# Introduction to the California Science Test Item Content Specifications

**Prepared for the California Department of Education by Educational Testing Service**



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## About the California Science Test Item Content Specifications

The CAST item content specifications provide details on each assessed dimension of a California Next Generation Science Standards (CA NGSS) Performance Expectation (PE). These CA NGSS dimensions are Science and Engineering Practices (SEPs), Disciplinary Core Ideas (DCIs), and Crosscutting Concepts (CCCs). The PE statements are designed to show what students have learned by engaging in the SEP to demonstrate an understanding of the DCI and making connections using the CCC. For more information on PEs and their dimensions, refer to the CDE NGSS for California Public Schools, K–12 web page at <https://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp>.

Item content specifications are living documents and are updated on a regular basis as items are continually being developed.There are 175 item content specifications, one for each assessed PE (i.e., 45 for grade five, 59 for grade eight, and 71 for high school). Originally, the specification documents were created as tools for item writers to ensure that new, multidimensional CAST items were aligned with the CA NGSS PEs. Over time, it became clear that the item content specifications could be an important tool for educators to use, along with the 2016 Science Framework for California Public Schools (Science Framework), as resources for developing items for interim, benchmark, and summative assessments for the classroom. With these specifications, educators will gain a better understanding of the three-dimensional nature of the CAST assessment items. Please note, however, that these item content specifications are **not** intended to guide instruction.

The format of the item content specifications begins with the PE and includes the clarification statement, applicable assessment boundaries, and the three dimensions (SEPs, DCIs, and CCCs). The specifications then break down each of the dimensions into assessment targets, which are integrated into possible tasks. A task is an item, set of items, or an instructional activity for students. The item content specifications also provide relevant Environmental Principles and Concepts, examples of phenomena and misconceptions, and additional assessment boundaries and references. Each section of the item content specifications is discussed in detail below.

## Sections of the Item Content Specifications

### California Next Generation Science Standards—Performance Expectations

The CA NGSS consist of PEs that have three integrated dimensions: the SEPs, CCCs, and DCIs. Each PE describes what students should know and be able to do in science. Clarification statements provide additional detail to describe the intended emphasis of the PE and may identify examples of phenomena aligned with the PE. Assessment boundaries provide guidance about the scope of the PE at a particular grade level.

In the DCI section, the DCI and the Core Component Ideas are presented. Educational Testing Service added a coding structure to the bulleted DCI Core Component Ideas in a PE for easier tracking of each DCI. This coding structure is used in the item content specifications to further explain the DCIs. Refer to figure 1 and accompanying text for an explanation of the coding structure.

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| **Disciplinary Core Ideas** |
| **PS1.A: Structure and Properties of Matter**  |
| 8. Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.  |
| **PS1.B: Chemical Reactions** |
| 4. Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. |

Figure 1. Sample DCI Statement

In this excerpt from MS-PS1-2, the DCI PS1.B: Chemical Reactions appears in three previous PEs (i.e., 2-PS1-4, 5-PS1-2, and 5-PS1-4). The fourth occurrence of the Chemical Reactions DCI appears in MS-PS1-2; therefore, a “4” has been placed before the Core Component Idea associated with the DCI PS1.B. The Core Component Ideas are vertically articulated and provide the developmental progressions of the DCI by adding layers of complexity and refining conceptual models as students progress through the grade levels. These progression can be found in *The Science Framework—Appendix 1: Progression of the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts in Kindergarten through Grade 12* web document at <https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix1.pdf>.

### Assessment Targets

Assessment targets are grade-specific knowledge, skills, and abilities that students should know or be able to demonstrate within a science domain. Furthermore, assessment targets identified in the CAST item content specifications reduce the “universe” of understanding in each dimension into smaller assessable pieces that can be integrated into an item or set of items for statewide assessments. Assessment Targets have been developed for each of the three dimensions of the CA NGSS.

#### Science and Engineering Subpractices

Educational Testing Service used published educational research and existing CA NGSS documents to analyze each SEP and generate essential components called “subpractices.” The subpractices describe a variety of ways to express the same SEP in an item. An item content specification document for a specific PE lists only those subpractices that are most relevant to how the PE incorporates the SEP. Therefore, not all item content specification documents will list all the subpractices of an SEP (refer to CDE CAST Item Content Specifications Appendix A web document at <http://www.cde.ca.gov/ta/tg/ca/documents/cast_itemspecsappendixa.docx> for a complete list of SEP subpractices).

#### Science and Engineering Subpractice Assessment Targets

Educational Testing Service further analyzed each subpractice to generate subpractice assessment targets. They selected subpractice assessment targets that best fit the intention of the PE. However, not all subpractice assessment targets are listed with every instance of their corresponding subpractice.

#### Disciplinary Core Idea Assessment Targets

Educational Testing Service analyzed the DCIs associated with each PE to generate DCI assessment targets. The item content specifications include only selected DCI assessment targets that best fit the intention of the PE. However, not all DCI assessment targets are listed with every instance of their corresponding DCI.

#### Crosscutting Concept Assessment Targets

Similarly, Educational Testing Service analyzed each CCC to generate CCC assessment targets. The item content specifications include only selected CCC assessment targets that best fit the intention of the PE. However, not all CCC assessment targets are listed with every instance of their corresponding CCC.

### Examples of Integration of Assessment Targets and Evidence

The CAST items are aligned with the DCI and at least one other dimension (i.e., SEP or CCC). The item content specifications capture these dimensions as assessment targets. Integration of the dimensions is described by the task descriptions in the examples of integration of assessment targets and evidence.

The examples of integration are designed such that a student’s participation in a task provides evidence of proficiency with the PE. For example, on the CAST, task participation is the student’s interaction with and response to an item. A student’s correct response to an item likely indicates a level of proficiency with the PE because the items integrate the specific SEP, DCI, and CCC assessment targets appropriate for the PE.

### Environmental Principles and Concepts

California’s Environmental Principles and Concepts (EP&Cs) examine the interactions and interdependence of human societies and natural systems. EP&Cs are used as context for assessment items, where appropriate, but students are not directly assessed on environmental literacy beyond what is called for in certain PEs. The EP&Cs, unique to California, are not considered a dimension for any of the PEs in the CA NGSS.

The EP&Cs have a strong association with specific PEs in the CA NGSS and provide a basis for phenomena (or context) for assessing those PEs. Only the appropriate environmental principles will be listed for PEs, where appropriate; that is, not all PEs will have an EP&C listed on the item content specifications. Refer to *2016 Science Framework—Appendix 2: Connections to Environmental Principles and Concepts* web document at <https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix2.pdf> for more information on the connections between the EP&Cs and PEs.

### Possible Phenomena or Contexts

Broad categories and specific examples that are appropriate for the PE are provided as possible phenomena or contexts for item development. The list of possible phenomena or contexts is **not** exhaustive, nor does the list imply that those phenomena or contexts are more likely to appear on the CAST.

### Common Misconceptions

Common misconceptions may be listed, if appropriate. Common misconceptions are generated from cycles of development of the CAST items and from interactions with California educators during professional development activities. The list of common misconceptions is **not** exhaustive.

### Additional Assessment Boundaries

Additional assessment boundaries above and beyond the PE may be provided. These additional boundaries are for statewide assessment development purposes only and are not intended to limit instruction of the PE.

### Additional References

All item content specification documents list additional references. Some item content specifications provide additional references that are more specific to the PE or suitable phenomena.