Specifying the Domain of the NGSS for Assessment

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California’s Next Generation Science Standards (CA NGSS) Assessment Plan

State Board of Education
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DEVELOPING ASSESSMENTS FOR THE NEXT GENERATION SCIENCE STANDARDS
1. Assessment tasks should allow students to engage in science practices in the context of disciplinary core ideas and crosscutting concepts. This poses a significant design challenge.

   ▶ Multi-component tasks that make use of a variety of response formats will be best suited for this.

   ▶ Selected-response questions, short and extended constructed response questions, and performance tasks can all be used, but should be carefully designed to ensure that they measure the intended construct and support the intended inference.

2. Students will need multiple and varied assessment opportunities to demonstrate their proficiencies with the NGSS performance expectations.
Next Generation Science Standards Implementation Time Line

- **2013**
  - September: SBE adopts the NGSS

- **2014**
  - March: Science Leadership Team develops State Implementation Plan for CA NGSS

- **2015**
  - March: SBE adopts the California Science Test
  - April: NGSS Rollout Phase 2: Deepening understanding of the shifts required by NGSS

- **2016**
  - March: SBE adopts the California Science Frameworks

- **2017**
  - March: CAST Pilot
  - April: SBE adopts CAST blueprints and achievement levels

- **2018**
  - March: CAA for Science Field Test
  - April: SBE adopts K-8 Science Instructional Materials

- **2019**
  - November: CAA for Science Pilot Year I
  - January: CAST Field Test

- **2020**
  - September: CAA for Science Field Test

Legend:
- CAST = California Science Test
- CAA = California Alternate Assessments
- NGSS = Next Generation Science Standards
- SBE = State Board of Education

*Tentative Dates*
Role of Stakeholders

CAST and CAA for Science designs were informed by feedback from:

- California science teachers, including representatives of the California Science Teachers Association (CSTA)
- Higher education officials, including representatives of Stanford University’s Next Generation Science Standards (NGSS) Assessment Program (SNAP)
- STEM reform experts, including representatives from the National Research Council (NRC), which developed A Framework for K–12 Science Education
- Representatives from various other advocacy groups

Higher education officials, including representatives of Stanford University’s Next Generation Science Standards (NGSS) Assessment Program (SNAP)
CA NGSS Assessment Design Goals

Goals for the design are to:

- Emphasize importance of group-level results to promote improvements to teaching and learning.
- Provide models of high quality, CA NGSS-aligned assessment items.
- Create incentives for schools to provide science instruction in every grade, not just in tested grades.
- Measure the range and depth of NGSS performance expectations by leveraging the state’s distinctly large student population.
- Minimize testing time and costs.
CA NGSS Design Features (continued)

- This is a two-stage adaptive assessment.
- Uses partial matrix sampling of content
  - Group level feedback while ensuring individual student performance is measured fairly and comparably
- Administered at grades five, eight and grade ten, eleven, or twelve.
- The assessment is designed to be administered in two hours or less.
Test Design

A

• 32 mainly discrete items.
• 60 minutes,
• Contributes to student and group scores.

B

• 2 performance tasks, each with 5-6 items.
• 40 minutes.
• Contributes to student and group scores.

C

• Differs across students.
• Looks like either A or B, but half length.
• 13 mainly discrete items or 1 PT.
• 20 minutes.
• Contributes only to group-level scores.
Performance in Segment A guides the selection of science domains presented in Segment B. The assignment of the science domains in Segment B is random unless performance on a particular domain in Segment A is conspicuously weak.

Segment B presents a pair of performance tasks that ask students to solve complex problems set in domain-specific contexts.

### Table: Practice Scores and Integrated Content Scores

<table>
<thead>
<tr>
<th>Domain</th>
<th>Practice</th>
<th>Integrated Content Scores</th>
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</thead>
<tbody>
<tr>
<td>Physical Science</td>
<td>CCC</td>
<td></td>
</tr>
<tr>
<td>Life Science</td>
<td>CCC</td>
<td></td>
</tr>
<tr>
<td>Earth &amp; Space Science</td>
<td>Etc.</td>
<td></td>
</tr>
<tr>
<td>Integrated Practice Scores</td>
<td></td>
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<tr>
<td>Total Score</td>
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</table>
Accumulating Scores

- Individual Total scores are based on Segments A & B only.
  - Individual subscores (perhaps augmented) may be possible for major content areas.

- Group-level score means and distributions are based on A, B and C.
  - Subscore means & distributions are likely for all major content domains and SEPs.
  - Group size sufficient to support reporting needs to be determined.

- Field test analyses will inform aggregation and reporting methodology.
CAST Training Tests

- Purpose: Provide students with an opportunity to view CA NGSS-aligned items

- Educators and students are encouraged to access the training test to see a variety of science content and item types.

Link to the CAST training tests is available at http://www.caaspp.org/practice-and-training/index.html. Select a test for grades 5, 8 or high school.
For more information about CAST and CAASPP:

California Science Test Web Page
http://www.cde.ca.gov/ta/tg/ca/caasppscience.asp

NGSS for California Public Schools, K-12
http://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp

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<table>
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<tr>
<th>Requirement</th>
<th>Feature</th>
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<tr>
<td>Comparable student scores</td>
<td>• Segments A &amp; B</td>
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<tr>
<td></td>
<td>• Adaptive content selection.</td>
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<td>Reliable student-level scores</td>
<td>• Multi-stage adaptation in Segment A.</td>
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<td>Stable, valid and detailed group-level scores</td>
<td>• Partial matrix design</td>
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<td>Minimize testing time.</td>
<td>• Use of variable section to deepen and broaden item sampling.</td>
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<tr>
<td></td>
<td>• Multi-stage adaptation.</td>
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CAASPP Assessments

California Assessment of Student Performance and Progress (CAASPP)

2016–17 CAASPP System

English Language Arts/Literacy and Mathematics Summative Assessments
- Smarter Balanced
- California Alternate Assessment (CAA)

Science
- California Science Test (CAST)
- CAA for Science

Reading/Language Arts
- Standards-based Tests in Spanish

Additional Resources:
- Interim assessments
- Formative assessment processes (Digital Library)
- Grade two diagnostics (English language arts/literacy and mathematics)
Science Assessment: The California Way

From slides of Michelle Center
Director, Assessment Development and Administration Division

California Department of Education
Summary

**Requirement**

Comparable student scores

Reliable student-level scores.

Stable, valid and detailed group-level scores.

Minimize testing time.
California Science Test (CAST) Design Goals

- Promote improvements to teaching and learning
- Provide models of high quality assessment items
- Incentivize science instruction in every grade
- Measure the range and depth of CA NGSS
- Minimize testing time and costs
- Reflect fidelity to the CA NGSS
Segment A is two-stage adaptive, presenting selected response and machine-scored short answer items that cover a broad range of the CA NGSS performance expectations.
Segment A is two-stage adaptive, presenting selected response and machine-scored short answer items that cover a broad range of the CA NGSS performance expectations.
Segment B presents a pair of performance tasks that ask students to solve complex problems set in domain-specific contexts.
Segment B

Segment B presents a pair of performance tasks that ask students to solve complex problems set in domain-specific contexts.

A Different Sort of Adaptation

- Performance in Segment A guides the selection of science domains presented in Segment B.
- The assignment of the science domains in Segment B is random unless performance on a particular domain in Segment A is conspicuously weak.
Variable Segment

**Segment C** presents items or tasks that serve a variety of purposes:

- Strengthen group-level scores by expanding the breadth and depth of the item samples on which scores are based.
  - Group scores are most valid and stable when based on dense item samples.
  - Extending the item sample across grades encourages teaching of science at all grade levels.
- Increases the size of the equating “anchor”, further stabilizing trend scores.