CRITERIA FOR EVALUATING K-8 SCIENCE INSTRUCTIONAL MATERIALS *§‡◊
(In Preparation for the 2006 Adoption)
California Curriculum Commission Science Committee (CCCSC)

I. Introduction

Instructional materials adopted by the state must help 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(h). These criteria will guide the development and govern the evaluation of instructional materials for grades kindergarten through eight, beginning with the 2006 Adoption of Science Instructional Resources.

The California Science Standards are challenging. In the initial years of implementing the 2003 Science Curriculum Framework for California Public Schools (referred to in this document as simply the "California Science Framework"), a major goal for most school districts across the state will be to facilitate the transition from what students actually know to what the California Science Standards envision they should know. Instructional materials play a central role in facilitating this transition.

Instructional materials adopted by the State Board of Education, on the whole, should provide programs that will be effective for all students - those who have mastered most of the content taught in the earlier grades and those who have not. In addition, instructional materials must specifically address the needs of teachers who instruct a diverse student population. Therefore, the California Science Framework does not ask publishers to use a particular pedagogical approach; instead, it encourages them to select research-based pedagogical approaches that make judicious use of instructional time, present science in interesting and engaging ways, and collectively give teachers alternatives that will help them to teach science effectively.

* Outlined from CCCSC's serial listing by R.R. Hake <rrhake@earthlink.net> on 10 November 2003.
§ As posted by Art Sussman <http://www.wested.org/cs/wew/view/u/146> for the members of the California Science Education Advisory Committee (CSEAC).
‡ The California Department of Education:
   a. Curriculum & Instruction <http://www.cde.ca.gov/ci/>
◊ Especially noteworthy sections are placed in **bold italics**.
II. Evaluation Criteria
The criteria for evaluation of K-8 science instructional resources are organized into five general categories:

A. 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.

B. Program organization.
The sequence and organization of the science program that provides structure to what students should learn each year.

C. Assessment.
The strategies presented in the instructional materials for measuring what students know and are able to do.

D. Universal access.
Instructional materials that address the needs of special student populations, including students eligible for special education, students whose achievement is either significantly below or above that typical of their class or grade level, and students with special needs related to language proficiency.

E. 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 help teachers to implement the science program.

III. Content Strands
In kindergarten through grade eight, the standards are organized by grade level in three content strands: Physical Science, Life Science, and Earth Science. The Investigation and Experimentation standards must be taught in the context of these content strands. The grade 6-8 standards provide for a specific content focus in each year, with Earth Science in grade 6, Life Science in grade 7, and Physical Science in grade 8. In grades nine through twelve, the standards are organized by discipline. Most schools teach the grade nine through twelve science curriculum in subject-specific courses, and some teach it in an integrated fashion. To provide local educational agencies and teachers with flexibility in presenting the material, the standards for grades nine through twelve do not mandate that a particular discipline be initiated and completed in a single grade. In addition, the order of the science standards does not imply a required organization for the materials within a grade level or discipline. Instructional materials may group related standards and address them simultaneously for purposes of coherence and utility.
Materials that fail to meet the Science Content/Alignment with Standards criteria will not be considered satisfactory for adoption. Only those programs determined to meet all criteria in category 1 will be evaluated under criteria categories 2-5. A program failing to meet any one of Categories 2-5 substantively will not be approved.

IV. The Five Categories

A. Category 1: Science Content/Alignment with Standards

Science materials should support teaching to the science content standards, in accord with the guidance provided in the California Science Framework. Instructional materials suitable for adoption must provide:

1. Content that is scientifically accurate.

2. Comprehensive teaching of all California Science Standards at the intended grade level, as discussed and prioritized in the California Science Framework, Chapters 3 and 3.

3. The only standards that may be referenced are the California Academic Content Standards developed under Education Code section 60605.

4. Multiple exposures to the California Science Standards (introductory, reinforcing, and mastery summative) leading to student mastery of each standard through sustained effort.

5. A checklist of California Science Standards in the teacher's guide, with page number citations or other references that demonstrate multiple points of student exposure. Extraneous lessons or topics that are not directly focused on the standards are kept to a minimum, and may not exceed 10% of the science instructional time.

6. A table of evidence in the teacher's guide, demonstrating that the California Science Standards can be comprehensively taught from the submitted materials with 25% or less of the science instructional time devoted to hands-on activities. Additional hands-on activities may be submitted, but must be clearly marked as optional and must meet all other adoption criteria.

7. Evidence in the teacher's guide that all submitted hands-on activities directly teach one or more California Science Standards, demonstrate scientific principles and concepts outlined in the California Science Framework, and will produce scientifically meaningful data in practice.

8. Explicit instruction in science vocabulary that emphasizes the meanings of roots, prefixes, and suffixes, and the different usage and meaning of common words in a scientific context.
9. Extensive grade-level appropriate reading and writing of expository text, and practice in the use of mathematics, aligned with the California Reading Language-Arts and Mathematics Frameworks.

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 prominent minority persons, 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 protection such as conservation of natural resources or pollution prevention. Such examples should give direct attention to the responsibilities of all people to create and maintain a healthy environment, but must not demean, stereotype, or patronize individuals engaged in environmentally sensitive occupations or behaviors.

B. 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, instructional materials in science 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 supports pre-teaching of the science content embedded in any hands-on activities.

6. A program organization that supports various lengths of class periods, and helps make efficient use of small blocks of time that may be available during the day in grades K-3.

7. An overview of the content in each lesson or instructional unit that outlines the scientific concepts and skills to be developed. Topical headings reflect the framework and standards and 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, indices, glossaries, content summaries, and assessment guides that are designed to help teachers, parents/guardians, and students.

C. 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, instructional materials in science must provide:

1. Strategies 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.

D. Category 4: Universal Access
Students with special needs must be provided access to the same academic standards-based curriculum that is provided to all students, following the guidance provided in Chapter 7 of the California Science Framework. Instructional materials must conform to the policies of the California State Board of Education, and to other applicable state and federal requirements, with respect to diverse populations and students with special needs. To be considered suitable for adoption, instructional materials in science 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.

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. Instructional materials that are designed to help meet the needs of students whose reading, writing, listening, and speaking skills fall below the level prescribed in the English language arts content standards and to assist in accelerating studentsí skills to grade level. Those students whose skills are significantly below grade level in reading should be directed to intensive reading instruction.

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.

(a) Design Principles for Perceptual Alternatives

(1) 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 for the deaf, or other specialized accessible media exclusively for use by pupils with visual disabilities or other disabilities that prevent use of standard materials.

(2) 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 hearing impaired).

(3) Provide educationally relevant descriptions for those 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.)
(b) Design Principles for Cognitive Alternatives

(1) Use "considerate text" design principles which include:
   * 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: 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

(2) 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.)

(3) Provide cognitive supports for content and activities: a) provide assessment to determine background knowledge;

(4) summarize those key concepts from the standards that the content addresses;

(5) provide scaffolding for learning and generalization;

(6) build fluency through practice.
(c) Design Principles for Means of Expression

(1) Explain in the teacher's edition that there is a variety of ways for students with special needs to use the materials and demonstrate their competence, e.g. for students who have dyslexia or who have difficulties physically forming letters, writing legibly, or spelling words. Suggest in the teacher's edition modifications that teachers could use to allow students to access the materials and demonstrate their competence. Examples of 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.

(2) Publishers should provide support materials that will give students opportunities to develop oral and written expression.

E. 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, instructional materials in science must provide:

1. A Teachers' Edition that describes what to teach, how to teach and when to teach. It includes ample and useful annotations and suggestions on how to present the content in the student edition and ancillary materials.

2. A checklist of program lessons in the Teachers' Edition, with cross-reference to the standards covered, detailing 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. 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.

5. Clear grade-appropriate explanations of science concepts appear in a form that teachers can easily adapt for classroom presentation.

6. 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.
7. Strategies to address and correct common student errors and misconceptions.

8. Clear procedures and explanations, in the teacher and student materials, of the science embedded in hands-on activities. These activities, where provided, must include suggestions for how to adapt the lesson to direct instruction methods of teaching.

9. Charts of time and cost of staff development services available for preparing teachers to fully implement the science program.

10. Technical support and suggestions for appropriate use of audiovisual, multimedia, and information technology resources associated with a unit.

11. Strategies for informing parents or guardians about the science program, and suggestions for how they can help to support student achievement.

12. Teachers' editions containing full, adult-level explanations and examples of the more advanced science concepts in the lessons, so that teachers can improve their own knowledge of the subject as necessary.