

Alignment of Unit Cells and Crystal Structures Module to the Next Generation Science Standards

The Next Generation Science Standards (NGSS) were published in April 2013. They consist of statements that convey the performance expectations for students. Each performance expectation is a single statement that is built from three parts: science and engineering practices (Practices), disciplinary core ideas (DCI) and crosscutting concepts.

The background material, reading, and the slides from the module address the aspects of the NGSS shown in Table 1.

TABLE 1. ALIGNED PRACTICES, DISCIPLINARY CORE IDEAS, AND CROSSCUTTING CONCEPTS		
<i>PRACTICE</i>	<i>DCI</i>	<i>CROSSCUTTING CONCEPT</i>
<i>MS Analyzing and Interpreting Data:</i> Analyze and interpret data to determine similarities and differences in findings.	<i>MS.PS1-A:</i> Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).	<i>MS Structure and Function:</i> Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.
<i>Where is this Practice found in the lesson plan?</i> In the Learning Activity, students are asked to analyze the results of the experiment, sketch it, and compare the results with images found in research.	<i>Where is this DCI found in the lesson plan?</i> This DCI is found in the teacher Background Information and the Power Point presentation.	<i>Where is this Crosscutting Concept found in the lesson plan?</i> Some discussion of the uses of crystals is included in the teacher Background Information, and a section labeled Current and Future Applications. The Discussion Questions include this Crosscutting Concept explicitly (question 4).
<i>How well is this Practice aligned?</i>	<i>How well is this DCI aligned?</i> Strong alignment.	<i>How well is this Cross Cutting Concept aligned?</i>

TABLE 1. ALIGNED PRACTICES, DISCIPLINARY CORE IDEAS, AND CROSSCUTTING CONCEPTS

Partial alignment. While they are asked to compare their results, students are not asked to perform a true analysis or interpretation of their results.		Strong alignment.
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Alignment of Unit Cells and Crystal Structures Module to the Common Core State Standards in English Language Arts/Literacy and Mathematics

The Common Core State Standards (CCSS) were published in June 2010. They articulate student skills for English language arts/literacy and mathematics. The content of the module addresses the concepts and skills shown in Tables 3 and 4.

For English language arts/literacy, the CCSS is organized around College and Career Anchor Standards (CCR) that articulate the over-arching skills that students need to be prepared for college and career. There are grade level versions of each Anchor Standard, as well as versions for science and social studies classrooms (literacy standards). Alignments in Table 3 were made to the Anchor Standards, unless a more specific version of the standard was a closer fit to the skills in the module. Additional alignments may be warranted, depending on the use of associated videos that are provided as links in the module and whether students engage in discussions.

TABLE 3. ALIGNED COMMON CORE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

STANDARD

CCR.L.6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

Where is this standard found in the module?

Scientific words and phrases are used throughout the module, including within the background information, PowerPoint slides, activity instructions, and discussion questions.

How well is this standard aligned?

Partial alignment. Familiarity with some scientific vocabulary is prerequisite, while some other conceptual vocabulary (e.g., ionic bonding, covalent bonding) may be part of instruction. Students must use scientific (domain-specific) words and phrases to accurately respond to discussion questions.

STANDARD

RST.11–12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

<p><i>Where is this standard found in the module?</i></p> <p>Students read and follow multi-step procedure when completing the activities; students analyze the specific results through discussion questions.</p>
<p><i>How well is this standard aligned?</i></p> <p>Weak alignment. The ability to follow written procedures is prerequisite to the module and not part of direct instruction; students' analysis of results is not based on explanations in the text.</p>
<p>STANDARD</p> <p>RST.9–10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.</p>
<p><i>Where is this standard found in the module?</i></p> <p>Students must understand a variety of graphics that are used within the PowerPoint slides, and they make a sketch of the crystal shape as part of the procedure.</p>
<p><i>How well is this standard aligned?</i></p> <p>Weak alignment. The ability to connect graphic images with a description of phenomena is assumed (prerequisite) and not part of instruction or assessment in the module.</p>
<p>STANDARD</p> <p>CCR.W.7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.</p>
<p><i>Where is this standard found in the module?</i></p> <p>Within the procedure, students must research the type of materials used in the experiment, determine the expected crystal structure, and find some images of these crystals.</p>
<p><i>How well is this standard aligned</i></p> <p>Partial alignment. Research skills are required by the procedure but are not the focus of instruction or assessment.</p>

For mathematics, Table 4 shows alignments to standards found in the 8th through 12th grade levels.

TABLE 4. ALIGNED COMMON CORE STANDARDS FOR MATHEMATICS

None Found