K-12 Computer Science Education Landscape Scan

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State education reports and data dashboards are two potential methods to provide researchers, policy makers, and educators with a broad range of data that can inform K-12 CS education planning and decision making (ECEP Alliance, 2022). To understand the current landscape of strategies, approaches, policies, and reporting metrics used by states to advance CS education, AIR examined 24 state reports and 17 data dashboards related to K-12 CS education using the capacity, access, participation, and experience (CAPE) framework (Fletcher et al., 2021). Our landscape scan is guided by two research questions (RQs) presented in Exhibit ES1.

Exhibit ES1. Summary of PAsmart Research Questions and Data Sources

Research question	Data source(s)
1. What are common strategies, approaches, and policies used by states to expand computer science (CS) education?	National– and state–level CS education landscape reports
2. What metrics related to K–12 CS education are commonly analyzed, reported, and used by states?	

Research Questions and Key Findings

AIR has identified 5 key findings from its analysis:

- **Finding 1.** Providing funding for teacher professional learning (PL) and creating clear CS teacher certification pathways were the two most common strategies, approaches, and policies implemented or recommended by states to equitably expand CS education. [RQ1]
- **Finding 2.** Most state landscape reports were used to make recommendations for CS education policies, as opposed to providing progress on their initiatives. [RQ1]
- **Finding 3.** Most state-level K–12 CS education data dashboards and landscape reports included metrics describing student Participation, whereas few included metrics describing student Experience. [RQ2]
- **Finding 4.** Data dashboards and landscape reports included CAPE metrics for elementary and middle school grade levels far less frequently than for high school or advanced grade levels. [RQ2]
- **Finding 5.** The three national–level CS reports examined for this landscape scan most frequently contained Capacity metrics and least frequently contained Access metrics. [RQ2]

Recommendations and Conclusion

This landscape scan demonstrates both the value and the limitations of current state-level reporting on K-12 computer science education. Dashboards and landscape reports provide policymakers, educators, and researchers with important insights into CS education participation trends and course availability. However, most states primarily emphasize high school participation counts, with far less attention to student experience measures, early-grade levels, or data disaggregated by demographic or site-level characteristic subgroups. Based on our results, AIR recommends that states:

- **Recommendation 1.** Collect and report on CS education capacity, access, participation, and experience data across elementary and middle school grade bands and disaggregated by key demographic subgroups and site-level characteristics.
- **Recommendation 2.** Administer data collections (e.g., surveys, focus groups) to measure student experience in CS education.
- **Recommendation 3.** Use reports and dashboards as mechanisms for accountability, measuring progress, and continuous improvement rather than solely as vehicles for advocacy or recommendations.

Summary of Methodology and Sample

This section provides a high–level summary of the methods and samples used to address our RQs. For more details on the methods used in this evaluation, please reference Appendix A.

To address RQs 1 and 2, in 2023 AIR conducted a systematic search and review of K–12 CS education landscape reports and state–level data dashboards. AIR identified a total of 24 state reports, 17 state dashboards, and three national reports (see Exhibit 1) across all 50 states, the District of Columbia, and all U.S. territories. This scan took place from June 2023 through October 2023. AIR sourced these reports from Expanding Computing Education Pathways' (ECEP)[1] curated list of state landscape reports, the websites of state-level departments of education, and the websites of state-level advocacy organizations related to CS education. AIR also reviewed national-level reports, including the *2023 State of Computer Science Education Report* (Code.org, 2023), *Current Perspectives and Continuing Challenges in Computer Science Education in U.S. K–12 Schools* (Gallup & Google, 2020), and *2018 NSSME+: Status of High School Computer Science* (Gordon & Heck, 2019).

[1] See https://ecepalliance.org/resources/toolkits–guides/landscape–reports/

Exhibit 1. Sample of State K–12 CS Education Reports and Data Dashboards

Document type	Included states[2]	*N*
State Landscape Reports	AL, AK, AZ, AR, CA, CT, GA, HI, IL, IN, IA, KY, MD, MI, MN, NV, NH, NC, OH, OK, TN, TX, UT, WA	24
CS Education Data Dashboards	AL, AR, CA, CT, GA, HI, ME, MD, MA, MS, NC, OH, PA, RI, TX, UT, WA	17

AIR developed a coding scheme and conducted a thematic analysis of reports and dashboards to construct findings. For a full table displaying if states had a dashboard or landscape report, consult Appendix C. The full coding scheme and definitions for landscape report codes can be found in Appendix D, and the coding scheme and definitions for data dashboards codes can be found in Appendix E.

Limitations

The reader should interpret the results and recommendations presented in this report within the limitations of this study. Interpretations of proportions should be made with caution because some sample sizes are less than 10.

[2] The United States Postal Service abbreviations for states have been used throughout the tables in this document. For a list of these postal abbreviations, please see Appendix B.

Summary of Landscape Scan Findings

Our landscape scan yielded five key findings addressing RQs 1 and 2. This section describes landscape report findings, organized by research question.

RQ1. What are common strategies, approaches, and policies used by states to equitably expand CS education?

KEY FINDING 1

Providing funding for teacher professional learning and creating clear CS teacher certification pathways were the two most common strategies, approaches, and policies implemented or recommended by states to equitably expand CS education.

States commonly implemented and suggested policies included in the Code.org Advocacy Coalition's 10 recommended policies to equitably expand CS education (Exhibit 2).[3] These recommendations serve as the basis for many state initiatives for expanding CS education (Education Development Center, 2017).[4] Code.org emphasizes that "[e]quity and diversity are overarching values reflected in each of the ten policies and must be addressed explicitly in policy development to avoid perpetuating disparities" (Code.org, 2023).

Out of the 10 policies, the top three policies suggested or reported by states in their landscape reports related to **Policy 3**, which is focused on allocating funding for rigorous CS teacher PL (n = 14, 58%); **Policy 4**, which relates to implementing certification pathways for CS teachers (n = 10, 42%); and **Policy 2**, which focuses on defining CS and establishing standards for K–12 CS (n = 8,

[3] Since the Code.org Advocacy Coalition's 10 Policies have been a prominent organizing structure utilized for state–level expansion of equitable CS education, we have organized our data into two categories: strategies, approaches, and policies that align with the Code.org 10 policies and strategies, approaches, and policies that fall outside the scope of the Code.org 10 policies.

[4] The Code.org policies originate from the 2017 document "The State of the States Landscape Report: State–Level Policies Supporting Equitable K–12 Computer Science Education." The 2017 State of the States Landscape Report was collaboratively authored by a team of individuals representing Code.org, Education Commission of the States (ECS), Education Development Center, Inc., and the Massachusetts Computer Attainment Network (EDC/MassCAN), Expanding Computing Education Pathways (ECEP), and SageFox Consulting Group. In 2023, a 10th policy recommendation was added to require all students to take computer science to earn a high school diploma (Code.org, CSTA, & ECEP Alliance, 2023). State progress toward implementing these recommendations has been tracked in annual state of CS education reports from 2017 to 2023 and are often explicitly tracked in state–level reports. When viewed through the lens of the CAPE framework, the 10 Code.org policy recommendations largely focus on building capacity (n = 6, 60%), followed by increasing participation (n = 3, 30%), bolstering access (n = 1, 10%), and improving experience (n = 1, 10%).

33%). The policy least frequently suggested or reported within landscape reports was **Policy 1**, related to creating a statewide plan for K–12 CS (*n* = 1, 4%).

For strategies, approaches, and policies that were not directly tied to the Code.org 10 policies, the most common approach referenced by states was increasing their outreach and awareness efforts to promote CS education (*n* = 7, 29%) and developing connections with industry to aid in expanding CS education (*n* = 6, 25%).

KEY FINDING 2

Most state landscape reports were used to make recommendations for CS policies, as opposed to providing progress on their initiatives.

States most often utilized landscape reports as a vehicle to make recommendations rather than report on the progress or impact of ongoing strategies, approaches, policies, or initiatives (see Exhibit 2 and Appendix F). State landscape reports varied to the extent to which they suggested or recommended new strategies, approaches, or policies compared to reporting on the implementation progress or impact of ongoing strategies, approaches, policies, or initiatives. Nine states (38%) had landscape reports that centered solely on recommendations, whereas another four states (17%) focused on suggesting strategies, approaches, or policies more frequently than they reported on the implementation of ongoing ones. Georgia is the only state that had an equal number of reported and suggested (4%) strategies, approaches, or policies. Georgia reported on activities within the state designed specifically to expand CS education while also providing detailed recommendations on how the activities could be expanded. Three states (13%) more frequently reported on the implementation and impact of existing policies, approaches, or strategies rather than recommending new ones, whereas six states (25%) made no suggestions of new approaches, strategies, or policies to expand CS education and focused solely on reporting details regarding existing efforts.

Exhibit 2. Strategies Implemented or Suggested by States as Described in State K–12 CS Education Landscape Reports

Strategy	Number of states mentioned	States	CAPE framework alignment
Code.org Policies, Strategies, and Approaches			
Policy 1. Create a *statewide plan* for K–12 CS	1 (4%)	(I): KY	Capacity
Policy 2. Define CS and establish *standards* for K–12 CS	8 (33%)	(I): AK, AZ, IL, KY, NH, NV (S): CT, TX	Capacity, Experience

Strategy	Number of states mentioned	States	CAPE framework alignment
Policy 3. Allocate *funding* for rigorous CS teacher professional learning	14 (58%)	(I): AL, CA*, GA*, KY, NV, TN (S): AR, CA*, CT, GA*, HI, MI, MN, IA, OH, UT	Capacity
Policy 4. Implement clear *certification* pathways for CS teachers at elementary and secondary levels	10 (42%)	(I): AZ, KY, MD, NV, TN (S): AK, CT, MN, TN, UT	Capacity
Policy 5. Create programs at institutions of higher education to encourage all *preservice teachers* to gain exposure to CS	6 (25%)	(I): AL, CA, CT*, NC, NH, TN (S): CT*	Capacity
Policy 6. Establish dedicated *CS positions in state education agencies*	3 (13%)	(I): AK, KY, MN	Capacity
Policy 7. Require that *all schools offer CS* with appropriate implementation timelines	6 (25%)	(I): IL, IA, NC, TX (S): OH, TN	Access
Policy 8. Allow CS to *count toward a core graduation requirement*	5 (21%)	(I): AK, KY, MN, NC (S): CT	Participation
Policy 9. Allow CS to satisfy an *admission requirement* at higher education institutions	2 (8%)	(I): KY (S): TN	Participation
Policy 10. *Require that all students take CS* to earn a high school diploma	5 (21%)	(S): CA, KY, MD OH, UT	Participation
Other Policies, Strategies, or Approaches			
Expand outreach and awareness–building	7 (29%)	(I): GA* (S): AK, AZ, AR, GA*, MI, OH, OK	Capacity
Create teacher supports and digital resources	7 (29%)	(S): AL, IA, NC, NH, NV, MD, OK	Capacity, Experience
Develop connections to industry	6 (25%)	(S): CA, CT, HI, IA, OH, UT	Capacity
Improve data collection/analysis	5 (21%)	(S): AL, AZ, IL, NH, WA	Capacity
Expand partnerships	4 (17%)	(I): GA* (S): AZ, CA, GA*, IO	Capacity
Establish common language	3 (13%)	(I): HI (S): AK, IL	Capacity
Hold local and regional planning	3 (13%)	(I): MA (S): OH, OK	Capacity
Provide administrator training and support	3 (13%)	(I): NV (S): AR, IL	Capacity
Hold CS education summits	3 (13%)	(I): MD, NV (S): CT	Capacity

Strategy	Number of states mentioned	States	CAPE framework alignment
Expand curriculum	2 (8%)	(I): NV (S): AK	Capacity

Note. CS = computer science, I = Implemented, S = Suggested; * means that state both reported implementation and provided suggestions. An explanation of the Code.org Advocacy Coalition policies can be found at https://advocacy.code.org/stateofcs; Fletcher et al., 2021. The total number of state–level CS education landscape reports examined for this report is equal to 24. Percentages in this table should be interpreted as the proportion of those state–level CS education landscape reports in the sample that mentioned employing and/or suggested each policy, and thus percentages will not sum to 100%. The lack of a metric found in a report does not guarantee that it does not exist elsewhere for that state.

RQ2. What metrics related to K–12 CS education are commonly analyzed, reported, and used by states?

KEY FINDING 3

Most state-level K–12 CS education data dashboards and landscape reports included metrics describing student Participation, whereas few included metrics describing student Experience.

The following section focuses on answering RQ2 by describing specific metrics contained in state data dashboards, state landscape reports, and national–level CS reports. The findings in this section are first organized by data source (e.g., state data dashboards, state landscape reports, national–level reports). Within each subsection, findings are further organized according to the CAPE framework. A summary of the most reported metrics across data sources is contained in Exhibit 3.

Exhibit 3. Most Commonly Reported Metrics Across Landscape Scan Data Sources

Type of Review	CAPE Category	% of States	Most Commonly Reported
Data Dashboards	Capacity	29%	Number of CS teachers and their demographics
	Access	76%	Statewide total CS course availability followed by the district–level CS course availability
	Participation	88%	CS student counts and CS student demographics
	Experience	18%	AP CS passing rates

Landscape Reports	Capacity	67%	State–level educator CS certification and the total number of CS educators
	Access	50%	State–level high school CS access and state–level high school advanced CS access
	Participation	83%	State–level high school AP CS participation and state–level CS course participation
	Experience	29%	Student–level achievement data
National Reports*	Capacity	100%	*National Reports contained limited intersection on the metrics they reported. See Appendix I for a full list of metrics from National Reports.
	Access		
	Participation		
	Experience	67%	

Note. The percentages for national reports are calculated by the number of national reports included metrics related to that category of the CAPE framework. CS = computer science.

State Data Dashboard Metrics

Most state-level K–12 CS education data dashboards included metrics describing Participation (88%) and Access (76%), whereas few included metrics describing Capacity (29%) and Experience (18%).

Capacity Metrics

Most state dashboards (71%) did not include capacity metrics; of those that did (29%), the most common metric was the number of CS teachers (see Appendix G). The five state dashboards that contained capacity metrics included the number of CS teachers (*n* = 4, 24%) disaggregated by their certification status (*n* = 3, 18%), highest obtained postsecondary degree (*n* = 3, 18%), gender and racial/ethnic identity (*n* = 3, 18%), and age (*n* = 1, 6%).

Access Metrics

Thirteen data dashboards (76%) included access metrics (see Appendix G). Of those dashboards that contained access metrics (*n* = 4, 24%), they frequently included access metrics related to the statewide availability of CS courses (*n* = 8, 47%), followed by district-level[5] availability of CS courses (*n* = 6, 35%), the number of elementary schools integrating CS into their courses (*n* = 3, 18%), and CS course availability by course title (*n* =3, 18%).

[5] Common data dashboard metrics were sometimes split into state–level, region–level, district–level, and school–level if they were reported at various levels. A dashboard was marked as having a metric for the level as long as at a minimum an aggregated count or percentage was available at the marked level.

Participation Metrics

Fifteen state dashboards (88%) included participation metrics (see Appendix G). States most commonly provided a district–level CS student count (*n* = 14, 82%), followed by a school–level CS student count (*n* = 9, 53%), CS enrollment over time (*n* = 8, 47%), a region-level CS student count (*n* = 6, 35%),and CS student enrollment by course type (*n* = 4, 24%).

Experience Metrics

Most data dashboards (*n* = 14, 82%) did not contain experience metrics; of those that did (*n* = 3, 18%), the most commonly included metric was AP CS passing rates. Experience was the least reported CAPE framework category in state data dashboards (see Appendix G). Examples of experience methods include AP CS Principles and AP CS A passing rates (*n* = 2, 12%) and the number of CS students who went on to major in CS during postsecondary studies (*n* = 1, 6%).

Landscape Reports Metrics

Most state-level K-12 CS education landscape reports included metrics describing Participation (83%), Capacity (67%), and Access (50%), whereas fewer included metrics describing Experience (21%).

Capacity Metrics

Approximately two thirds (*n* = 16, 67%) of the landscape reports contained metrics related to capacity (see Appendix F). In contrast to our findings pertaining to data dashboards, states reported capacity-related metrics more frequently than access-related metrics in their landscape reports. Landscape reports most frequently reported state-level[6] educator CS certification (*n* = 9, 38%), followed by the number of CS educators (*n* = 8, 33%). State–level educator CS demographics, such as gender and race/ethnicity, were reported by five states (21%). Landscape reports also reported CS curriculum used in schools (*n* = 4, 17%), state-level CS educator highest degree obtained (*n* = 3, 13%), and the number of teachers participating in PD by PD type (*n* = 3, 13%).

Connecticut, Illinois, Michigan, and Utah surveyed educators and administrators to produce capacity data (as defined by the CAPE framework). These four states (17%) reported on educator/administrator perceived demand from students for CS education. Three states (13%) reported on educator/administrator opinion of why CS is not offered, two states (8%) reported on educator/administrator perceived demand from parents for CS education, and one state

[6] Common landscape report metrics were sometimes split into state–level, region–level, district–level, and school–level if they were reported at various levels. A landscape report was marked as having a metric for the level as long as at a minimum an aggregated count or percentage was available.

(4%) reported on educator/administrator opinion of CS education. Three states (13%) that conducted surveys also reported on the demographics of their survey respondents.

Access Metrics

Half of states (50%) included access metrics in their landscape reports (see Appendix F). Comparatively, landscape reports reported access measurements less frequently than data dashboards. Landscape reports most frequently reported state-level high school CS course availability (*n* = 12, 50%), followed by state-level high school advanced CS course availability (*n* = 6, 25%), district-level high school advanced CS course availability (n = 5, 21%), state-level middle school course availability (*n* = 5, 21%), state-level elementary school access (*n* = 5, 21%), and school-level high school advanced CS availability (*n* = 3, 13%).

Participation Metrics

Through their landscape reports, nearly every state (*n* = 20, 83%) shared data related to participation (see Appendix F). This finding is consistent with our findings from our review of data dashboards, with participation being the most widely reported category of the CAPE framework. State–level high school AP CS participation was the most widely tracked metric (*n* = 10, 42%). This is likely because, for several years, The College Board (the organization behind AP courses and exams) published state-level statistics each year related to AP CS participation. Landscape reports also included participation metrics related to state-level high school participation (*n* = 9, 38%) followed by district-level high school participation (*n* = 3, 13%).

Experience Metrics

Few landscape reports (*n* = 5, 21%) included experience metrics, whereas most (*n* = 19, 79%) landscape reports had no experience metrics (see Appendix F). Similar to the data dashboards, states reported on the experience of students much less frequently than the other elements of the CAPE framework. California and North Carolina (*n* = 2, 8%) captured both AP scores and how many students actually sat for the AP exam (which is a metric unique from students actually taking AP courses due to the fact that AP exams are optional). Hawaii, Maryland, and Minnesota (*n* = 3, 13%) also captured AP scores but did not capture the number of students taking the exams.

KEY FINDING 4

Data dashboards and landscape reports included CAPE metrics for elementary and middle school grade levels far less frequently than high school or advanced grade levels.

Exhibit 4 displays grade levels[7] for which states reported metrics, organized by the CAPE framework.

Across all elements of the CAPE framework, state dashboards more frequently reported measures at the high-school level than middle or elementary-school levels. Consistent with our findings from state data dashboards, state-level landscape reports most frequently reported measures across the CAPE framework at the high-school level more often than the middle or elementary school level. States most likely report CAPE measures at the high-school level more frequently than in earlier grade levels because CS course data is more available and easier to track in upper grade levels. CS education data collections are more frequent at the high school level than earlier grade levels, and high school CS instruction is typically implemented within dedicated CS courses with unique course codes rather than integrated into other subjects' courses like in elementary and middle school grade levels; moreover, CS has often historically been perceived as a subject intended for students in higher grade levels, there are less formal professional learning opportunities for elementary and middle school CS teachers, and states more often only have dedicate teaching certificates for upper grade levels. These factors make it more difficult for states to report CAPE metrics in elementary and middle school CS compared to high school (Yadav et al., 2016; Gallup and Google, 2020; Code.org, 2023; Kim et al., 2021).

Exhibit 4. CAPE Metrics Measurement by Grade Level

Category measured	No. of states that measured		States
	Dashboards	Reports	
CS Capacity			
Elementary	3 (18%)	10 (42%)	(D): AL, HI, PA (R): AL, AR, CT, HI, IL, IN, MD, MN, NH, UT
Middle	4 (24%)	13 (54%)	(D): AL, HI, PA, WA (R): AL, AR, CT, GA, HI, IL, IN, KY, MD, MI, MN, NH, UT
High	5 (29%)	16 (67%)	(D): AL, HI, PA, TX, WA

[7] States were consistent with the standard definitions for grade levels, with K–5 as elementary, 6–8 as middle school, and 9–12 as high school.

Category measured	No. of states that measured		States
	Dashboards	Reports	
			(R): AL, AR, CT, GA, HI, IL, IN, KY, MD, MI, MN, NH, NC, TX, UT, WA
Advanced (AP)	0 (0%)	0 (0%)	(D): N/A (R): N/A
CS Course Access			
Elementary	4 (24%)	5 (21%)	(D): AL, GA, HI, RI (R): HI, MD, MI, TN, UT
Middle	5 (29%)	5 (21%)	(D): HI, RI, GA, MS, NC (R): HI, MD, MI, TN, UT
High	14 (82%)	12 (50%)	(D): AL, CA, CT, GA, HI, ME, MD, MS, NC, PA, RI, TX, UT, WA (R): AK, CA, HI, IL, KY, MD, MI, MN, OH, OK, TX, UT
Advanced (AP)	6 (35%)	10 (42%)	(D): CA, CT, GA, MD, TX, UT (R): AZ, VA, GA, HI, KY, MD, MN, NC, TN, WA
CS Course Participation			
Elementary	5 (29%)	1 (4%)	(D): AL, GA, HI, MA, RI (R): IN
Middle	5 (29%)	1 (4%)	(D): AR, GA, HI, MA, RI (R): IN
High	15 (88%)	15 (63%)	(D): AL, AR, CA, CT, GA, HI, MD, MA, NC, OH, PA, RI, TX, UT, WA (R): AL, AR, CA, CT, GA, HI, IA, KY, MD, NV, NH, NC, OH, TX, WA
Advanced (AP)	7 (41%)	10 (42%)	(D): AL, AR, CA, CT, GA, MD, UT (R): AK, AZ, CA, CT, GA, HI, MD, MN, OK, TX
CS Student Experience			
Elementary	0 (0%)	0 (0%)	(D): N/A (R): N/A
Middle	0 (0%)	0 (0%)	(D): N/A (R): N/A
High	0 (0%)	0 (0%)	(D): N/A (R): N/A
Advanced (AP)	2 (12%)	5 (21%)	(D): AL, TX (R): CA, HI, MD, MN, NC

Note. CS = computer science, D = Data Dashboard, R = Landscape Report; the total number of state–level CS data dashboards examined for this report is equal to 17 and the total number of education landscape reports examined for this report is equal to 24. Percentages in this table should be interpreted as the proportion of those state–level CS education data dashboards or landscape reports (depending on the column) in the sample that measured the category. The lack of a metric found in a report does not guarantee that it does not exist elsewhere for that state.

KEY FINDING 5

The three national–level CS reports examined for this landscape scan most frequently contained Capacity metrics and least frequently contained Access metrics.

In addition to reviewing state-level landscape reports and data dashboards, AIR also reviewed three national-level reports described in Exhibit 5.

Exhibit 5. Description of National–Level Reports in Landscape Scan

Report	Description
2023 State of Computer Science Education	Released annually by the Code.org Advocacy Coalition, CSTA, and ECEP, the State of Computer Science Education reports attempt to provide the most comprehensive data and analysis possible on the progress of K–12 CS education across the United States. The report reviewed for this landscape scan was the most recent edition of the report available.
2018 NSSME+: Status of High School Computer Science	The National Survey of Science and Mathematics Education (NSSME) is an NSF–funded survey that has been periodically administered in the United States since 1977. The most recent iteration of the survey included computer science as a main area of inquiry. The sample for the entire 2018 NSSME+ survey was 7,600 science, mathematics, and computer science teachers from 1,273 schools across the United States. The report reviewed for this landscape scan was titled 2018 NSSME+: Status of High School Computer Science and utilized the responses of 289 high school computer science teachers.
Current Perspectives and Continuing Challenges in Computer Science Education in U.S. K–12 Schools	Between the years of 2015 and 2020, Google funded Gallup to study the growing interest in and commitment to providing opportunities for all students to learn computer science. The results of the 2020 study were generated through surveys with a nationally representative sample of teachers, principals, superintendents, and students in Grades 7–12. The report reviewed for this landscape scan was the most recent major report published through these research efforts.

The 2023 State of Computer Science Education and 2018 NSSME+: Status of High School Computer Science reports most frequently contained capacity related metrics (Exhibit 6). Google and Gallup's Current Perspectives and Continuing Challenges in Computer Science Education in U.S. K–12 Schools report mostly frequently included experience related metrics. A full description of metrics contained in National-level reports can be found in Appendix I.

Exhibit 6. National Reports’ Measurement of Metrics by CAPE Framework Category

Report	Capacity	Access	Participation	Experience
2023 State of Computer Science Education	8 (44%)	2 (11%)	8 (44%)	0 (0%)
2018 NSSME+: Status of High School Computer Science	30 (62%)	6 (13%)	2 (4%)	10 (21%)
Current Perspectives and Continuing Challenges in Computer Science Education in U.S. K–12 Schools	11 (33%)	2 (6%)	5 (15%)	15 (46%)

Conclusion

This landscape scan demonstrates both the value and the limitations of current state-level reporting on computer science (CS) education. Dashboards and landscape reports provide policymakers, educators, and researchers with important insights into CS education participation trends and course availability. However, most states primarily emphasize high school participation counts, with far less attention to student experience measures, early-grade levels, or disaggregated data. Limited disaggregation of data and a lack of insight into CS education across the entire span of K-12 grade levels in state dashboards and reports often obscures gaps across racial, gender, socioeconomic, geographic groups. To strengthen the utility of these resources, states should consider (1) expanding the data they include and (2) moving beyond using landscape reports and dashboards solely as advocacy tools or recommendation vehicles and **begin leveraging them as mechanisms for accountability, measuring progress, and continuous improvement**.

Embedding capacity, access, participation, and experience data disaggregated by gender, socioeconomic, racial, and geographic groups into dashboards and reports can help illuminate where gaps persist and provide a clearer picture of whether initiatives and investments in CS education are translating to opportunities for all teachers and students. Likewise, more systematic reporting on capacity, such as teacher credentials, participation in professional development, and availability of CS courses at the elementary and middle school levels would allow states to track progress toward building sustainable infrastructures and student pathways across all K-12 grade levels. To address limited student experience data in reports and dashboards, we recommend that states consider conducting student surveys and focus groups to supplement existing data from their administrative systems to provide a more robust view of CS education in their states.

Taken together, these steps would align state reporting with the CAPE framework, Code.org's policy recommendations, and guidance from the ECEP Alliance (2022), positioning dashboards and reports as actionable tools for advancing CS education for all students. By linking policy commitments to transparent measures of capacity, access, participation, and experience, states can ensure that CS education grows in ways that are both inclusive and enduring.

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Appendix A. Methods

The methodological approach used to conduct the CS landscape scan, administrative data analysis, listening sessions, and focus groups is described in this appendix.

Landscape Scan Methods

To address RQs 1 and 2, AIR conducted a scan and review of K–12 CS education landscape reports and state–level data dashboards. AIR identified a total of 24 state reports, 17 state dashboards, and three national reports.[8] These reports and dashboards represent the total number identified during our scan across all 50 states, Washington DC, and all US territories. AIR developed a coding scheme and conducted a thematic analysis of reports and dashboards to construct preliminary findings.

Data Sources and Sample

To answer RQ1 and RQ2, AIR reviewed state–level CS education landscape reports as well as state–level CS education data dashboards to document what measures states are tracking and what strategies they are implementing or suggesting to broaden participation in computing. In addition to the state–level documentation, AIR also reviewed national–level reports including the 2023 State of Computer Science Education Report, Current Perspectives and Continuing Challenges in Computer Science Education in U.S. K–12 Schools, and 2018 NSSME+: Status of High School Computer Science.

AIR collected state–level CS education landscape reports and links to CS education data dashboards by scanning websites of two types of organizations for relevant documentation: (a) state departments of education and (b) state–level advocacy organizations. We also reviewed the portion of the Expanding Computing Education Pathways (ECEP) Alliance's website that lists examples of CS education landscape reports.[9] AIR identified Landscape reports were often using the titles and/or descriptions of the documents. If the document was not immediately identifiable as a landscape report, AIR reviewed it to determine whether it had multiple pages that examined access to and/or participation in K–12 CS education coursework at the state level. If a document simply described the future of CS education in a state but did not contain any data related to current or past access or participation, it was excluded from the sample. Data dashboards were included if they were identified as CS education data dashboards or, at a minimum, contained data related to CS course access or participation.

[8] The scan was conducted from June 2023 through October 2023.
[9] See https://ecepalliance.org/resources/toolkits–guides/landscape–reports/

Landscape Scan Sample

To address RQs 1 and 2, AIR conducted a systematic search and review of K–12 CS education landscape reports and state–level data dashboards.[10] AIR identified a total of 24 state reports, 17 state dashboards, and three national reports (Exhibit A–1). These reports and dashboards represent the total number identified during our scan across all 50 states, Washington DC, and all US territories. We conducted this scan from June 2023 through October 2023.

We sourced these reports from Expanding Computing Education Pathways (ECEP) Alliance's curated list of state landscape reports, the websites of state–level departments of education, and the websites of state–level advocacy organizations related to CS education. AIR also reviewed three national–level reports: the 2023 State of Computer Science Education Report, Current Perspectives and Continuing Challenges in Computer Science Education in U.S. K–12 Schools, and 2018 NSSME+: Status of High School Computer Science.

Exhibit A–1. Sample of State K–12 CS Education Reports and Data Dashboards

Document Type	Included States[11]	*N*
State Landscape Reports	AL, AK, AZ, AR, CA, CT, GA, HI, IL, IN, IA, KY, MD, MI, MN, NV, NH, NC, OH, OK, TN, TX, UT, WA	24
CS Education Data Dashboards	AL, AR, CA, CT, GA, HI, ME, MD, MA, MS, NC, OH, PA, RI, TX, UT, WA	17

Measures and Instrument Development

AIR took differing approaches in its development of codes for landscape reports and data dashboards.

Landscape Reports

For landscape reports, AIR utilized a deductive approach to developing the initial codes, basing them on our theories of what we thought we might see, and then supplemented with an inductive approach, adding additional codes as they emerged from the data (Dey, 2003; LeCompte, 2000). To begin, AIR constructed an initial set of codes. AIR categorized these codes into two categories: 1) Metrics, and 2) Policies, Strategies, and Approaches. AIR based the initial

[10] In addition to the inclusion of state landscape reports and data dashboards in the sample, AIR also utilized the following resources in order to become oriented with the CS education landscape specific to Pennsylvania: The PaTTAN Computer Science Education Website (https://www.pattan.net/Supports/STEM/computer–science), the Pennsylvania CS Education data dashboard (https://www.pattan.net/Supports/STEM/computer–science/Data–Dashboard), the STEM and Computer Science FAQ page on PDE's website (https://www.education.pa.gov/Educators/Certification/CertFAQs/Pages/STEMCS.aspx), and the Code.org State Fact Sheet for Pennsylvania (https://advocacy.code.org/state–handouts/Pennsylvania.pdf).

[11] AIR has used The United States Postal Service abbreviations for states throughout the tables in this document. For a list of these postal abbreviations, please see Appendix B.

codes for Metrics on the CAPE framework, while the initial codes for Policies, Strategies, and Approaches were based on the ten Code.org policies (Code.org, n.d.).

Through the process of reviewing landscape reports, if Researchers found a metric or policy, strategy, and approach that did not fit within an existing code, AIR created a new code. Researchers then rolled new codes forward in further iterations of the protocol. Researchers also conducted a review to see if previously examined landscape reports contained the new codes. In the Metrics category of the protocol, Researchers took notes to capture the primary method the report utilized when conveying the metric (Graph, Text, etc.) as well as which numerical measures (Count, Percentage, etc.) were utilized. In the Policies, Strategies and Approaches section, reviewers attempted to examine items across three levels: context, implementation, and results. For context, it was important for Researchers to record information about how the coded item came to be enacted or suggested in the state—this may include information such as legislation that has passed to prompt action, etc. For implementation, Researcher noted the scale and scope of the coded item. For results, AIR recorded any qualitative or quantitative information contained within the report indicating the impact of the policy, strategy, or approach.

Data Dashboards

AIR did not start with reviewing data dashboards using a theory–based codebook, but instead, used a grounded approach (Glaser, 1999). First, researchers reviewed Pennsylvania's data dashboard to create a baseline of codes. Then, as researchers reviewed new data dashboard, metrics and features that were not present in Pennsylvania's dashboard were added to the protocol. Dashboards are interactive, so in many instances, metrics can emerge as the user engages with the dashboard. Researchers noted each of these metrics was in their review.

Analysis Methods

To address RQs 1 and 2, AIR systematically reviewed the documents and dashboards. AIR determined how many state landscape reports contain each of the measures examined in the coding rubric. These descriptive statistics (e.g., frequencies, counts) revealed which items were commonly included in state CS education landscape reports and which were more uncommon. Then, guided by the four categories of the CAPE framework, AIR compiled the collected data together and analyzed the strategies, policies, and approaches described in the landscape reports, the metrics used in the landscape reports, and the metrics used in the data dashboards.

Appendix B. Postal Service State Abbreviations

This appendix contains Exhibit B–1, which defines the postal abbreviation for each state referenced in this report.

Exhibit B–1. United States Postal Service State Abbreviations

State	Postal Abbreviation	State	Postal Abbreviation
Alabama	AL	Nebraska	NE
Alaska	AK	Nevada	NV
Arizona	AZ	New Hampshire	NH
Arkansas	AR	New Jersey	NJ
California	CA	New Mexico	NM
Colorado	CO	New York	NY
Connecticut	CT	North Carolina	NC
Delaware	DE	North Dakota	ND
District of Columbia	DC	Ohio	OH
Florida	FL	Oklahoma	OK
Georgia	GA	Oregon	OR
Hawaii	HI	Pennsylvania	PA
Idaho	ID	Puerto Rico	PR
Illinois	IL	Rhode Island	RI
Indiana	IN	South Carolina	SC
Iowa	IA	South Dakota	SD
Kansas	KS	Tennessee	TN
Kentucky	KY	Texas	TX
Louisiana	LA	Utah	UT
Maine	ME	Vermont	VT
Maryland	MD	Virginia	VA
Massachusetts	MA	Virgin Islands	VI
Michigan	MI	Washington	WA
Minnesota	MN	West Virginia	WV
Mississippi	MS	Wisconsin	WI
Missouri	MO	Wyoming	WY
Montana	MT		

Appendix C. Landscape Reports and Data Dashboards by State

Contained in this appendix is Exhibit C–1, which displays the results of AIR's scan for state–level CS data dashboards and landscape reports.

Exhibit C–1. CS Education Report and Dashboard Inventory Scan

State	Landscape Report	Data Dashboard	Landscape Report Citation	Data Dashboard Citation
Alabama	**X**	**X**	Alabama State Department of Education. (2023). Alabama Computer Science Expansion Data Report. In 2022 Alabama Computer Science Expansion Data Report (Vol. 2). https://bit.ly/ALCSPDreport.	Alabama CS Expansion Data Report. (n.d.). https://sites.google.com/view/alcsexpansiondatareport/
Alaska	**X**	**M**	Alaska Department of Education and Early Development. (2023). Alaska Computer Science Education State Plan.	Not Applicable
Arizona	**X**	**M**	Mak, J. (n.d.). Computer Science (CS) Implementation Guidance Landscape.	Not Applicable
Arkansas	**X**	**X**	Arkansas Computer Science and Cyber Security Task Force. (2020). Arkansas Computer Science and Cyber Security Task Force Report.	ADE Data Center. (2022). Enrollment – Computer Science. https://adedata.arkansas.gov/statewide/ReportList/Districts/StudentCountComputerScience.aspx?year=32&search=&pagesize=50
California	**X**	**X**	Koshy, S., Hinton, L., Cruz, L., Scott, A., & Flapan, J. (2021). The California Computer Science Access Report.	The Data. Computer Science for California. (2023, July 14). https://csforca.org/the–data/
Colorado	**M**	**M**	Not Applicable	Not Applicable
Connecticut	**X**	**X**	Corricelli, J., Freeman, S., & Uche, C. (2018). CS for CT: Examining the Landscape of Computer Science in Connecticut.	Computer science dashboard. CT.gov. (n.d.). https://public–edsight.ct.gov/Instruction/Computer–Science–Dashboard?language=en_US
Delaware	**M**	**M**	Not Applicable	Not Applicable
Florida	**M**	**M**	Not Applicable	Not Applicable
Georgia	**X**	**X**	Aldridge, A., Wall, B. M., Cox, B., Hagin, D. L., & Williams, L. (2023). Computer Science: A Landscape Picture and State Plan For Georgia.	Georgia Department of Education. (2023). Computer Science Dashboard. https://www.georgiastandards.org/Georgia–Standards/Pages/Computer–Science.aspx

State	Landscape Report	Data Dashboard	Landscape Report Citation	Data Dashboard Citation
Hawaii	**X**	**X**	Trúc Nguyễn, T. T., & Mordecai, M. (2020). Catching Up to Move Forward: A Computer Science Education Landscape Report of Hawaii Public Schools. In COMPUTER SCIENCE LANDSCAPE. http://www.hawaii.edu/crdg	HIDOE DGA. (n.d.). ACT158 Public Dashboard. Public.tableau.com. https://public.tableau.com/app/profile/hidoe.dga/viz/ACT158PublicDashboard/Cover
Idaho	**M**	**M**	Not Applicable	Not Applicable
Illinois	**X**	**M**	Hegeman–Davis, R., & Sewell, M. (2021). Landscape report of K–12 Computer Science Education in Illinois.	Not Applicable
Indiana	**X**	**M**	Office of Teaching and Learning. (2023). Indiana Code 20–20–45 Next Level Computer Science Program Biannual Report.	Not Applicable
Iowa	**X**	**M**	Kay, K., & Weld, J. (2021). Building on Iowa's Vision for Computer Science Education.	Not Applicable
Kansas	**M**	**M**	Not Applicable	Not Applicable
Kentucky	**X**	**M**	Kentucky Department of Education. (2022). Kentucky K–12 Annual Computer Science Report.	Not Applicable
Louisiana	**M**	**M**	Not Applicable	Not Applicable
Maine	**M**	**X**	Not Applicable	Computer Science in Maine Schools. (2023). https://www.google.com/maps/d/u/0/viewer?mid=1gLnHeC7TJJI1qrkKOBhwX23L0M60d_yb&ll=44.50762902525757%2C–68.63094226912817&z=7
Maryland	**X**	**X**	Garvin, M. (2021). Maryland Center for Computing Education Securing the Future of Maryland: Computer Science Education for All.	Maryland Longitudinal Data System Center . (n.d.). Participation in Maryland High Quality Computer Science Courses and Post–Graduation Outcomes . Computer science dashboard. https://mldscenter.maryland.gov/ComputerscienceDashboard.html
Massachusetts	**M**	**X**	Not Applicable	Massachusetts Department of Elementary and Secondary Education. (n.d.). 2023 digital literacy and Computer Science Coursetaking Report. https://profiles.doe.mass.edu/statereport/computersciencecourse.aspx
Michigan	**X**	**M**	Michigan Department of Education. (2020). State of Computer Science Education in Michigan.	Not Applicable

State	Landscape Report	Data Dashboard	Landscape Report Citation	Data Dashboard Citation
Minnesota	**X**	**M**	Not Applicable	Not Applicable
Mississippi	**M**	**X**	Not Applicable	Where computer science is offered. CS4MS. (n.d.). https://cs4ms.org/k12courses/course-map/
Missouri	**M**	**M**	Not Applicable	Not Applicable
Montana	**M**	**M**	Not Applicable	Not Applicable
Nebraska	**M**	**M**	Not Applicable	Not Applicable
Nevada	**X**	**M**	Nevada Department of Education. (2018). Nevada Department of Education Status Report: Senate Bill 200 Computer Science Education.	Not Applicable
New Hampshire	**X**	**M**	Deloge, R. W., Sabin, M., Jin, K., & Manus Painchaud, M. (2016). NH Computing Education Landscape Report.	Not Applicable
New Jersey	**M**	**M**	Not Applicable	Not Applicable
New Mexico	**M**	**M**	Not Applicable	Not Applicable
New York	**M**	**M**	Not Applicable	Not Applicable
North Carolina	**X**	**X**	Frye, D., Morris, S., Samberg, M., & Keller, L. (2017). NC Computing Education Summit: North Carolina Preliminary Landscape Report.	The Friday Institute. (2022). NC CS Dashboard v2. https://public.tableau.com/app/profile/sam.morris3753/viz/CS_v21/NCCSDashboard
North Dakota	**M**	**M**	Not Applicable	Not Applicable
Ohio	**X**	**X**	Duffey, M., Wiseman, J., & Gaier Evans, K. (2022). Report of the State Committee on Computer Science.	Ohio Department of Education. (2022). Computer Science Enrollment. https://data.ohio.gov/wps/portal/gov/data/view/ode-computer-science-dashboard
Oklahoma	**X**	**M**	CSforOK. (2020). CSforOK Strategic Plan.	Not Applicable
Oregon	**M**	**M**	Not Applicable	Not Applicable
Pennsylvania	**M**	**X**	Not Applicable	Pennsylvania Training and Technical Assistance Network. (2023). PA Smart Data Dashboard. https://www.pattan.net/Supports/STEM/computer-science/Data-Dashboard
Rhode Island	**M**	**X**	Not Applicable	CSD4RI. (2022). Snapshot of Rhode Island Schools – 2021/2022. https://www.cs4ri.org/data-dashboard
South Carolina	**M**	**M**	Not Applicable	Not Applicable
South Dakota	**M**	**M**	Not Applicable	Not Applicable

State	Landscape Report	Data Dashboard	Landscape Report Citation	Data Dashboard Citation
Tennessee	**X**	**M**	Tennessee Department of Education. (2020). Tennessee Computer Science State Education Plan: Task Force Report & Recommendations. https://publications.tnsosfiles.com/acts/111/pub/pc0454.pdf	Not Applicable
Texas	**X**	**X**	Fletcher, C.L., Ramchand, R. (2018) Preparing Texas Students for the Cyber Economy. The University of Texas at Austin. Retrieved from https://utexas.box.com/v/CS–Task–Force–Report–2018	Texas Advanced Computing Center. (2023). Texas CS Education Data. https://tacc.utexas.edu/education/educators/data–dashboard/
Utah	**X**	**X**	Rich, P., Hu, H., Christensen, J., & Ellsworth, J. (2019). The Landscape of Computing Education in Utah.	CS4Utah. https://cs4utah.org/. Utah Computer Science Dashboard for Grades 9–12. (2023).
Vermont	**M**	**M**	Not Applicable	Not Applicable
Virginia	**M**	**M**	Not Applicable	Not Applicable
Washington	**X**	**X**	Thissen, S. (2021). K–12 Computer Science Education Data Summary Report.	CS for All Washington. (2023). CS for All Washington – Data. https://www.csforallwa.org/data
West Virginia	**M**	**M**	Not Applicable	Not Applicable
Wisconsin	**M**	**M**	Not Applicable	Not Applicable
Wyoming	**M**	**M**	Not Applicable	Not Applicable
American Samoa	**M**	**M**	Not Applicable	Not Applicable
Guam	**M**	**M**	Not Applicable	Not Applicable
Northern Mariana Islands	**M**	**M**	Not Applicable	Not Applicable
Puerto Rico	**M**	**M**	Not Applicable	Not Applicable
US Virgin Islands	**M**	**M**	Not Applicable	Not Applicable
Total	**24**	**17**		

Note. M = not identified or missing*;* X = identified and reviewed

Appendix D. Definitions of Landscape Review Codes for State CS Education Data Dashboards

This appendix contains Exhibit D-1, which displays definitions for the codes used to analyze K–12 CS education data dashboards.

Exhibit D–1. State Data Dashboards: Definitions of Codes

Description	Definition
Capacity Codes	
Number of CS teachers	The total number of teachers of CS statewide.
Educator Certification of CS teachers	The total number of teachers who hold CS teaching credentials.
Highest Degree Obtained of CS teachers	The highest postsecondary degree obtained by teachers of CS.
Years of Service of CS Teachers	The number of years across any subject area that a teacher of CS has been an educator.
Number of teachers that attended PD	The number of teachers that attended professional development related to CS.
PD attendees by PD provider	The number of teachers that attended professional development related to CS, organized by PD provider.
Gender breakdown of CS teachers	The gender of teachers of CS
Race/Ethnicity breakdown of CS teachers	The race/ethnicity of teachers of CS.
Age of CS teachers	The age of teachers of CS.
Schools with teachers that attended CS PD	The number of schools that had at least one teacher that attended professional development related to CS education.
Schools with implementation plans	The number of schools that have reported having implementation plans related to CS education.
Schools with adopted curriculum	The number of schools that have reported adopting CS education curriculum.
Access Codes	
Statewide Total CS Course Availability	The availability of CS courses with the data spanning the entire state.
District–Level CS Course Availability	The availability of CS courses with the data broken down by district.

Description	Definition
School–Level CS Course Availability	The availability of CS courses with the data broken down by school.
CS Offerings by Course Type	The availability of CS course offerings by type.
Urbanicity	Student access to CS education by the rural/suburban/urban designation of a school.
Title 1 / School FRL Rate	A school's qualification for Title 1 funds and/or the percentage of students at the school that qualify for free or reduced lunch
School race/ethnicity	The overall racial and ethnic composition of schools.
Students Attending a School with a CS Course	The number of students who attend a school that has at least one CS course.
CS Pathways Availability	The availability of CS education pathways, such as CTE pathways.
Number of Elementary Schools offering CS integration	The number of K–5 schools introducing students to CS through integration, as opposed to courses.
Number of Middle Schools offering CS integration	The number of 6–8 schools introducing students to CS through integration, as opposed to courses.
List of CS course titles	A listing of course titles that count as CS coursework in the state.
CS offerings over time	A display of CS course offerings over two or more school years.
State Legislative District	CS education available as filtered geographically by state legislative district.
US Congressional District	CS education available as filtered geographically by US congressional district.
Participation Codes	
Statewide Total CS Students Count	The number of students participating in CS with the data spanning the entire state.
Region–Level CS Student Count	The number of students participating in CS with the data broken down by a regional category that is not school districts.
District–Level CS Student Count	The number of students participating in CS with the data broken down by school district.
School–Level CS Student Count	The number of students participating in CS with the data broken down by school.
Economically Disadvantaged Status of CS Students	The socioeconomic breakdown of students who participate in CS coursework.
Gender of CS Students	The gender breakdown of students who participate in CS coursework.
Race/Ethnicity of CS Students	The racial and ethnic breakdown of students who participate in CS coursework.

Description	Definition
ELL Status of CS Students	The ELL status of students who participate in CS coursework
IDEA Status of CS Students	The IDEA status of students who participate in CS coursework.
504 Status of CS Students	The 504 status of students who participate in CS coursework.
Homelessness Status of CS Students	The homelessness status of students who participate in CS coursework.
Enrollment by Course Type	Enrollment in CS courses by the type of course.
CS Student Grade Levels	The grade levels (K–12) of students who participate in CS.
Type of CS Course	The different types of CS courses that students enroll in.
Urbanicity	Student participation in CS education by the rural/suburban/urban designation of a school.
CS Pathways Enrollment	Student participation in CS education pathways, such as CTE pathways.
% of HS graduates who took at least one CS course	The percentage of HS graduates who took at least one CS course over the time period of their high school enrollment.
CS enrollment over time	Student enrollment data over two or more school years.
State Legislative District	Student participation in CS education as filtered geographically by state legislative district.
US Congressional District	Student participation in CS education as filtered geographically by US congressional district.
Experience Codes	
% of CS course takers who then major in CS	The percentage of CS course takers who then go onto postsecondary schools and major in CS.

Appendix E. Definitions of Landscape Review Codes for State CS Education Landscape Reports

This appendix contains Exhibit E–1, which displays definitions for the codes used to analyze K–12 CS education landscape reports.

Exhibit E–1. State Landscape Reports: Definitions of Codes

Description	Definition
Capacity Codes	
State–level number of CS educators	The total count of educators teaching computer science at the state level.
State–level educator CS certification	The certification status of educators for teaching computer science at the state level.
State–level CS educator certification test results	The outcomes of certification tests taken by educators for teaching computer science at the state level.
State–level educator CS demographics	The demographic breakdown of computer science educators at the state level.
State–level CS educator highest degree obtained	The highest level of education attained by computer science educators at the state level.
Number of teachers participating in PD by PD Type	The count of teachers engaged in professional development (PD), categorized by the type of PD.
Inclusion of CS in teacher prep programs	The integration of computer science education within teacher preparation programs.
Enablers that Support CS Learning	Factors or resources that facilitate the learning of computer science.
CS Curriculum used in schools	The computer science curriculum adopted by schools.
Barriers to CS Learning	Challenges or obstacles that hinder the learning of computer science.
Method of offering CS	The approach or medium through which computer science education is provided.
Educator/Administrator opinion of CS education	The perspectives of educators and administrators on computer science education.
Educator/Administrator opinion of why CS is not offered	The reasons provided by educators and administrators for not offering computer science education.
Educator/Administrator perceived demand from students of CS education	The demand for computer science education as perceived by educators and administrators from the student body.
Educator/Administrator perceived demand from parents of CS education	The demand for computer science education as perceived by educators and administrators from parents.

Description	Definition
Opinion of parents regarding CS	The viewpoints of parents concerning computer science education.
Demographics of Survey Respondents	The demographic information of individuals who responded to a survey.
Access Codes	
State–level High School Access	The availability of computer science courses at high schools across the state.
Regional–level CS course access	The availability of computer science courses at a regional level.
District–level High School Access	The availability of computer science courses at high schools within a school district.
School–level High School Access	The availability of computer science courses at individual high schools.
State–level High School Advanced CS Access	The availability of advanced computer science courses at high schools across the state.
District–level High School Advanced CS Access	The availability of advanced computer science courses at high schools within a school district.
School–level High School Advanced CS Access	The availability of advanced computer science courses at individual high schools.
State–level Middle School Access	The availability of computer science courses at middle schools across the state.
State–level Elementary School Access	The availability of computer science courses at elementary schools across the state.
Extracurricular CS Access	The availability of extracurricular computer science learning opportunities.
Student Access to Pathways (such as CTE)	The accessibility of pathways like Career and Technical Education (CTE) that include computer science.
Participation Codes	
State–level CS course Participation	The participation rates in computer science courses at the state level.
State–level High School Participation	The participation rates in computer science courses at high schools across the state.
District–level High School Participation	The participation rates in computer science courses at high schools within a school district.
School–level High School Participation	The participation rates in computer science courses at individual high schools.
State–level High School Advanced CS Participation	The participation rates in advanced computer science courses at high schools across the state.
District–level High School Advanced CS Participation	The participation rates in advanced computer science courses at high schools within a school district.
State–level Middle School Participation	The participation rates in computer science courses at middle schools across the state.
State–level Elementary School Participation	The participation rates in computer science courses at elementary schools across the state.
Student enrollment by course	The number of students enrolled in each computer science course.

Description	Definition
Student enrollment by course delivery method (in–person vs …)	The number of students enrolled in computer science courses, categorized by the method of delivery (e.g., in–person, online).
Student Enrollment by Grade Level	The number of students enrolled in computer science courses, categorized by grade level.
Experience Codes	
Student–level achievement data	The performance data of students in computer science courses.
Student–level taking an AP CS exam	The number of students taking an Advanced Placement (AP) computer science exam.

Appendix F. Comparison of Landscape Reports Reporting or Suggestions Strategies, Approaches, and Policies

This appendix contains Exhibit F–1, which the number of strategies, approaches and policies included within each state–level landscape report, and whether the strategy, approach, or policy was reported or suggested.

Exhibit F–1. State Landscape Reports: Strategies, Approaches, and Policies Reported Versus Suggested

State	Reported N	Reported %	Suggested N	Suggested %	Total Number of Strategies, Approaches, and Policies Mentioned	Ratio (Reported: Suggested)
AL	1	100.0%	0	0.0%	1	All Reported
AK	3	37.5%	5	62.5%	8	0.6
AZ	0	0.0%	5	100.0%	5	All Suggested
AR	0	0.0%	5	100.0%	5	All Suggested
CA	3	75.0%	1	25.0%	4	3
CT	0	0.0%	8	100.0%	8	All Suggested
GA	6	50.0%	6	50.0%	12	1
HI	0	0.0%	7	100.0%	7	All Suggested
IL	6	66.7%	3	33.3%	9	2
IN	1	100.0%	0	0.0%	1	All Reported
IA	2	40.0%	3	60.0%	5	0.666666667
KY	9	100.0%	0	0.0%	9	All Reported
MD	6	100.0%	0	0.0%	6	All Reported
MI	0	0.0%	4	100.0%	4	All Suggested

State	Reported N	Reported %	Suggested N	Suggested %	Total Number of Strategies, Approaches, and Policies Mentioned	Ratio (Reported: Suggested)
MN	3	50.0%	3	50.0%	6	1
NV	4	80.0%	1	20.0%	5	4
NH	3	100.0%	0	0.0%	3	All Reported
NC	3	100.0%	0	0.0%	3	All Reported
OH	0	0.0%	10	100.0%	10	All Suggested
OK	0	0.0%	1	100.0%	1	All Suggested
TN	3	33.3%	6	66.7%	9	0.5
TX	1	33.3%	2	66.7%	3	0.5
UT	0	0.0%	8	100.0%	8	All Suggested
WA	0	0.0%	1	100.0%	1	All Suggested

Note. The total number of state landscape report is equal to 24. Ratios have been recoded so that when the ratio is undefined, it is noted as "All reported" and when the ratio is 0, it is noted as "All Suggested".

Appendix G. Full Tables for Metrics from Data Dashboards

This appendix includes tables containing a count of metrics observed from each state CS education data dashboard included in AIR's landscape scan. This section is organized by the CAPE framework, with the first table including metrics categorized as related to capacity (see Exhibit G–1), the second table including metrics categorized as related to access (see Exhibit G–2), the third table including metrics categorized as related to participation (see Exhibit G–3), and the fourth table including metrics categorized as related to experience (see Exhibit G–4).

Exhibit G–1. State Data Dashboards: Metrics Related to Capacity

	PA	AL	AR	CA	CT	GA	HI	ME	MD	MA	MS	NC	OH	RI	TX	UT	WA	Total
Number of Measures Observed	8	7	0	0	0	0	5	0	0	0	0	0	0	0	1	0	5	
Number of CS teachers	•	•					•										•	4
Educator Certification of CS teachers	•						•										•	3
Highest Degree Obtained of CS teachers	•						•										•	3
Years of Service of CS Teachers	•																	1
Number of teachers that attended PD		•																1
PD attendees by PD provider		•																1
Gender of CS teachers	•						•										•	3
Race/Ethnicity of CS teachers	•						•										•	3
Age of CS teachers	•																	1
Schools with teachers that attended CS PD		•																1
Schools with implementation plans		•																1
Schools with adopted curriculum		•																1
Schools with a certified CS teacher															•			1
Courses with a certified CS teacher	•																	1
Schools meeting CS ed legislation requirements		•																1

Exhibit G–2. Data Dashboards: Metrics Related to Access

Description	PA	AL	AR	CA	CT	GA	HI	ME	MD	MA	MS	NC	OH	RI	TX	UT	WA	Total
Measures Observed	3	2	0	4	1	1	4	1	3	0	2	6	0	4	2	2	0	
Statewide Total CS Course Availability	•	•		•	•		•		•			•		•				8
Region–level CS Course Availability															•			1
District–Level CS Course Availability				•			•		•		•	•		•				6
School–Level CS Course Availability				•												•		2
CS Offerings by Course Type	•															•		2
Urbanicity												•						1
Title 1 / School FRL Rate												•						1
School or district overall race/ethnicity				•								•						2
Students Attending a School with a CS Course												•						1
CS Pathways Availability						•												1
Number of Elementary Schools offering CS integration		•					•							•				3
Number of Middle Schools offering CS integration							•							•				2
CS availability by course title								•	•		•							3
CS offerings over time	•																	1
State Legislative District															•			1

Exhibit G–3. Data Dashboards: Metrics Related to Participation

Description	PA	AL	AR	CA	CT	GA	HI	ME	MD	MA	MS	NC	OH	RI	TX	UT	WA	Total
Measures Observed	11	7	1	6	9	8	10	0	8	10	0	9	9	8	10	10	12	
Statewide Total CS Students Count	•	•		•	•	•	•		•	•		•	•		•	•	•	13
Region–Level CS Student Count				•			•					•	•		•		•	6
District–Level CS Student Count	•	•	•	•	•	•	•			•		•	•	•	•	•	•	14
School–Level CS Student Count	•	•		•		•	•			•					•	•	•	9
Economically Disadvantaged Status of CS Students	•				•		•		•	•		•	•	•	•	•	•	11
Gender of CS Students	•	•		•	•	•	•		•	•		•	•	•	•	•	•	14
Race/Ethnicity of CS Students	•	•		•	•	•	•		•	•		•	•	•	•	•	•	14
ELL Status of CS Students	•				•		•			•		•	•	•	•	•	•	10
IDEA/Disability Status of CS Students	•				•	•	•		•	•		•	•	•	•	•	•	12
504 Status of CS Students	•									•								2
Homelessness Status of CS Students	•																	1
Enrollment by Course Type		•			•	•										•		4
CS Student Grade Levels		•					•			•				•			•	5
Urbanicity														•				1
CS Pathways Enrollment									•									1
High school graduates who took at least one CS course									•									1
CS enrollment over time	•				•	•			•			•	•		•	•		8
State Legislative District																	•	1
U.S. Congressional District																	•	1

Note. PA and MA included specific metrics related to the 504 status of students. Ten other states measured IDEA/disability status, and it was unclear from dashboards whether or not their definitions were inclusive of all 504 students.

Exhibit G–4. Data Dashboards: Metrics Related to Experience

Description	PA	AL	AR	CA	CT	GA	HI	ME	MD	MA	MS	NC	OH	RI	TX	UT	WA	Total
Measures Observed	0	2	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	
Percentage of CS course takers who then major in CS									•									1
AP CS Principles Passing Rates		•													•			2
AP CS A Passing Rates		•													•			2

Appendix H. Full Tables of Metrics from Landscape Reports

This appendix includes tables containing a count of metrics observed from each state K–12 CS education landscape report included in AIR's landscape scan. This section is organized by the CAPE framework, with the first table including metrics categorized as related to capacity (see Exhibit H–1), the second table including metrics categorized as related to access (see Exhibit H–2), the third table including metrics categorized as related to participation (see Exhibit H–3), and the fourth table including metrics categorized as related to experience (see Exhibit H–4).

Exhibit H–1. Landscape Reports: Metrics Related to Capacity

Description	AL	AK	AZ	AR	CA	CT	GA	HI	IL	IN	IA	KY	MD	MI	MN	NV	NH	NC	OH	OK	TN	TX	UT	WA
Measures Observed	2	0	0	2	0	5	2	3	5	2	0	4	9	5	1	0	2	1	0	0	0	2	3	4
State–level number of CS educators	•						•	•				•	•				•					•		•
State–level educator CS certification	•			•			•	•				•	•				•					•		•
State–level CS educator certification test results				•																				
State–level educator CS demographics						•		•				•	•											•
State–level CS educator highest degree obtained									•			•												•

Description	AL	AK	AZ	AR	CA	CT	GA	HI	IL	IN	IA	KY	MD	MI	MN	NV	NH	NC	OH	OK	TN	TX	UT	WA
Number of teachers participating in PD by PD Type										•			•										•	
Inclusion of CS in teacher prep programs													•		•									
Enablers that Support CS Learning													•											
CS Curriculum used in schools						•				•			•										•	
Barriers to CS Learning													•											
Method of offering CS													•											
Educator/ Administrator opinion of CS education														•										
Educator/ Administrator opinion of why CS is not offered						•			•					•										
Educator/ Administrator perceived demand from students of CS education						•			•					•									•	

Description	AL	AK	AZ	AR	CA	CT	GA	HI	IL	IN	IA	KY	MD	MI	MN	NV	NH	NC	OH	OK	TN	TX	UT	WA
Educator/ Administrator perceived demand from parents of CS education									•					•										
Opinion of parents regarding CS																		•						
Demographics of Survey Respondents						•			•					•										

Exhibit H–2. Landscape Reports: Metrics Related to Access

Description	AL	AK	AZ	AR	CA	CT	GA	HI	IL	IN	IA	KY	MD	MI	MN	NV	NH	NC	OH	OK	TN	TX	UT	WA
Measures Observed	0	1	1	0	4	0	1	5	2	0	0	5	5	3	3	0	0	2	1	1	3	1	3	2
State–level High School Access		•			•			•				•	•	•	•				•	•		•	•	•
Regional–level CS course access									•															
District–level High School Access					•							•												
School–level High School Access												•												

Description	AL	AK	AZ	AR	CA	CT	GA	HI	IL	IN	IA	KY	MD	MI	MN	NV	NH	NC	OH	OK	TN	TX	UT	WA
State–level High School Advanced CS Access					•		•	•					•		•									•
District–level High School Advanced CS Access					•			•				•	•		•									
School–level High School Advanced CS Access			•															•			•			
State–level Middle School Access								•					•	•							•		•	
State–level Elementary School Access								•					•	•							•		•	
Extracurricular CS Access									•									•						
Student Access to Pathways (such as CTE)												•												

Exhibit H–3. Landscape Reports: Metrics Related to Participation

Description	AL	AK	AZ	AR	CA	CT	GA	HI	IL	IN	IA	KY	MD	MI	MN	NV	NH	NC	OH	OK	TN	TX	UT	WA
Measures Observed	1	1	1	1	2	2	2	5	0	3	2	2	5	0	1	2	1	1	1	1	0	2	0	2
State–level CS course Participation					•	•	•	•			•	•	•					•						•
State–level High School Participation	•			•				•					•			•	•		•			•		
District–level High School Participation								•			•		•											
School–level High School Participation																•								
State–level High School Advanced CS Participation		•	•		•	•	•	•					•		•					•		•		
District–level High School Advanced CS Participation								•					•											
State–level Middle School Participation										•														
State–level Elementary School Participation										•														

Description	AL	AK	AZ	AR	CA	CT	GA	HI	IL	IN	IA	KY	MD	MI	MN	NV	NH	NC	OH	OK	TN	TX	UT	WA
Student enrollment by course												•												
Student enrollment by course delivery method (in–person vs..)										•														
Student Enrollment by Grade Level																								•

Exhibit H–4. Landscape Reports: Metrics Related to Experience

Description	AL	AK	AZ	AR	CA	CT	GA	HI	IL	IN	IA	KY	MD	MI	MN	NV	NH	NC	OH	OK	TN	TX	UT	WA
Measures Observed	0	0	0	0	2	0	0	1	0	0	0	0	1	0	1	0	0	2	0	0	0	0	0	0
Student–level achievement data					•			•					•		•			•						
Student–level taking an AP CS exam					•													•						

Appendix I. National Report Metrics

This appendix includes Exhibit I-1 containing metrics from each national CS education report included in AIR's landscape scan. This table is organized by the CAPE framework, with the first section including metrics categorized as related to capacity, the second section including metrics categorized as related to access, the third section including metrics categorized as related to participation, and the fourth section including metrics categorized as related to experience.

Exhibit I-1. Metrics From National Reports

Report	Metric
Capacity Metrics	
State of CS Report	Adoption of Code.org Advocacy Coalition Policies
	Adoption of State Plans over time
	State plan status and access to CS education
	Number of states allocating funding to CS education
	Funding and access to CS education
	Number of states adopting the requirement for all schools to offer CS over time
	Requirement for all schools to offer CS and access to CS education
	Requirement for All Students to Take Computer Science to Earn a High School Diploma
NSSME+	Demographics of the High School CS Teaching Force
	High School CS Classes Taught by Teachers with Varying Experience, by Proportion of Students Eligible for Free/Reduced–Price Lunch
	High School CS Classes Taught by Teachers from Race/Ethnicity Groups Historically Underrepresented in STEM
	High School CS Teachers' Paths to Certification
	High School CS Teachers' Areas of Certification
	High School CS Teacher Degrees
	High School CS Teachers Completing Various College Courses
	High School CS Teachers' Coursework Related to CSTA/ISTE Preparation Standards
	High School CS Teachers' Perceptions of Their Preparedness to Teach Each of a Number of Topics
	High School CS Teachers Considering Themselves Very Well Prepared for Each of a Number of Tasks
	High School CS Classes in Which Teachers Feel Very Well Prepared for Each of a Number of Tasks in the Most Recent Unit in a Designated Class
	High School CS Teachers' Perceptions of Preparedness Composites

Report	Metric
	High School CS Teachers Agreeing With Various Statements About Teaching and Learning
	High School CS Teachers’ Beliefs About Teaching and Learning Composites
	Analyses of Class Mean Scores for High School CS Teachers’ Beliefs About Teaching and Learning Composites
	High School CS Teachers Having Various Leadership Responsibilities Within the Last Three Years
	High School CS Teachers’ Most Recent Participation in CS–Focused Professional Development
	Time Spent by High School CS Teachers on CS–Focused Professional Development in the Last Three Years
	High School CS Teachers Participating in Various CS–Focused Professional Development Activities in Last Three Years
	High School CS Teachers Whose Professional Development in the Last Three Years Had Each of a Number of Characteristics to a Substantial Extent
	High School CS Teachers Reporting That Their Professional Development in the Last Three Years Gave Heavy Emphasis to Various Areas
	High School CS Teacher Mean Scores for Professional Development Composites
	Analyses of High School CS Class Mean Scores for Professional Development Composites
	High School CS Classes in Which Teachers Report Having Strong Control Over Various Curricular and Instructional Decision
	High School CS Classes for Which Various Types of Instructional Materials Are Designated
	High School CS Classes Basing Instruction on Various Instructional Resources at Least Once a Week
	Publication Year of Textbooks/Programs Used in High School CS Classes
	High School CS Teachers’ Use of Instructional Materials in Most Recent Unit
	Technologies in High School CS Classes
	Availability of Instructional Technologies in High School CS Classes
Google and Gallup Report	Ability of teachers and administrators to correctly identify CS topics
	Teacher and Administrator opinion if teaching computer science has become a higher priority in the past three years in their districts or schools.
	Teacher and Administrator Opinion of what businesses or other organizations can do to ensure more schools can make high–quality computer science education available to students
	Teacher and Administrator opinion on if computer science learning should be incorporated into other subjects at school
	Teacher and Administrator opinion on if students should be required to take a course in computer science if it is available
	Teacher and Administrator perception of allocation of resources to teach CS

Report	Metric
	Teacher and Administrator perception of school boards' commitment to offering computer science education
	Teacher and Administrator Perception of the value of computer science in life and at work
	Teacher and Administrator perception of whether computer science education is currently a top priority for their district
	Teacher and Administrator perception of whether teachers' efforts to teach computer science are highly valued
	Teacher and administrator perspective on the importance of CS compared with other subjects that are required courses
Access Metrics	
State of CS Report	National–level CS course access
	State–level CS course Access
NSSME+	Access to CS Instruction, by Schools and Students
	Analyses of High Schools Offering CS Instruction
	High Schools Offering Various CS and Technology Courses
	Access to AP CS Courses, by Schools and Students
	Analyses of High Schools Offering At least One AP CS Course
	Most Commonly Offered High School CS Courses
Google and Gallup Report	Teacher and Administrator reporting of how much CS courses are available for students
	Teacher and Administrator satisfaction with the availability of computer science opportunities
Participation Metrics	
State of CS Report	National–level high school CS Participation
	State–level High School Participation
	National–level Middle School CS Participation
	State–level Middle School CS Participation
	State–level Elementary School Participation
	State–level Advanced CS course Participation
NSSME+	Demographics of Students in High School CS Courses
	Prior Achievement Grouping in High School CS Classes
Google and Gallup Report	Student reporting of weekly hours spent learning CS
	Students reporting if they have ever learned CS
	Students reporting they are enrolled in a CS class
	Students reporting they learned computer science at school in the past year
	Teacher and Administrator reporting if students were learning CS

Report	Metric
Experience Metrics	
NSSME+	High School CS Classes in Which Teachers Report Using Various Activities at Least Once a Week
NSSME+	High School CS Classes in Which Teachers Report Students Engaging in Various Aspects of CS Practices at Least Once a Week
	High School CS Class Mean Scores for Engaging Students in Practices of CS Composite
	High School CS Classes Participating in Various Activities in Most Recent Lesson
	Average Percentage of Time Spent on Different Activities in the Most Recent High School CS Lesson
	Amount of Homework Assigned in High School CS Classes Per Week
	Reasons Why Parts of High School CS Materials Are Skipped
	Reasons Why High School CS Materials Are Supplemented
	Reasons Why High School CS Materials Are Modified
	Factors Perceived as Problems in High School CS Classes
Google and Gallup Report	Ability of students to correctly identify CS topics
	Parent perception of the likelihood that their children will need to know computer science for their careers someday
	Parent perception of whether they would support their child if they wanted to learn computer science
	Parent perspective on the importance of their child learning CS
	Student confidence in being successful in learning computer science if they wanted to
	Student interest in learning CS
	Student interest in pursuing a job in computer science someday
	Student perspective on how important it is for them to learn CS
	Student perspective on how important it is for them to learn CS by average hours that student spent learning CS each week
	Student perspective on how their friends view the importance of learning CS
	Student report of what type of devices they use at home
	Student report of what type of devices they use at school
	Student satisfaction with the availability of computer science opportunities
	Teacher and Administrator perception of CS learning quality
	Teacher reporting of encouraging a student to take a computer science course

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