Revised Science Criteria

Criteria for Evaluating K-8 Science Instructional Materials

Introduction

Instructional materials are adopted by the state for the purpose of helping teachers present the content set forth in the Science Content Standards for California Public Schools (referred to in this document as simply the "California Science Standards"). To accomplish this purpose, this document establishes the criteria for evaluating instructional materials, as defined in Education Code Section 60010. These criteria will govern the evaluation of instructional materials for kindergarten through grade eight that are submitted for adoption beginning with the 2006 Adoption of Science Instructional Materials, and they will be helpful to publishers in developing their submission.

The California Science Standards are challenging. In the initial years of implementing the 2003 Science Framework for California Public Schools (referred to in this document as simply the "California Science Framework"), a major goal of most local education agencies across the state will be to facilitate the transition from what many students have traditionally been taught in science to the rigorous content presented in the California Science Standards. Instructional materials play a central role in facilitating this transition. **Students should have the opportunity to learn science by direct instruction, by reading textbooks and supplemental materials, by solving Standards-based problems, and by doing lab investigations and experiments.**

The State Board of Education (State Board) will adopt science programs that provide effective learning materials for all students - those students who have mastered most of the content taught in

the earlier grades and those who have not - and that specifically address the needs of teachers who instruct a diverse student population. **Some teachers may not have specialized in science and may not have an extensive background in science, while others may hold supplemental authorizations in life or physical science or have had extensive training in science content and pedagogy. The publishers shall develop and submit programs that offer the flexibility to meet the diverse needs of students and teachers with varying science backgrounds.**

These criteria, in keeping with the California Science Framework, do not specify a single pedagogical approach, although the framework incorporates certain commonsense pedagogical features. The State Board encourages publishers to select research-based pedagogical approaches that comprehensively cover the rigorous California Science Standards, reflect the California Science Framework, make judicious use of instructional time, present science in interesting and engaging ways, and otherwise give teachers the resources they need to teach science effectively.

Evaluation Criteria

The criteria for evaluation of K-8 instructional materials are organized into five categories:

1. Science Content/Alignment with Standards. The content as specified in the California Science Standards, and presented in accord with the guidance provided in the California Science Framework.
2. Program Organization. The sequence and organization of the science program that provide structure to what students should learn each year.
3. Assessment. The strategies presented in the instructional materials for measuring what students know and are able to do.
4. Universal access. The resources and strategies that address the needs of special student populations, including students with disabilities, students whose achievement is either

significantly below or above that typical of their class or grade level, and students with special needs related to English language proficiency.

5. Instructional planning and support. The instructional planning and support information and materials, typically including a separate edition specially designed for use by the teacher, that enable the teacher to implement the science program effectively.

In kindergarten through grade five, the California Science Standards are organized by grade level in three content strands: Physical Sciences, Life Sciences, and Earth Sciences. The standards for grades six through eight provide for a specific content focus in each year, with Earth Sciences being the focus in grade six, Life Sciences in grade seven, and Physical Sciences in grade eight. Investigation and Experimentation standards are also provided at each grade level (K-8) which must be taught in the context of these content strands.

In grades nine through twelve, the California Science Standards are organized by discipline. A set of Investigation and Experimentation standards common to all of the disciplines is also presented. Most high schools provide the grade nine through grade twelve science curriculum in discipline-specific courses, while some either additionally or exclusively provide integrated science courses that combine the various disciplines. To provide local education agencies and teachers with flexibility in presenting the material, the standards do not identify a particular discipline with a particular grade. Moreover, the standards do not specify a particular organization of the content of each discipline, although the California Science Framework suggests the logical sequencing of content in some places. Instructional materials may group related standards and address them simultaneously for purposes of coherence and utility.

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Submissions that fail to meet Category 1, the Science Content/Alignment with Standards criteria, will not be considered satisfactory for adoption. Categories 2-5 will be considered as a whole with each submission passing or failing these criteria as a group. However, every submission will be expected to have strengths in each of Categories 2-5 to be worthy of adoption.

Category 1: Science Content/Alignment with Standards

Science instructional materials must support teaching and learning of the California Science Standards, in accordance with the guidance provided in the California Science Framework. To be considered suitable for adoption, an instructional materials submission must provide:

1. Content that is scientifically accurate.
2. Comprehensive teaching of all California Science Standards at the intended grade level(s), as discussed and prioritized in the California Science Framework, Chapters 3 and 4. The only standards that may be referenced are the California Science Standards. There should be no reference to national standards or benchmarks or to any standards other than the California Science Standards.
3. Multiple exposures to the California Science Standards (introductory, reinforcing, and summative) leading to student mastery of each standard through sustained effort.
4. A checklist of California Science Standards in the teacher edition, with page number citations or other references that demonstrate multiple points of student exposure, and a reasonable and judicious allotment of instructional time for learning the content of each standard. Extraneous lessons or topics that are not directly focused on the standards are minimal, certainly composing no more than 10 percent of the science instructional time.

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5. A table of evidence in the teacher edition, demonstrating that the California Science Standards can be comprehensively taught from the submitted materials with hands-on activities composing **no more than** **at least** 20 to 25 percent of **the** science instructional **program time** (as specified in the California Science Framework). **Hands-on activities must be cohesive, connected and build on each other to lead students to a comprehensive understanding of the California Science Content Standards.** **Additional hands-on activities may be included, but must not be essential for complete coverage of the California Science Standards for the intended grade level(s), must be clearly marked as optional, and must meet all other evaluation criteria.**
6. Investigations and experiments that are integral to, and supportive of the grade-appropriate Physical, Life, and Earth Science Standards, so that investigative and experimental skills are learned in the context of those content standards. The instructional materials must include clear procedures and explanations, in the teacher and student materials, of the science content embedded in hands-on activities.
7. Evidence in the teacher edition that each hands-on activity **(whether part of the intended program or included as an additional activity)** directly covers one or more California Science Standards, (in the grade-appropriate Physical, Life, or Earth Science strands), demonstrates scientific concepts, principles, and theories outlined in the California Science Framework, and produces scientifically meaningful data in practice. All hands-on activities **(whether part of the intended program or included as an additional activity)** must be safe and age appropriate.
8. Explicit instruction in science vocabulary that emphasizes the meanings of roots, prefixes, and suffixes, and the usage and meaning of common words in a scientific context.

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9. Extensive grade-level appropriate reading and writing of expository text, and practice in the use of mathematics, aligned with, respectively the Reading Language-Arts Framework for California Public Schools and the Mathematics Framework for California Public Schools.
10. Examples, where directly supportive of the California Science Standards, of the historical development of science and its impact on technology and society. The contributions of minority persons, particularly those individuals who are recognized as prominent in their respective fields, should be included and discussed when it is historically accurate to do so.
11. Examples, where directly supportive of the California Science Standards, of principles of environmental science, such as conservation of natural resources and/or pollution prevention. These examples should give direct attention to the responsibilities of all people to create and maintain a healthy environment and to use resources wisely.

Category 2: Program Organization

The sequence and organization of the science program provides structure to what students should learn each year and allow teachers to convey the science content efficiently and effectively. The program content is organized and presented in a manner consistent with the guidance provided in the California Science Framework. To be considered suitable for adoption, an instructional materials submission must provide:

1. A logical and coherent structure that facilitates efficient and effective teaching and learning within a lesson, unit, and year.
2. Specific instructional objectives that are identified and sequenced so that prerequisite knowledge is introduced before more advanced content.
3. Clearly stated student outcomes and goals that are measurable and standards-based.

4. Materials and assessments that include a cumulative and/or spiraled review of skills.
5. A program organization that provides the option of **preparing or** pre-teaching of the science content embedded in any hands-on activities.
6. A program organization that supports various lengths of instructional time and helps make efficient use of small blocks of time (that may be available during the instructional day) in kindergarten through grade three.
7. An overview of the content in each lesson or instructional unit that outlines the scientific concepts and skills to be developed. Topical headings need to reflect the framework and standards and to clearly indicate the content that follows.
8. Support materials that are an integral part of the instructional program. These may include video and audio materials, software, and student workbooks.
9. Tables of contents, indexes, glossaries, content summaries, and assessment guides that are designed to help teachers, parents/guardians, and students.
10. For grades four through eight, explicit statements of the relevant grade-level standards in both the teacher and student editions.

Category 3: Assessment

Instructional materials should contain strategies and tools for continually measuring student achievement, following the guidance provided in Chapter 6 of the California Science Framework. To be considered suitable for adoption, an instructional materials submission must provide:

1. Strategies and/or instruments teachers can use to determine students' entry-level skills and knowledge, and methods of using the information in guiding instruction.
2. Multiple measures of individual student progress at regular intervals and at strategic points of instruction, such as lesson, chapter, and unit tests, or laboratory reports.

3. Suggestions on how to use assessment data to guide decisions about instructional practices and to help teachers determine the effectiveness of their instruction.
4. Guiding questions for monitoring student comprehension.
5. Answer keys for all workbooks and other related student resources.

Category 4: Universal Access

Resources and strategies must be provided to enable effective teaching of students with special needs, allowing them full access to the rigorous academic content specified in the Science Content Standards in accordance with the guidance set forth in Chapter 7 of the California Science Framework. The resources and strategies must support compliance with applicable state and federal requirements for providing instruction to diverse populations and students with special needs and should be consistent with any applicable policies of the State Board toward that end. To be considered suitable for adoption, an instructional materials submission must provide:

1. Suggestions based on current and confirmed research for strategies to adapt the curriculum and the instruction to meet students' identified special needs.
2. Strategies for students who are below grade level, including more explicit explanations of the science content to assist in accelerating student knowledge to grade level.
3. Teacher and student editions that include suggestions or reading materials for advanced learners who need an enriched or accelerated program or assignments.
4. Suggestions to help teachers pre-teach and reinforce science vocabulary and concepts with English learners.
5. Resources that provide specific help to meet the needs of students whose reading, writing, listening, and speaking skills are below grade level (in relationship to the English-Language Arts Content Standards for California Public Schools and the Reading-Language Arts

Framework for California Public Schools) and help ensure that these students know, understand, and use appropriate academic language in science.

6. Evidence of adherence to the Design Principles for Perceptual Alternatives, Design Principles for Cognitive Alternatives, and Design Principles for Means of Expression, as detailed below.

The following design principles are guidelines for publishers to use in creating materials that will allow access for all students:

Design Principles for Perceptual Alternatives

- Consistent with federal copyright law, provide all student text in digital format so that it can easily be transcribed, reproduced, modified, and distributed in braille, large print (only if the publisher does not offer such an edition), recordings, American Sign Language videos, or other specialized accessible media for use by pupils with visual disabilities or other disabilities that prevent use of standard materials.
- Provide written captions and/or written descriptions in digital format for audio portions of visual instructional materials, such as videotapes (for those students who are deaf or hard-of-hearing).
- Provide educationally relevant descriptions for the images, graphic devices, or pictorial information essential to the teaching of key concepts. (When key information is presented solely in graphic or pictorial form, it limits access for students who are blind or who have low vision. Digital images with verbal description provide access for those individuals and also provide flexibility for instructional emphasis, clarity, and direction.)

Design Principles for Cognitive Alternatives

- Use "considerate text" design principles including:
    - Adequate titles for each selection

- Introductory subheadings for chapter sections
- Introductory paragraphs
- Concluding or summary paragraphs
- Complete paragraphs including clear topic sentence, relevant support, and transitional words and expressions (e.g. furthermore, similarly)
- Effective use of typographical aids - boldface print, italics
- Adequate, relevant visual aids connected to the print, such as illustrations, photos, graphs, charts, maps
- Manageable versus overwhelming visual and print stimuli
- Identification and highlighting of important terms
- List of reading objectives or focus questions at the beginning of each selection
- List of follow-up comprehension and application questions

• Provide optional information or activities to enhance students' background knowledge. (Some students face barriers because they lack the necessary background knowledge. Pre-testing prior to an activity will alert teachers to the need for advanced preparation. Instructional materials can include optional supports for background knowledge, to be used by students who need them.)

• Provide cognitive supports for content and activities including:

- Assessments to determine background knowledge
- Summaries of those key concepts from the standards that the content addresses
- Scaffolds for learning and generalization
- Opportunities to build fluency through practice

Design Principles for Means of Expression

- Explain in the teacher edition that there are various ways for students with special needs to use the materials and demonstrate their competence, and suggest modifications that teachers could use to allow students to access the materials and demonstrate their competence. For example, for students who have dyslexia (or difficulties physically forming letters, writing legibly, or spelling words), appropriate modifications of means of expression might include (but are not limited to) student use of computers to complete pencil and paper tasks, use of on-screen scanning keyboards, enlarged keyboards, word prediction, and spellcheckers.
- Provide support materials that will give students opportunities to develop oral and written expression.

Category 5: Instructional Planning and Support

Instructional materials must contain a clear "road map" for teachers to follow when planning instruction. To be considered suitable for adoption, an instructional materials submission must provide:

1. A teacher edition that ~~**describes what to teach, how to teach, and when to teach, including**~~ **includes** ample and useful annotations and suggestions on how to present the content in the student edition and in the ancillary materials.
2. A checklist of program lessons in the teacher edition, with cross-references to the standards covered, and details regarding the instructional time necessary for overall instruction and hands-on activities.
3. Lesson plans including suggestions for organizing resources in the classroom and ideas for pacing lessons.
4. Blackline masters that are accessible in print and in digitized formats and are easily reproduced. Dark areas are to be minimized to conserve toner.

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5. Prioritization of critical components of lessons. Learning objectives and instruction are explicit, and the relationship of lessons to standards or skills within standards is explicit.
6. Clear grade-appropriate explanations of science concepts, principles, and theories that are presented in a form that teachers can easily adapt for classroom use.
7. Lists of necessary equipment and materials for any hands-on activities, guidance on obtaining these materials inexpensively, and explicit instructions for organizing and safely conducting the instruction.
8. Strategies to address and correct common student errors and misconceptions.
9. Suggestions for how to adapt each hands-on activity provided to ~~**direct instruction methods of teaching**~~ **other methods of teaching, including teacher modeling, teacher demonstration, direct instruction, or reading, as specified in the California Science Framework.**
10. Charts of time and cost of staff development services available for preparing teachers to fully implement the science program.
11. Technical support and suggestions for appropriate use of audiovisual, multimedia, and information technology resources associated with a unit.
12. Strategies for informing parents and guardians about the science program and suggestions for how they can help to support student achievement.
13. Teacher editions containing full, adult-level explanations and examples of the more advanced science concepts, principles, and theories that appear in the lessons, so that teachers can refresh or enhance their own knowledge of the topics being covered as may be necessary.