that standard. And then . . . we have a lot of teachers that this is their first time teaching computer science, or they're working on certification in computer science, and so they need that guidance to help them."

Of course, there is some risk of confusion when providing examples: it is important to clarify that these are *examples* and not *requirements*. Additionally, it is an open question whether it is better to include the examples in the standard itself or to include them in supplementary materials such as notes and explanations. The advantage of including examples in the standard itself is that they may be more likely to be referenced; the disadvantage is that they may become dated and/or lead to lengthy standards.

8.2.2 Content: Ensure word choice aligns with intended implementation boundaries.

Consider this CSTA standard and some similar state standards in the table below.

CSTA 1B-AP-14	**Observe intellectual property rights and give appropriate attribution when creating or remixing programs.**
Maryland 3.AP.PD.02	Identify instances of remixing, when ideas are borrowed and treated upon, and provide attribution.
North Dakota 6.C.1	Repurpose or remix original works following fair use guidelines.
Tennessee 2.NI.2	Cite media and/or owners of digital content.
Virginia 3.7	The student will give credit to sources when borrowing or changing ideas (e.g., using information and pictures created by others, using music created by others, remixing programming projects).

Note that the CSTA standard refers only to *programs*, while the state standards refer more broadly to *ideas, original works*, and *content*. Given that student programs may incorporate images, audio, and other forms of media covered by intellectual property rights, it would be better to refer more broadly to content. Broad phrasing can also be more accommodating of technological changes that may occur in the future.

> "I feel like we did a pretty good job of writing our [state] standards, where it gives a little bit of flexibility in that . . . the technology can grow and change. [For example, with] 'How are devices connected?' I don't want to tell you that it's wifi or that it's a LAN or it's whatever. I want you to understand connectivity, devices, and maybe that means something different tomorrow than it does today."

Another interviewee, who had experience with special education, noted that more broadly phrased standards can be more accommodating to students with varying abilities.

As with the inclusion of examples, there are advantages and disadvantages to the use of broad phrasing, and the practice must be weighed against other considerations. An advantage of broad phrasing is the flexibility that it can provide; disadvantages are that it may leave teachers without adequate guidance and it may be more challenging to assess.

8.2.3 Content: Weigh the use of more than one verb.

Consider the CSTA standards in the table below.

CSTA 1A-DA-05	Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data.
CSTA 3A-AP-16	Design and iteratively develop computational artifacts for practical intent, personal expression, or to address a societal issue by using events to initiate instructions.

The presence of multiple verbs in one standard can complicate the process of designing instructional activities and assessments based on that standard. On a pragmatic level, it increases the likelihood that some aspects of the standard will be overlooked. On the other hand, creating six standards – each with one verb – to replace CSTA 1A-DA-05 may be a cumbersome solution. One alternative is to rephrase the standard with one general verb with several examples, as shown in the table below.

Create computational artifacts (via a design and development process) for practical intent, personal expression, or to address a societal issue by using events to initiate instructions.

There is no one solution to the issue, but standards writers should be aware of the various advantages and disadvantages of including more than one verb per standard.

8.2.4 Content: Consider articulating standards reflecting lower-order thinking skills.

The current CSTA standards reflect a higher level of Bloom's taxonomy than most states' standards. Note also that the most common verb – by far – in the state standards that are *not* similar to CSTA standards is *identify*. The current CSTA standards may presume that lower-order thinking concepts will be taught before the higher-order skills articulated in the standards are addressed. It may make sense for CSTA's new standards to explicitly articulate these lower-order thinking skills. For example, CSTA 2-NI-04 is "Model the role of protocols in transmitting data across networks and the Internet." This standard presumes that the student can identify protocols, data features, and network features. Articulating these precursor skills may make the CSTA standards more usable by the states (as they will not have to reverse engineer the simpler standards) and more accessible to users with less computing subject matter knowledge (as they will not need to determine what precursor skills are needed).

There are some concerns with articulating lower-order thinking skills, however. First, they may shift the focus of CS programs to emphasize those skills. Second, they may be concentrated in the earlier grades and lead to a less rich CS experience. All levels of Bloom's are possible at all grade levels.

8.2.5 Content: Consider dividing overly broad standards.

The section above called Frequency of Use calculated how often each CSTA standard is used by the states. It may be the case that a CSTA standard that appears very frequently in one state's standards is an indication that the CSTA standard is too broad: the states felt compelled to divide its content among multiple state standards. Standards with high frequencies may be candidates for division into multiple standards. (It may also be the case that one standard appeared in multiple state courses; in this case, division into multiple standards would not be warranted. Consult the brief for the standard to determine if this is the case.) As an example, the most frequently used standard is 1A-IC-17, "Work respectfully and responsibly with others online." It may make sense to divide that standard into standards that address separate skills, such as using collaborative tools versus giving constructive feedback versus respecting intellectual property laws.

8.2.6 Content: Consider whether and how states use each current CSTA standard.

The section above called Type of Use shows, for each CSTA standard, what percent of states have an identical standard, a very similar standard, a based-on standard, or have nothing similar to the standard. A current CSTA standard with very high percentages of adoption of identical standards by the states may be a standard deemed to meet the needs of the states. By contrast, a current CSTA standard with a low percentage of direct adoption may be a candidate for adjustment. Similarly, a current CSTA standard that is often not used at all by the states may be a candidate for deletion.

8.2.7 Content: Consider cognitive complexity.

This report presents an overview of the cognitive complexity for the state and the CSTA standards, per Bloom's taxonomy. There is a pattern of increasing complexity as the grade band increases, but it is not clear that this is the best approach. It is certainly the case that younger students can use higher-order thinking skills, such as the creation of computational artifacts. In fact, these creation-focused activities may create opportunities for CS instruction that is personally and culturally relevant and therefore engaging for students in a way that lower-order thinking skills (e.g., a task that requires remembering information) may not. Thus, we suggest that standards writers carefully consider the cognitive complexity of proposed standards, including whether standards for younger students incorporate sufficient higher-order thinking skills. (Interestingly, more than one interviewee mentioned that they would have preferred if their state's standards were more rigorous.)

8.2.8 Content: Address emerging technologies.

Several interviewees mentioned that they hoped that the revised CSTA standards would address emerging technologies, such as AI and quantum computing. It can be difficult to anticipate which emerging technologies – and what aspects of them – are worth including in K-12 CS education. However, inclusion of appropriate items is an important aspect of a set of standards that will meet the needs of students in future years. See the section Preparation for the Future in the Reimagining CS Pathways report.

8.3 Flexibility

8.3.1 Flexibility: Consider state political contexts.

A standard such as CSTA 3A-IC-25 ("Test and refine computational artifacts to reduce bias and equity deficits.") may not be usable in states with movements favoring the restriction of diversity, equity, and inclusion efforts. Whether to maintain this language or whether to shift to language more accommodating to these states should be a deliberate decision. (One example of such a shift is Oklahoma L1.IC.CU.02: "Test and refine computational artifacts to ensure access to a variety of user audiences.")

8.3.2 Flexibility: Accommodate state-level constraints on standards.

Our interviews with state and local education leaders with responsibility for computer science revealed a number of constraints determined by state systems. For example, state CS standards writers may not have control over whether their state's CS standards will be organized according to grade levels or bands (and, if in bands, which bands). Rather, this decision is sometimes predetermined based on how the state's standards for other subject areas are organized. Thus, no matter how CSTA organizes its standards, many states will be unlikely to adopt that organizational pattern wholesale. There is no perfect or optimal organization that CSTA can adopt. Rather, standards writers should consider the variety of needs and contexts across states. While the CSTA Standards could be designed to be most useful to the greatest number of states, another strategy is to offer multiple options for organizing standards, including various mapping and alignment schemes. This principle is likely true for constraints other than organization into grade levels and bands. At a more general level, policies around standards creation vary by state. For example, some state standards writers are required to consult national-level standards, and some state standards writers are not permitted to directly adopt national standards.

8.3.3 Flexibility: Accommodate teachers with no CS background or experience.

Our interviews also suggested that a primary concern for state and local leaders is that the standards not be inaccessible to the increasing number of teachers, particularly those in K-5th grades, who are asked to incorporate computer science concepts into their instruction.

> "When the teachers look at those standards, they get very overwhelmed . . . a typical teacher needs to be able to read through there and understand what's happening. And I think that that's not always the case with the CSTA standards. They're written . . . by people who are in the computer science world."

Meeting the needs of these teachers will likely require standards that have supplemental materials providing definitions, examples, activity and assessment ideas, and so forth. (See this example of supplemental information for a California standard.)

8.3.4 Flexibility: Consider equity issues.

There are many ways in which a standard might promote – or inhibit – equitable computer science education. One of our interviewees mentioned that they present proposed standards to various groups throughout their state to ensure that any gaps in the standards writers' understanding of what might present equity issues are more likely to be recognized. Specific equity issues mentioned in the interviews included ensuring that standards did not require resources that some schools might lack. Similarly, standards that address bias in society – such as the potential for some AI tools to be biased – are an important part of CS education.

> "We would say, 'Okay . . . how is a student . . . that has no access to technology going to meet this standard?' And we would discuss, 'how could we change this?' How could we edit this [standard] with the student that doesn't have access to technology, that the student [who] lives in a shelter, the student that you know . . . whose family doesn't have a phone? And I think that was very helpful. . . . [We also provided] multiple means of expression built into the demonstration of understanding the standard . . . for example, 'the student should write an algorithm' . . . could be written 'the student should demonstrate their understanding of an algorithm.'"

9 Appendix A: State Briefs

This report contains data for all states. We have also created briefs for each state that contain only the data for that state. These briefs are in available in this folder: State Standards Reports.

Alabama	Montana
Alaska	Nevada
Arizona	New Hampshire
Arkansas	New Jersey
California	New Mexico
Colorado	New York
Connecticut	North Carolina
Florida	North Dakota
Georgia	Ohio
Hawaii	Oklahoma
Idaho	Pennsylvania
Illinois	Rhode Island
Indiana	South Carolina
Iowa	Tennessee
Kansas	Texas
Kentucky	Utah
Maryland	Virginia
Massachusetts	Washington
Michigan	West Virginia
Mississippi	Wisconsin
Missouri	Wyoming

9 Appendix B: Links to Resources

We have gathered the links to all supplementary materials that are referenced throughout this report here for convenience. The page number indicates where the item is introduced in this report; see that page for additional context about each file.

- *Standards Crosswalk Report Changelog* (page 4)
- State Standards (for Distribution) (page 4)
- Python notebook for data analysis (page 4)
- SCR Count by State (page 6)
- SCR Standards Counts.docx (page 7)
- SCR Categories of State Standards.docx (page 12)
- SCR Courses Offered by State.docx (page 13)
- Practices and Subpractices (page 14)
- Subpractices by Level (page 15)
- Most Significant Changes to CSTA Standards (page 20 and page 36)
- SCR Instances per State by Standard (page 25)
- SCR Instances per State by Standard (Levels) (page 25)
- SCR Instances per State by Standard (Bands) (page 25)
- SCR Percent Related Standards (page 26)
- SCR Percent Identical Standards (page 26)
- SCR Percent Similar Standards (page 26)
- SCR Percent Based Standards (page 26)
- FINAL CSTA Standards by State Inclusion (page 28)
- Different Grade Bands (page 29)
- SCR Bloom Comparison for Related Standards (page 30)
- SCR Common States of 'Different' Standards (page 31)
- SCR Most Common Verbs in Different Standards (page 34)
- SCR Most Common Nouns in Different Standards (page 34)
- SCR Different AI Standards (page 35)
- Briefs for each CSTA standard (page 37)
- Briefs for each state (page 45)