Guidelines for the Evaluation of Instructional Materials in Science

Instructional materials are an important and persistent resource in US classrooms. They represent the intersection of standards, disciplinary knowledge and practices, and pedagogy. In light of the Framework for K–12 Science Education (National Research Council, 2012) and the Next Generation Science Standards (NGSS; Lead States, 2013), decision-makers need consistent information about the quality of instructional materials in science and the extent to which they embody the NGSS (NRC, 2013). To offer this consistent information, a system for evaluating instructional materials should be valid and reliable. With the support of the National Science Foundation, BSCS has developed guidelines for the creation of tools and processes to evaluate instructional materials and result in valid and reliable information about their quality. Tables 1 and 2 provide overviews of key components of these guidelines, which are contained in a report release by BSCS in May 2017. Table 1 describes characteristics of measures for the evaluation of instructional materials.

Table 1 Guidelines for assessing the quality of instructional materials.

The evaluation system	
1. includes both tools and processes. 2. includes a guide for evaluators. 3. specifies a summary report that justifies the evaluation results and offers suggestions for modifying instructional materials to enhance their quality.	
The evaluation system should be supported by Tools that	**The evaluation system should include Processes that**
4. specify what to look for as evidence for each Evaluative Criterion.	7. identify appropriate units of analysis.
5. have clearly defined scoring guidelines for capturing evidence from materials.	8. involve dialogue and consensus-building among a team of evaluators.
6. include forms for documenting specific evidence of the Evaluative Criteria and suggestions for improvement.	9. assure consistency across evaluators.

The information provided through the application of these measures can only be as good as the criteria by which the instructional materials are evaluated. The NRC *Framework* and the NGSS provide a foundation for such criteria based on what many science educators have long advocated: the integration of science practices and disciplinary ideas, with a focus on carefully chosen disciplinary core ideas that are generative and more opportunities for authentic experiences with doing science. In practice, this means learning is guided by clearly articulated, focused learning goals that anchor rich experiences with the science and engineering practices (SEPs) *and* crosscutting concepts (CCCs) *and* disciplinary core ideas (DCIs) together—and the integration of these three domains, called *three-dimensional learning*. Table 2 briefly describes criteria that represent the vision of what instructional materials should look like as the NGSS are more widely adopted. These criteria are organized into four broad categories articulated in the form of assertions about high-quality materials that support the vision of the NRC *Framework* and the NGSS:

1. Instructional materials support NGSS-driven learning goals.
2. Instructional materials provide coherence across the three dimensions.
3. Instructional materials support science learning experiences that promote three-dimensional learning.
4. Instructional materials provide ways to monitor student learning across the three dimensions.

Table 2 Criteria for evaluation instructional materials in science.

When evaluating student materials, consider the extent to which …	*When evaluating teacher materials, consider the extent to which …*
NGSS-Driven Learning Goals	
1S Materials are based on learning goals. Those goals call for learning of • disciplinary core ideas, science and engineering practices, crosscutting concepts from NGSS integrated as three-dimensional learning; • the nature of science, engineering, technology, and applications of science from NGSS; and • Common Core State Standards for English language arts and mathematics.	1T Materials explain the learning goals; the rationale for selecting them; and • how they promote three-dimensional learning; • how they promote learning of the nature of science, engineering, technology, and applications of science; and • how they promote learning of the Common Core standards for English language arts and mathematics.
2S Materials use phenomena or problems to focus students on learning goals.	2T Materials explain how the phenomena or problems are used to focus students on learning goals.
3S Materials are based on scientifically accurate and grade-level-appropriate learning goals.	3T Materials situate learning goals within the progression of K-12 learning laid out by the NGSS.
Coherence across Three Dimensions	
4S Materials are designed with carefully sequenced learning goals and well-matched experiences.	4T Materials communicate the design principles and sequencing underpinning the storyline.
5S Materials provide students with opportunities to make links across the three dimensions to build coherent conceptual understanding and abilities to use the practices.	5T Materials promote teacher knowledge-building related to the storyline.
Learning Experiences across Three Dimensions	
6S Materials provide multiple opportunities for students to share and negotiate their ideas, prior knowledge, and experiences.	6T Materials support teachers in anticipating common student ideas and include guidance to elicit and challenge student thinking.
7S Materials use motivating contexts to engage students in real-world phenomena and authentic design problems.	7T Materials provide guidance to teachers for using effective teaching strategies that engage students in real-world phenomena and authentic design problems.
8S Materials are accessible to a wide range of students.	8T Materials provide suggestions for how to address a range of students' skills, needs, and interests.
Monitoring Learning across Three Dimensions	
9S Materials include accessible and unbiased formative and summative assessments of students' three-dimensional learning.	9T Materials highlight formative and summative assessments and provide tools and guidance for interpreting evidence of three-dimensional learning and using assessment results to plan for future instruction.
10S Materials include multiple opportunities for self-assessment and reflection to promote sensemaking among students.	10T Materials provide guidance for teachers to use data from assessments to provide feedback to students and promote student self-assessment and reflection.

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