

Framing Computer Science Education Meeting Summaries

Meeting Summary #3: Stakeholder Meeting – November 18th, 2015

Overview

What is the “Framing CS ” effort?

The Framing CS effort brings together K12 computer science education stakeholders to agree upon the concepts and practices that all students from kindergarten to twelfth grade in the United States should know. These concepts and practices will comprise a framework for K12 computer science education in the United States. Guided by a steering committee with representation from The Association for Computing Machinery (ACM) and the Computer Science Teachers Association (CSTA), along with input from Achieve, Inc. and Outlier Research & Evaluation at the University of Chicago, Code.org is convening a series of the meetings with “Thought Leaders,” “Stakeholders” and “Writers” to accomplish this task.

The Advisor Meetings (AM) focus on identifying and articulating the concepts and practices that will make up the K12 computer science framework. The Stakeholder Meeting focuses on sharing and communication about computer science education work among interested state and organizational leaders. Finally, Writers Workshops are designated times when writers communicate and collaborate in person to put “pen to paper” to create the framework.

The final framework will focus on “concept themes” and “practices.” Concept themes are categories that contain major content areas in the field of computer science. Each concept theme will include multiple concepts that can be organized by grade band. Practices are the behaviors that computer scientists engage in that require both content knowledge and specific skills, and these practices They are the skills and processes used by computer scientists that will enable students to engage with the concepts. Concept themes and practices will contain ”sub-concepts” and “sub-practices” respectively. These sub-concepts and sub-practices will be organized by grade band as illustrated in the figure below.

	Concept Theme 1	Concept Theme 2	Concept Theme 3
K-2	Statement 1... Statement 2....		
3-5			
6-8			
9-12			

	Practice 1	Practice 2	Practice 3
K-2	Statement 1... Statement 2...		
3-5			
6-8			
9-12			

The framework also contains “cross-cutting themes”. Cross-cutting, themes by definition, must speak to all or most of the concepts themes, and all or most of the grade bands. The framework writers will consider the cross-cutting themes as they work to develop the framework. Examples of cross-cutting themes from the Next Generation Science Standards (NGSS) are Patterns, Structure and Function, and Stability and Change. Proposed computer science cross-cutting themes include Abstraction, Computational Thinking, and Systems and System Models.

What is the difference between the framework and standards?

The framework does not contain standards. Standards are expectations for what students should know and be able to do that can be assessed. The framework, in contrast will contain only lists of concepts and practices. It is the expectation that standards will be written by marrying practices and concepts together to create a specific, outcomes-focused standards that can be assessed, similar to the structure and format of the Next Generation Science Standards (NGSS). For example, one standard from the NGSS created this way is, “Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem,” which was constructed by marrying the practice of “Developing and using models” and the concept of “Cycle of matter and energy transfer in ecosystems.”

What are the Meeting Summary documents?

Outlier Research & Evaluation, at CEMSE at the University of Chicago, observed each meeting, took notes during whole group discussions, observed and took notes during selected small group discussions, and reviewed documents generated by meeting participants. Using that information, Outlier created a general summary of meeting activities with a specific focus on documenting key decisions made about the framework content. This document is the third in the series of meeting summaries.

Summary of Stakeholder Meeting – November 18th, 2015

Who were the Stakeholders?

The following Stakeholders attended this meeting:

Julie Alano, Indiana Department of Education
Owen Astrachan, Duke University
Derek Babb, Nebraska
Julia Bell, Walters State Community College
Tiara Booker Dwyer, Maryland Department of Education
David Byer, Apple
Raquel Cardona, NYC Department of Education
Myra Deister, Sunny Hills HS, CA
Leigh Ann Delyser, CSNYC
Caitlin Dooley, Georgia Dept. of Education
Phillip Eaglin, Change Expectations
Jeremy Eitz, Indiana Department of Education
Joe Finkelstein, Georgia
Diana Franklin, CEMSE at University of Chicago
Dan Frost, University of California Irvine
Jacqui Garrison, Nebraska DOE
Mark Gruwell, Iowa
Mark Guzdial, Georgia Tech
Cindy Hasselbring, Maryland DOE
Maya Israel, University of Illinois Urbana-Champaign
Vanessa Jones, Austin Independent School District
Rich Kick, Newbury Park HS, CA
Caroline King, WA STEM
Mike Lach, CEMSE at the University of Chicago
Heather Lageman, Maryland Department of Education
Todd Lash, Champaign Schools, IL
Irene Lee, CSTA
Eugene Lemon, Hidden Genius
Carl Lyman, Utah Department of Education
Tim McMurtrey, Idaho Department of Education
David Millage, Apple
Dianne O'Grady Cunniff, Charles County Public Schools MD
Anthony Owen, Arkansas Department of Education
Helen Padgett, International Society for Technology in Education
Minsoo Park, Kenwood ES, IL
Hadi Partovi, Code.org
Tammy Pirmann, CSTA
George Reese, University of Illinois Urbana-Champaign
Heidi Schweingruber, National Research Council
Deborah Seehorn, CSTA

Ben Shapiro, University of Colorado Boulder
Jim Stanton, MassCAN
Amanda Strawhacker, Tufts
Chris Stephenson, Google
Bryan Twarek, San Francisco Unified School District
Nicki Washington, Winthrop University
David Weintrop, Northwestern University
Jeff Weld, Iowa Department of Education
Brenda Wilkerson, Chicago Public Schools
Trish Williams, CA State Board
Lance Wrzesinski, Washington Department of Education
Aman Yadav, Michigan State
Sarah Young, Utah Department of Education

Development Staff:

Baker Franke, Code.org
Lian Halbert, Code.org
Katie Hendrickson, Code.org
Rachel Phillips, Code.org
Pat Yongpradit, Code.org

Steering Committee Members:

Cameron Wilson, Code.org

Process Advisors:

Jeanne Century, Outlier Research & Evaluation
Michael Gilligan, Achieve Inc.

What did the Stakeholders do?

The Stakeholder meeting was held after the Thought Leader meetings. The purpose of the Stakeholder meeting was for participants to be able to:

- 1) Describe and give input into the purpose and structure of the framework
- 2) Describe their role in the framework development process
- 3) Learn about the status of K12 CS in other states/districts and provide input into the framework guidance material

The participants ranged in organizational affiliation from universities; state departments of education; non-profit organizations; for-profit organizations; elementary schools; high schools; and school districts.

The results of the previous two Thought Leader meetings were shared with participants, including the process Thought Leaders used, rubrics, and the content themes and practices. Attendees representing state or district computer science education efforts spoke about what their organizations had achieved.

States:

Arkansas: Anthony Owens of Arkansas outlined what his state had done to bring CS education to all schools. Arkansas recently completed the majority of their K8 computer science standards, which will require students to take a block of coding in 7th and 8th grade. Implementation of the standards will begin in the 2017-18 school year. The biggest issue Arkansas faces is teacher certification, particularly a multi-state certification process.

California: Representatives from the State Board of California shared that the Governor of California was very interested in working on policy relating to computer science education. They are currently working to adopt the NGSS, which contain sections on computational thinking.

Idaho: The representative from Idaho reported that they have formed a statewide partnership with Code.org, and that they are beginning work on a teacher certification process, in collaboration with Idaho State University. Idaho also counts AP CS toward graduation requirements.

Indiana: Indiana shared that they have been adding computing science standards to their K8 standard framework, and plan to have CS as a requirement by 2017.

Iowa: Attendees from Iowa shared that their governor is enthusiastic about CS education, and that they are looking at what CSTA and other states have done to find the best strategies for them. One challenge they face is that they are a rural state, and that they may need to rely on virtual delivery of instruction.

Massachusetts: Attendees from Massachusetts reported that they have been working with the Massachusetts Computing Attainment Network (MassCAN) and Education Development Center, Inc. (EDC) to create an “action plan” for CS education in the state. They have already created a document that cross-walks the NGSS with instructional technology standards. They hope to bring the document to their state board in 2016. They have also been working on licensure and endorsement for teachers. Their challenges lie with funding.

Maryland: Maryland reported that both Exploring Computer Science and AP CS-A can count for either a Tech Ed or Math credit in their state. Seven of their superintendents also visited Charles County, MD to see how CS can be integrated into a district. One challenge they face is that their Department of Education does not have a CS content expert on staff. They also need to build a teacher certification program.

Nebraska: The attendee from Nebraska reported that they were just beginning to work on CS education, and were looking for best practices from other states. They also shared that they needed to work on a teacher certification program.

Utah: Sarah Young, an attendee from the Utah Department of Education, shared that her colleagues recently became hooked on the Hour of Code and were planning to bring CS education to the forefront in their state education initiatives. They have made the Code.org

affiliate training part of their CS teacher endorsement program and are working to bring CS courses to the middle grades, in addition to pre-existing courses in high schools. They have also created a two-tier high-school teacher endorsement.

Washington: An attendee from Washington STEM (a non-profit organization) spoke about their success in making CS count for a math or science graduation requirement two years prior. She also shared that the governor is very enthusiastic about computer science.

Districts:

Charles County, MD: Dianne O’Grady-Cunniff spoke about the 26,000 students in 36 Charles County schools that participated in CS during the 2014-15 school year. Their challenge is figuring out where CS will live in schools – whether it will be integrated into other subjects and how that might look. They are working on what CS will look like in the middle grades, and aim to bring CS to every person in their county, even in libraries and other public places.

Chicago Public Schools, IL: Brenda Wilkerson of Chicago Public Schools described their CSforAll initiative, which aims to require all high school students to take a computer science course. Their work has focused on making a grass-roots push for CS education. They are also collaborating with Illinois State University and others to work on a teacher certification program. Their most pressing challenge is funding.

New York City, NY: The mayor of New York recently announced that the state would aim to have at least one unit of CS for each student before they graduate from high school. The district is partnering with CSNYC, a private organization, to build a support system for teachers, including teacher certification.

San Francisco Unified School District, CA: Bryan Twarek spoke about the district’s mission to reach every student, every year, with CS opportunities in preK-8th grades, and electives in high school. They have developed a preK scope and sequence, and are working to have specialists teach at the elementary levels to reduce the burden on the general education teachers.

Framing Computer Science Education Meeting Summaries

Meeting Summary #8: Stakeholder Meeting #2 – April 11th, 2016

Overview

What is the “Framing CS” effort?

The Framing CS effort brings together K-12 computer science education stakeholders to agree upon the concepts and practices that all students from kindergarten to twelfth grade in the United States should know. These concepts and practices will comprise a framework for K-12 computer science education in the United States. A steering committee with representation from the Association for Computing Machinery (ACM), the Computer Science Teachers Association (CSTA), Code.org, the National Math and Science Initiative (NMSI), and the Cyber Innovation Center (CIC), along with input from Achieve, Inc. and Outlier Research & Evaluation at the University of Chicago, is convening a series of the meetings with “Advisors,” “Stakeholders,” and “Writers” to accomplish this task.

The Advisor Meetings (AM) focus on identifying and articulating the concepts and practices that will make up the K-12 computer science framework. The Stakeholder Meetings focus on sharing and communicating about computer science education work among interested state, district, and organizational leaders. Finally, Writing Workshops are designated times when writers communicate and collaborate in person to put “pen to paper” to create the framework.

The final framework will focus on “concept themes” and “practices.” Concept themes are categories that contain major content areas in the field of computer science. Each concept theme will include multiple concepts that can be organized by grade band. Practices are the behaviors that computer scientists engage in that require both content knowledge and specific skills, and these practices will enable students to engage with the concepts. Concept themes and practices will contain “sub-concepts” and “sub-practices” respectively. These sub-concepts will be organized by grade band, while the sub-practices will be organized through a narrative learning progression, both of which are illustrated in the figures below.¹

The framework also contains “Crosscutting Concepts.” Crosscutting Concepts, by definition, must speak to all or most of the concept themes, and all or most of the grade bands. The framework writers will consider the crosscutting themes as they work to develop the framework. Examples of Crosscutting Concepts from the Next Generation Science Standards (NGSS) are Patterns, Structure and Function, and Stability and Change. Proposed computer science crosscutting concepts include Abstraction, Computational Thinking, and Systems and System Models. Crosscutting Concepts are internally integrated into the Concept statements of the framework and do not constitute a third external dimension as opposed to analogous Science frameworks.

¹ In prior Meeting Summaries, sub-practices were also described as being organized by grade bands. However, at Writing Workshop #2, it was decided that practices would be organized around a narrative learning progression instead of specific grade bands (see the Writers Workshop #2 Summary for more information on this decision).

	Concept Theme 1	Concept Theme 2	Concept Theme 3
K-2	Statement 1... Statement 2....		
3-5			
6-8			
9-12			

	Practice 1	Practice 2	Practice 3
Description of Practice			
Example Grade 12 Learning Goals			
Example K-12 Learning Progression			

What is the difference between the framework and standards?

The framework does not contain standards. Standards are expectations for what students should know and be able to do that can be assessed. The framework, in contrast, will contain only lists of concepts and practices. It is the expectation that standards will be written by marrying practices and concepts together to create specific, outcomes-focused standards that can be assessed, similar to the structure and format of the Next Generation Science Standards (NGSS). For example, one standard from the NGSS created this way is, “Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem,” which was constructed by marrying the practice of “Developing and using models” and the concept of “Cycle of matter and energy transfer in ecosystems.”

What are the Meeting Summary documents?

Outlier Research & Evaluation, at the Center for Elementary Mathematics and Science Education (CEMSE) at the University of Chicago, observed each meeting, took notes during whole group discussions, observed and took notes during selected small group discussions, and reviewed documents generated by meeting participants. Using that information, Outlier created a general summary of meeting activities with a specific focus on documenting key decisions made about the framework content. This document is the sixth in the series of meeting summaries.

Summary of Stakeholder Meeting #2 – April 11th, 2016

Who were the Stakeholders?

The following Stakeholders attended this meeting:

Alana Aaron, Director of Elementary School CS, NYC Department of Education
Meghan Ables, Arkansas Teacher of the Year
Thomas Adams, Deputy Superintendent, California Department of Education
Traci Chappelle, Board Member, Charles County, MD
Scott Cook, Director of Academic Services, Idaho State Department of Education
Christopher Cox, Educational Technology Specialist, New Jersey
Angela DeGuzman, Professional Learning & Instructional Assessment Specialist, Maryland
Department of Education
Anne DeMallie, Math Coordinator, Massachusetts Department of Education
Lien Diaz, Sr. Director, AP Program, College Board
Brian Dorn, Assistant Professor, University of Nebraska—Omaha
Ellen Ebert, Director, Washington Office of Superintendent of Public Instruction
Jeremy Eltz, Assistant Director, College & Career Readiness, Indiana Department of Education
Gregg Fleisher, President, National Math Science Initiative
Delda Hagin, Business & Computer Science Specialist, Georgia Department of Education
Amy Hirotaka, Director of State Policy, Code.org
Clayton Hollingshead, Program Director, State Collaboratives on Assessment and Student
Standards, Council of Chief State School Officers
Shanika Hope, digital Content Strategy and Research Lead, Amazon Web Services
Dena Irwin, Business, Marketing, IT, & Entrepreneurship State Program Leader, Indiana
Department of Education
Steve Kesel, Educational Technology Program Administrator, San Francisco Unified School District
Ashlee Kolar, Math & Science Teacher, Caldwell School District, Boise, Idaho
Jennifer Lyons, Computer Science Specialist, San Francisco Unified School District
Kimberly MacDonald, Business, Finance, & IT Education Consultant, North Carolina Department
of Education
Craig Martinson, Advisory Member, Iowa Governors STEM CS Advisory Council Working Group
Tim McMurtrey, Deputy Superintendent, Idaho State Department of Education
Kimberly Moody, CTE Coordinator, Clark County School District, Las Vegas, Nevada
Mark Newburn, Board Member, Nevada State Board of Education
Hadi Partovi, CEO, Code.org
Aankit Patel, Associate Director of Computer Science, New York City Department of Education
Dennis Perks, CTE Education Consultant, North Carolina Department of Instruction
Lue Ann Ray, National Sales Manager of Mid-Market Sales—Public Sector, Amazon Web Services
Joseph Reaper, Secondary Mathematics Consultant, North Carolina Department of Education
Dean Reese, Computer Science Liaison, California Instructional Quality Commission
Deidre Richardson, Coordinator of Mathematics, New Jersey Department of Education
Andrew Rothstein, Senior VP—Programs, National Academy Foundation
Melissa Scott, Education Programs Professional—CTE, Nevada Department of Education
Sarah Silverman, Program Director—Education, National Governors Association
Jim Stanton, Executive Director, MassCan

Andreas Stefik, Assistant Professor, University of Nevada—Las Vegas
Chris Stephenson, Head of Computer Science Education Programs, Google
Jason Taylor, Vice President of Programs, Project Lead The Way
Ann Watts, Iowa Program Manager, Microsoft Imagine Academy / Advisory Member, Iowa
Governor's STEM Advisory Council
Trish Williams, State Board Member, California State Board of Education
Sarah Young, STEM Coordinator, Utah Department of Education

Who were the Writers?

The following Writers attended this meeting:

Julie Alano, Teacher, Hamilton Southeastern High School
Derek Babb, Teacher, Omaha North High School
Julia Bell, Professor, Walter State Community College
Tiara Booker-Dwyer, CTE Coordinator, Maryland Department of Education
Leigh Ann DeLyser, Director, CSNYC
Mark Gruwell, Facilitator, Iowa STEM Council Computer Science Workgroup
Dan Frost, Professor, University of California—Irvine
Vanessa Jones, Teacher, Austin Independent School District
Richard Kick, Teacher, Newbury Park High School
Heather Lageman, Director of Curriculum, Maryland Department of Education
Todd Lash, Kenwood Elementary
Carl Lyman, CTE Specialist, Utah Department of Education
Daniel Moix, Teacher, Arkansas School for Math, Science, and the Arts
Dianne O'Grady-Cunniff, Instructional Specialist for Computer Science and Technology
Education, Charles County Public Schools, Washington, DC Metro area
Anthony Owen, Coordinator of Computer Science, Arkansas Department of Education
Shay Pokress, Director, Computer Science Programs, Project Lead The Way
Alfred Thompson, Teacher, Bishop Guertin High School / Board Member, CSTA
Bryan Twarek, Computer Science Coordinator, San Francisco Unified School District
Alicia Nicki Washington, Professor, Winthrop University

Who were the Advisors?

The following Advisors attended this meeting:

Owen Astrachan, Professor of the Practice, Duke University
Karen Brennan, Assistant Professor, Harvard Graduate School of Education
Phillip G. Eaglin, Founder and CEO, Change Expectations
Kathi Fisler, Professor, Worcester Polytechnic
Yasmin Kafai, Professor, University of Pennsylvania
Helen Hu, Professor, Westminster College
Tammy Pirmann, Co-Chair CSTA K-12 Standards, CSTA
Deborah Seehorn, CSTA Board Past Chair, CSTA Standards Revision Co-Chair, CSTA

Chinma Uche, Teacher, Greater Hartford Academy of Math and Science
Sheena Vaidyanathan, Teacher, Los Altos School District

Development Staff:

Debbie Carter, Editor
Lian Halbert, Administrative Assistant, Code.org
Katie Hendrickson, Advocacy & Policy, Code.org
Pat Yongpradit, Chief Academic Officer, Code.org

Steering Committee:

Krystal Corbett, Director, Cyber Innovation Center
Deepa Muralidhar, Computer Science Specialist, NMSI
Mehran Sahami, Professor, Stanford University
Cameron Wilson, COO & VP of Government Affairs, Code.org

Process Advisors:

Jennifer Childress, Achieve, Inc.
Courtney Blackwell, Outlier Research & Evaluation, University of Chicago
Heather King, Outlier Research & Evaluation, University of Chicago

Goals of the Meeting

The meeting had four main goals:

1. Stakeholders and Advisors will get an update on the K-12 CS Framework development.
2. State and district teams will receive guidance on the different uses of the framework and discuss implementation issues beyond the framework.
3. State and district teams will be able to provide input on the types of guidance materials that will help them message and implement the framework within their local education context.
4. Advisors will provide input on the most current framework drafts and collaborate with the writing teams to address the feedback.

What did the Stakeholders do?

Morning

Pre-Meeting Gathering

Prior to the start of the day's activities, the Development Team met separately with the Advisors to discuss the Advisors' recent feedback on the Framework as well as provide updates on how the Writers were addressing such feedback as well as the public review feedback more generally.

At the same time, the Writers and Stakeholders met informally over breakfast at tables designated by state and/or district, with some tables having multiple states/districts.

Introduction & Overview

Pat Yongpradit of the Development Team provided opening remarks to the whole group, including “who’s who” in the room, an overview of the day’s activities, and an update on the CS education policy context, given important district, state, and federal initiatives that occurred since the Stakeholders last met in November 2015.

Table 1. CS Education Policy Updates

<p>Federal</p> <ul style="list-style-type: none"> Proposed \$4 billion in funding for CS education through its CS for All initiative Included CS as part of a well-rounded education in the ESSA reauthorization. <p>State</p> <ul style="list-style-type: none"> Idaho is funding bill for CS education. Maryland is working with STEM teacher prep to intro CS (now that CS is part of the STEM definition) Rhode Island announced a new initiative to offer CS at every grade (K12) at every school in the state by the end of 2017. Virginia added CS in the state’s K-12 learning standards and mandated CS learning across all grades. <p>District</p> <ul style="list-style-type: none"> Chicago, IL (the 3rd largest school district in the United States) made CS a graduation requirement

Following this introduction, the group reviewed the CS Framework vision statement (Table 2) and guiding principles (Table 3).

Table 2. Framework Vision Statement

<p>A framework that will empower students to...</p> <ul style="list-style-type: none"> Be informed citizens who can critically engage in public discussion on CS-related topics Develop as learners, users, and creators of CS knowledge and artifacts Better understand the role of computing in the world around them Learn, perform, and express themselves in other subjects and interests

Table 3. Framework Principles

<ol style="list-style-type: none"> What is best for teachers and students? The ultimate purpose of the framework is to serve the needs of teachers and students, and this should be held in careful consideration throughout the process. Less is more. The framework should aim to be concise rather than exhaustive.
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3. **Don't reinvent the wheel.**
Resources and ideas that already exist in the field should be utilized whenever possible.
4. **Research-backed and research-forward.**
The framework should be supported by research, and should help foster a research agenda for the field.
5. **Aligned to national standards structures and process norms.**
Both the process by which the framework is generated, and the framework itself, should follow the high standards put forth by similar efforts. In particular, the process for creating the framework should be as transparent as possible.
6. **A step toward something more.**
While the goal of in-person meetings is to produce the best work possible, we also need to recognize that revisions will be necessary.
7. **Aim for 75% agreement.**
Every participant need not completely agree to each decision. To keep the process moving, we will aim for each decision to have about 75% "agreement."

Katie Hendrickson from the Development Team also provided an overview of the Framework development process and updated timeline for release. Leigh Ann DeLyser and Bryan Twarek from the Writing Team followed with a more in-depth update on reviewer feedback (Table 4) and what the Writers are doing to address such feedback (Table 5).

Table 4. Summary of Public Review and Advisor Feedback

Positive Feedback	Critical Feedback
<ul style="list-style-type: none"> • Significant improvements from the first version • Good topic selection • Most statements are appropriate for grade band 	<ul style="list-style-type: none"> • Too many concepts • Too technical, too jargon-y • Inconsistent voice and grain size

Table 5. Summary of Writers' Progress to Date

<p>Accomplished to date:</p> <ul style="list-style-type: none"> • Finished entire K-12 progression • Added glossary • Adjusted core concepts and practices • Added crosscutting concepts • Revised with equity lens: CS for all students • Included opportunities for interdisciplinary work • Added examples and descriptive material • Improved consistency and clarity <p>Ongoing Progress:</p> <ul style="list-style-type: none"> • Big idea lens/focusing statements • Consolidating sub-concepts • Clarifying and simplifying language for a broad audience

- Developing smooth K-12 learning progressions
- Using an action lens to focus on the “doing” aspect of CS
- Adding more descriptive materials, including a research background, standards alignment, examples, and suggestions for integration

Work still TBD:

- Reconcile contradictory feedback from reviewers
- Integrate feedback from advisor
- Check each grade band along for consistency
- Revise for consistent voice and grain size

Panel Discussion on CS Education at the State Level

Following the introduction and Framework updates, Yongpradit facilitated a panel on current CS education work occurring at the state level. Panel members included Anne DeMallie, the Math Coordinator at the Massachusetts Department of Education; Anthony Owen, the Coordinator of CS Education at the Arkansas Department of Education; and Ellen Ebert, the Director of Washington Office of Superintendent of Public Instruction. Each panelist shared updates on CS education policy in their respective states, including challenges they have encountered and strategies they have used to overcome them. An open question and answer discussion followed.

At the conclusion of the panel discussion, two concurrent breakout sessions occurred, one for the Writers and Advisors (and any organization representatives interested in joining) to continue working on the Framework and a second for the state and district Stakeholders on guidance for developing CS standards. These sessions lasted 60 minutes.

Morning Breakout Session Group 1: States/Districts Guidance for Standards

Bryan Twarek and Daniel Moix, two Framework Writers, led a discussion on how states and districts can use the Framework to inform the development of their standards. They began with a presentation regarding the Framework development context, followed by a deeper dive into the structural components of the Framework itself. They emphasized the historical precedent of using frameworks to inform standards (e.g., Next Generation Science Standards) as well as the understanding that multiple audiences (e.g., states, districts, organizations) will use the Framework as an input to inform a variety of products, including standards but also curriculum and professional development. Additionally, they summarized the key components of the Framework to ensure all Stakeholders clearly understood what it would look like and what would be included in the final document.

Next, they led a focused discussion on how the Framework can help states meet their standards development goals of ensuring rigor, focus, specificity, clarity, coherence, measurability, diversity/equity, and connections to other disciplines. They also provided a concrete example of how standards writers could match a concept with a practice in the Framework to create a standard (Figure 1). Finally, a question and answer session occurred around the Framework development process, standards development, and implementation challenges.

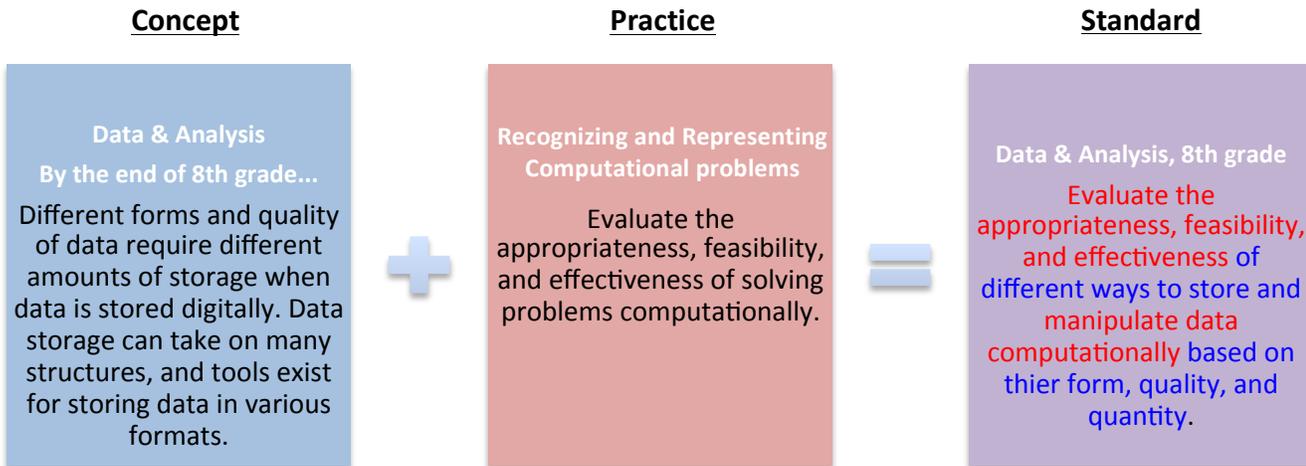


Figure 1. Example of how to match a CS Framework concept with a practice to create a standard.

Morning Breakout Session Group 2: Writers and Advisors Framework Working Session

Writers from each Concept team and the Practices team led small group discussions with Advisors and other organizational representatives around specific questions or issues they wanted help resolving. They were tasked with resolving as much of the reviewer/Advisor feedback as possible, with the goal of having a polished draft of the Framework by the end of the day.

Afternoon

In the afternoon, two additional breakout sessions happened. While the Writers and Advisors continued to discuss the Framework, the Stakeholders gathered in small groups based on their state or district affiliation and engaged in discussions regarding CS education implementation in their local contexts. These sessions lasted 2 hours.

Afternoon Breakout Session Group 1: State and District Small Group Discussions

The overarching goals for this session were: 1) identify key issues and barriers to CS education; 2) suggest recommendations to overcome such issues/barriers; and 3) identify specific questions to address for guiding states/districts with using the Framework. To accomplish these goals, Stakeholders gathered in small groups for facilitated discussions on the following five topic areas:

1. What communications strategies are necessary now for different stakeholder groups? After the Framework is out? (*Facilitator: Ellen Ebert, WA OSPI*)
2. What are the first steps to begin preparing (in service) teachers to implement K-12 CS for all students? (*Facilitator: Tammy Pirmann, CSTA*)
3. How does CS fit into the K-12 menu? Integration? What do possible pathways look like? (K-5? 9-12?) (*Facilitator: Jim Stanton, MassCAN*)

4. What are some good models for computer science teacher certification? What are the first steps? (*Facilitator: Amy Hirota, Code.org*)
5. What are some other anticipated challenges in implementing K-12 CS for all students? Which should be addressed first? What are some possible solutions? (*Facilitator: Jennifer Childress, Achieve, Inc.*)

After 60 minutes of these small group discussions, Stakeholders from the same state and/or district regrouped to debrief and to develop some short-term (next few months) actionable next steps.

Afternoon Breakout Session Group 2: Writers and Advisors Framework Working Session

The Writers and Advisors came back together to continue their small group discussions. To increase the diversity of feedback across the various Concepts and Practice teams, Advisors informally switched discussion groups as they saw fit based on their interests and expertise.

Report Out

Following the afternoon breakout sessions, the whole group reconvened and representatives from some of the districts and states reported out on the discussions that occurred around barriers to implementation and strategies to overcome such challenges. Three states also reported out the practical next steps they would take based on what they discussed and learned during the meeting.

California: increased awareness of all the different CS efforts going on in their state and across the country; they scheduled an initial meeting to discuss CS standards development and implementation.

North Carolina: felt empowered to push harder in their efforts after learning about other state level initiatives; they will create a formal coalition of stakeholders to discuss CS implementation in their state, including licensure, building CS K12 pathways, and help problem solve throughout this process.

Idaho: learned about other state and district efforts regarding teacher professional development and CS integration in middle school; they are in the process of revising state standards, including science, and releasing them for public review.

Online Resources & Wrap Up

Process Advisor Heather King presented online resources that Outlier Research & Evaluation has created to help states and districts implement and sustain CS education. She described the history of Outlier's work in CS education, including the [Building an Operating System for CS Education](#) project, which focused on better understanding the landscape of high school CS teachers; the NSF-funded [BASICS](#) project investigating the supports and barriers to implementing high school introductory CS courses; and the current evaluation of the [Code.org K12 curriculum](#). She also presented the [LeadCS.org](#) online toolkit, where educators and school and state/district education leaders can find ready-to-use tools to help bring and sustain CS in their local context. Finally, Yongpradit ended the meeting with a short wrap up and reflection on the day's activities.