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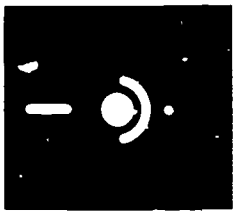
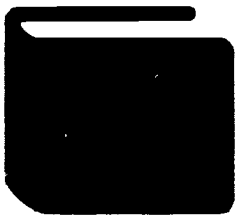
ABSTRACT

To assist school districts in selecting science instructional materials, the California State Department of Education has developed detailed descriptions of state-adopted elementary programs and texts. This guide includes an annotated index of all adopted materials and separate descriptions for each program or series. The index contains a listing of the program's title, copyright year, grade levels and readability levels. Each program description includes sections on: (1) contents coverage (addressing the areas of science, technology, and society and the biological, earth, and physical sciences); (2) teaching and learning activities; (3) organization of topics and activities; (4) ancillary materials; (5) teacher materials; (6) assessment and evaluation techniques; (7) implementation requirements; and (8) areas needing supplementation. (ML)





Program Descriptions for Science Instructional Materials

CALIFORNIA STATE DEPARTMENT OF EDUCATION
Bill Honig—Superintendent of Public Instruction
Sacramento, 1986

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Contents

Foreword

The State Department of Education considers textbooks and other instructional materials to be important ingredients in the overall educational reform effort and is committed to improving their quality. Research has documented the pervasive use of textbooks by students; thus, textbooks exert considerable influence over what is taught in school and how it is taught.

To assist school districts with the important task of selecting instructional materials in science, the Department has developed the detailed program descriptions found in this publication. These descriptions include more details than were provided in previous descriptions as well as information on how specific programs correspond to the goals set forth in the 1978 *Science Framework* and 1984 *Science Framework Addendum.* However, these program descriptions should not be used to replace the necessary careful analysis, which should be conducted by educators with subject-matter expertise.

Some key points to be considered in the selection of textbooks include the following:

- Clarity and logical organization of the text
- Specific goals of instruction for science focused on in the text
- Readability of the text (organization, completeness, continuity, and correctness) (*Note:* Special attention should be given to readability. A textbook should be a model of the effective use of language, no matter what the subject area.)
- Facilitation of the development of higher order thinking skills, with opportunities to think critically and analytically (Students should have the opportunity to synthesize, evaluate, solve problems, and make judgments.)
- Appealing to students so that they will not be indifferent to the subject of science

I hope you find these program descriptions helpful, and I would enjoy hearing your suggestions for improving the quality of textbooks and instructional materials for California students.

Bill Honig

Superintendent of Public Instruction

Preface

Since 1972 the *Education Code* has allowed school districts to select instructional materials from a list adopted by the State Board of Education. However, several changes have been made in adoption and ordering procedures through the years. In 1972 the *Education Code* limited allotments to school districts to no more than $7 per unit of average daily attendance (a.d.a.). Currently, districts are allocated $23.17 per unit of a.d.a. In the past, the State Board adopted basic and supplementary materials; now only basic programs are adopted, and districts may use up to 20 percent of their allocations for instructional materials to purchase supplementary materials from an extensive list of items that have been reviewed for compliance with certain social content criteria. Some school districts have exercised the option provided by *Education Code* Section 60242 to order all instructional materials directly from the publishers. However, 80 percent of a district's allocation must be used to purchase state-adopted materials, such as those described in this guide, unless the district has successfully petitioned the State Board to do otherwise.

In keeping with the changes and to assist school districts more effectively with the selection of instructional materials, we are producing two documents. This publication, *Program Descriptions for Science Instructional Materials,* should be used as a guide to selecting instructional materials. Another publication, *Price List and Order Form for Science Instructional Materials,* is to be used as an order form by school districts using the State Department of Education's system and as a guide to correct information about prices for school districts ordering directly from publishers.

We see the selection of instructional materials as an important function involving three actions. First, the district will plan its curricular objectives and project a schedule for when it wishes to replace materials in each subject-matter area. Second, the district will inventory those materials on hand that will help the district accomplish its curricular objectives. And third, the district will decide what kinds of materials are needed from the state to satisfy the remainder of its instructional materials needs.

Some districts complete the cited tasks on a districtwide basis; others do so on a school basis. Either way, these actions should be taken before the program descriptions can be useful. By using the program descriptions as a guide, districts can reduce the number of materials that must be reviewed in making their selections.

We are grateful for the assistance of members of the Curriculum Development and Supplemental Materials Commission, analysts from the Educational Products Information Exchange (EPIE), and personnel in the

State Department of Education who generously gave of their time and talent to make this guide available to school districts. In particular, we want to call attention to the work of Robert Douglas, Director of Special Services, Plumas Unified School District, who acted as liaison for the Curriculum Development and Supplemental Materials Commission and reviewed all program descriptions to ensure consistency with the instructional materials evaluation panel reports. In addition, we commend Tom Sachse, Manager, Mathematics, Science, and Physical Education, State Department of Education, for analyzing the descriptions in terms of correlation with the *Science Framework* and *Science Framework Addendum;* and analysts Kathleen Carter Nagel and David Elliott, Educational Products Information Exchange (EPIE), Berkeley, for developing the preliminary program descriptions. Finally, we commend State Department of Education employees Frank Bennett, Consultant, Curriculum Framework and Textbook Development Unit, who coordinated the production of the analysis with the publishers; and Linda Crayne, Staff Services Analyst, Curriculum Framework and Textbook Development Unit, who coordinated the review. This collaborative effort among the Curriculum Development and Supplemental Materials Commission, the Educational Products Information Exchange, and the State Department of Education has resulted in a document that should prove to be useful to those charged with the critical task of selecting science materials for California students.

JAMES R. SMITH
Deputy Superintendent
for Curriculum and
Instructional Leadership

FRANCIE ALEXANDER
Director
Curriculum, Instruction,
and Assessment Division

Introduction

California is on a six-year cycle for adopting basic instructional materials for students in kindergarten through grade eight. This year the State Board of Education adopted the programs that are described in this publication, *Program Descriptions for Science Instructional Materials.* These programs were evaluated carefully prior to adoption by instructional materials evaluation panels (IMEPs), made up of teachers, curriculum specialists, and administrators representing the state geographically. The panels worked under the direction of the Curriculum Development and Supplemental Materials Commission. A representative of the commission assisted in the preparation of the program descriptions to provide coordination between the statewide adoption process and the local selection process. The programs described will be in adoption for six years (termination date: June 30, 1992), and this guide is to be used for the same time period.

This guide includes an annotated index of all adopted basic programs and separate descriptions for each basic program. The annotated index gives pertinent information about each program, including program title, year of copyright, designated grade levels, and readability levels for each grade reported as a range or an average. The readability levels were provided by the publishers. Individual publishers should be contacted if further clarification is needed. The listing for each program also includes a page number reference to the second part of this guide, where more detailed information about the materials is provided. This information includes a description of each program relative to the *Science Framework* and *Science Framework Addendum,* including a description of what framework and addendum topics are covered, and sections on teaching and learning activities, organization of topics and activities, levels of thinking, the interrelationship among the sciences and other subject areas, teachers' materials and provisions for individual differences, extension and enrichment activities, assessment and evaluation techniques, ancillary materials available from the publisher, and implementation requirements. Not all components to each program described may be listed in the detailed write-up; but, as previously indicated, the annotated index contains a complete listing of all items in a program.

Use of the information in this guide should not be substituted for actual study of the adopted materials. Users are encouraged to examine the materials at one of the 29 instructional materials display centers (IMDCs) throughout the state. A list of addresses of these centers may be found in the separate instructional packet.

Publications Available from the Department of Education

This publication is one of over 600 that are available from the California State Department of Education. Some of the more recent publications or those most widely used are the following.

Administration of Maintenance and Operations in Public Schools (1986)	$6 75
Apprenticeship and the Blue Collar System. Putting Women on the Right Track (1982)	10 00
Bilingual-Crosscultural Teacher Aides. A Resource Guide (1984)	3 50
Boating the Right Way (1985)	4 00
California Private School Directory	9 00
California Public School Directory	14 00
Computer Applications Planning (1985)	5 00
Computers in Education: Goals and Content (1985)	2 50
Educational Software Preview Guide (1985)	2 00
Elementary School Program Quality Criteria (1985)	3 25
Food Service Program Monthly Inventory Record (1985)	6 00
Guide for Vision Screening in California Public Schools (1984)	2 50
Handbook for Conducting an Elementary Program Review (1985)	4 50
Handbook for Conducting a Secondary Program Review (1985)	4.50
Handbook for Planning an Effective Foreign Language Program (1985)	3 50
Handbook for Planning an Effective Mathematics Program (1982)	2.00
Handbook for Planning an Effective Reading Program (1983)	1 50
Handbook for Planning an Effective Writing Program (1983)	2 50
Handbook on California Education for Language Minority Parents—Chinese/English Edition (1985)	3.25
History—Social Science Framework for California Public Schools (1981)	2.25
Improving the Attractiveness of the K—12 Teaching Profession in California (1983)	3 25
Improving the Human Environment of Schools: Facilitation (1984)	5 50
Improving Writing in California Schools: Problems and Solutions (1983)	2.00
Individual Learning Programs for Limited-English-Proficient Students (1984)	3 50
Instructional Patterns: Curriculum for Parenthood Education (1985)	12 00
Manual of First-Aid Practices for School Bus Drivers (1983)	1.75
Martin Luther King, Jr., 1929—1968 (1983)	3 25
Mathematics Framework for California Public Schools (1985)	3.00
Model Curriculum Standards: Grades Nine Through Twelve (1985)	5.50
Price List and Order Form for Instructional Materials in Health, 1986—1988 (1986)	2 00
Price List and Order Form for Instructional Materials in Science, 1986—1988 (1986)	2.50
Program Descriptions for Health Instructional Materials (1986)	2 50
Program Descriptions for Science Instructional Materials (1986)	2 50
Physical Performance Test for California, 1982 Edition (1984)	1.50
Program Guidelines for Severely Orthopedically Impaired Individuals (1985)	6 00
Raising Expectations: Model Graduation Requirements (1983)	2.75
Reading Framework for California Public Schools (1980)	1.75
School Attendance Improvement: A Blueprint for Action (1983)	2 75
Science Education for the 1980s (1982)	2.50
Science Framework for California Public Schools (1978)	3 00
Science Framework Addendum (1984)	3.00
Secondary School Program Quality Criteria (1985)	3.25
Selected Financial and Related Data for California Public Schools (1985)	3 00
Standards for Scoliosis Screening in California Public Schools (1985)	2.50
Studies on Immersion Education: A Collection for U.S. Educators (1984)	5 00
Trash Monster Environmental Education Kit (for grade six)	23.00
University and College Opportunities Handbook (1984)	3 25
Visual and Performing Arts Framework for California Public Schools (1982)	3.25
Wet 'n' Safe: Water and Boating Safety, Grades 4—6 (1983)	2.50
Wizard of Waste Environmental Education Kit (for grade three)	20.00
Work Permit Handbook (1985)	6 00
Young and Old Together: A Resource Directory of Intergenerational Resources (1985)	3 00

Orders should be directed to:

California State Department of Education
P.O. Box 271
Sacramento, CA 95802-0271

Remittance or purchase order must accompany order. Purchase orders without checks are accepted only from government agencies in California. Sales tax should be added to all orders from California purchasers.

A complete list of publications available from the Department, including apprenticeship instructional materials, may be obtained by writing to the address listed above.

A list of approximately 140 diskettes and accompanying manuals, available to members of the California Computing Consortium, may also be obtained by writing to the same address.

Annotated Index to the Program Descriptions for State-Adopted Basic Instructional Materials in Science

(Adoption Termination Year: 1992)

Publisher, item or program title, and copyright date	*Recommended grade level*	*Kind of material*	*Readability level*	*Page number*
Addison-Wesley Publishing Company, Inc.				
ADDISON-WESLEY SCIENCE © 1984	K—6	Textbook (1—6) (Spanish, 1—5) Teachers' editions (1—6) (Spanish, 1—5) California science teacher's resource book (6) Teachers' resource books (1—6) (Spanish, 1—5) Experience and record books (consumable) (1—6) Experience and record books (teachers' editions) (1—6) Teacher's manual (K) Reproducible masters (K) Materials kit (K)	Spache scale: 1—1.4 2—2.1 3—3.1 4—4.2 Dale-Chall scale. 5—5.2 6—6.3	5
Harcourt Brace Jovanovich, Inc.				
HBJ SCIENCE © 1985	K—6	Textbook (English and Spanish, 1—6) Big Book (K) Teacher's edition (English and Spanish, 1—6) Test booklets (1—6) Learning system, including bilingual (1—2) Learning system (teacher's edition) (1—2) Classroom lab, including bilingual (K—6) Materials guide for classroom lab (K—6)	Spache scale: K—Not applicable 1—1st 2—2nd 3—3rd Dale-Chall scale. 4—4th and below 5—5th-6th 6—5th-6th	9
D. C. Heath & Company				
HEATH EARTH SCIENCE © 1984 HEATH LIFE SCIENCE © 1984 HEATH PHYSICAL SCIENCE © 1984	7—8	Textbook Teacher's edition Teacher's resource binder Copy masters Duplicating masters Activities workbook Workbook (teacher's edition) Teacher's resource book	Dale-Chall, Harris-Jacobson, Fry scales: The average readability scores are at grade level for the student's textbook	13
Holt, Rinehart & Winston, Inc.				
HOLT SCIENCE © 1986	K—8	Textbook (1—8) (Spanish, 1—6) Teacher's edition (1—8) Teacher's resource book (1—8) Duplicating masters (1—6)	1—Fry, 1.0 Spache, 1.4 Bormuth, 37.0 2—Fry, 2.0 Spache, 1.8 Bormuth, 42.8	17

Publisher, item or program title, and copyright date	*Recommended grade level*	*Kind of material*	*Readability level*	*Page number*
HOLT SCIENCE (Continu		Delta equipment kits (1—8) Posters (1—6) Teacher's guide for posters Skillbooks (3—6) Teacher's edition of skillbooks Jumbo Book (K) Teacher's edition (tests, activities, and work sheets) (K) Teachers' guides (Spanish, 1—6)	3—Fry, 3.0 Spache, 2.3 Bormuth, 47.0 4—Fry, 4.0 Dale-Chall, 5.2 Bormuth, 49.0 5—Fry, 5.0 Dale-Chall, 6 3	17
Macmillan Publishing Company, Inc.				
EARTH SCIENCE © 1986 LIFE SCIENCE © 1986 PHYSICAL SCIENCE © 1986	7—8	Textbook Teacher's edition Laboratory and skills manual Laboratory and skills manual (teacher's edition) Teacher's resource book Test masters	Dale-Chall scale: 6.2—8.9 6 2—9.0 7.1—10.1	21
Charles E. Merrill Publishing Company				
ACCENT ON SCIENCE © 1985	K—6	Textbook (English and Spanish, K—6) Teacher's edition (English and Spanish) (K—6) California science resource book (K—6) Teacher's resource book (English and Spanish) Super Scientist Kit (K—6) Critter Stickers (English and Spanish) (K—6) Big Book (K—1) Student's activity book (1—6) Activity book, teacher's edition (1—6) Spirit evaluation and activity program (1—6) Poster packet with teacher's guide (English and Spanish, 1—6)	Spache, Fry, Gunning, McLaughlin scales (with science words): 1—1.2 2—1.8 Dale-Chall, Fry, Gunning, McLaughlin scales (with science words): 3—2.7 4—4.0 5—5.4 6—6.2	25
FOCUS ON EARTH SCIENCE © 1984	7—8	Textbook Teacher's edition Teacher's resource book Spirit evaluation program Learning strategy for lab (student's edition) Learning strategy for lab (teacher's edition) Review and reinforcement guide (student's edition) Review guide (teacher's edition) Skill cards	Fry, Gunning, McLaughlin scales (with science terms) Range, 7.3—9 7 Mean, 8.2	28

Publisher, item or program title, and copyright date	*Recommended grade level*	*Kind of material*	*Readability level*	*Page number*
FOCUS ON LIFE SCIENCE © 1984	7—8	Same as previous entry	Range, 6 7—8 1 Mean, 7.3	28
FOCUS ON PHYSICAL SCIENCE © 1984	7—8	Textbook Teacher's edition Student lab Lab (teacher's edition) Skillcards	Range, 6 6—9 5 Mean, 8 1	
PRINCIPLES OF SCIENCE © 1986	7—8	Textbook Teacher's edition Teacher's resource book (Book two)*		32
Prentice-Hall, Inc.				
A VOYAGE OF ADVENTURE ©1986 A VOYAGE OF DISCOVERY © 1986 A VOYAGE OF EXPLORATION © 1986	7—8	Textbook Teacher's edition Laboratory manuals Teacher's edition Software	Fry, Dale-Chall scales: 6th-7th 6th-7th 7th-8th	36
LIFE SCIENCE** © 1986 PHYSICAL SCIENCE** © 1986	7—8	Textbook Teacher's edition Laboratory and activity book Teachers' resource book	Fry; Dale-Chall scales. 7th-8th Fry; Dale-Chall scales. 7th-8th	39
Scott, Foresman & Company				
SCOTT, FORESMAN SCIENCE © 1986	K—6	Textbook (1—6) (English and Spanish) Teacher's edition (English and Spanish, 1—6) Teacher's resource book and reproducible masters Posters Kindergarten teacher's book and reproducible blackline masters (English and Spanish) (K) Posters (K) Story tapes (English and Spanish) (K) Science equipment kits (1—6) Software (4—6)	Spache scale. 1—1.6 2—2.1 3—3.0 Dale-Chall scale. 4—4.7 5—5.3 6—5.7	43
SCOTT, FORESMAN EARTH SCIENCE © 1986/83 SCOTT, FORESMAN LIFE SCIENCE © 1986/83	7—8	Textbook Teacher's edition Activity guide Reproducible duplicating masters	Dale-Chall scale. Earth, 6 0 Life, 5 9 Physical, 6 0	46

*Book one was not adopted by the State Board of Education However, it will be provided free of charge by the publisher to school districts that adopt this program

**On September 13, 1985, the State Board of Education did not adopt the *Earth Science* volume of this series

Publisher, item or program title, and copyright date	*Recommended grade level*	*Kind of material*	*Readability level*	*Page number*
SCOTT, FORESMAN PHYSICAL SCIENCE © 1986/83		Study guide, duplicating masters Test packet, reproducible masters Teacher's resource book masters (West) Software		46
Silver Burdett Company				
SILVER BURDETT SCIENCE © 1985	K—6	Textbook (1—6) (English and Spanish) Teacher's edition (English and Spanish, K—6) Sound and color filmstrips (English and Spanish with teacher's guide) (K—6) Check up copy masters (3—5) Teacher's resource package (English and Spanish, 1—6) Picture packet with teacher s manual (English and Spanish, K) Copy master (English and Spanish, K) California copy masters (English and Spanish, K) Equipment package (K)	Spache scale: K—Not provided 1—1st 2—2nd 3—3rd Dale-Chall scale: 4—4th 5—5th 6—6th	51

Addison-Wesley Publishing Company, Inc.
Addison-Wesley Science (1984), K—6

Summary

Relationship to the *Science Framework* and the *Science Framework Addendum*

Contents coverage. Many of the topics identified in the *Science Framework* and the *Science Framework Addendum* are covered as follows. In the area of Science, Technology, and Society, the strongest emphasis is given to describing careers related to science and to presenting scientists as role models. Some descriptions of scientific methods are included also. In Biological Science the study of human beings and ecosystems is given in-depth coverage. The main areas of emphasis in Earth Science are astronomy and meteorology. The stress in Physical Science is on mechanics, forms of energy, and electricity. Less extensive coverage is given to topics dealing with geology, oceanography, ethical issues, cells, protists, evolution, and California flora and fauna. Throughout the program, content from life, earth, and physical science areas is kept separate.

Teaching and learning activities. A wide range of learning activities is suggested in the textbooks, teachers' editions, and activity sheets. The hands-on activities are provided for in the text, and some work sheets are integrated in the content. Some activities are more complex than activities found in other programs and require more steps to complete experiments, but performing these steps is necessary for the students to work with more complex scientific issues.

Complete lesson plans give step-by-step suggestions for daily lessons, including the integration of exercises included in activity sheets, the identification of supplementary materials, and suggestions for extension and enrichment activities. Key features of this program include the activity section on creative writing provided in the chapter review pages beginning in grade three and the opportunities for problem solving included in the "Problems" and "Find Out on Your Own" sections located at the end of each chapter. The creative writing activities rather than the "Subject Integrating" activities included in lessons allow students to apply writing skills in a scientific context. For example, students are instructed to describe what muscles are used in particular sports, the food chain that led to the ingredients found in their favorite dish of food, and so forth. These writing activities may also be used as an informal means of evaluation or as an addition to the objective-type tests. The provisions for problem solving will challenge the more capable students in the class.

Areas needing supplementation. The following areas need supplementation to meet the California textbook standards: (1) topic coverage, particularly ethical issues, genetics, evolution, geology, oceanography, and California flora and fauna; (2) levels of thinking represented in the narrative textbooks beyond Observing, Communicating, Comparing, and Organizing as defined in the *Addendum;* (3) provisions for below-average learners that will allow students to review concepts rather than perform additional exercises that assume students' prior understanding of the skill or concept; and (4) provisions to assess students' progress in tapping higher levels of thinking, acquiring skills, and affect.

Textbooks and Related Materials

Topic Coverage

Topic	*Content emphasized*	*Content emphasized to a limited extent or not in evidence*
Science, Technology, and Society	Careers Scientists Methods of science Environmental issues Nature of science	Ethical issues
Biological Science	Human beings (organ systems, health) Ecosystems	Cells Genetics Evolution

Topic	*Content emphasized*	*Content emphasized to a limited extent or not in evidence*
	Plants Animals	Protists
Earth Science	Astronomy Meteorology	Oceanography Geology and resources
Physical Science	Matter Mechanics Energy: heat Energy: sound Energy: light Energy: electricity and magnetism	Energy: sources and transformations

Science, Technology, and Society

Special textbook sections deal with science in everyday life ("Using Science," grades one and two) and with scientists from the past ("Our Science Heritage," grades three through six). "Jobs Using Science" sections (grades three through six) also describe careers related to chapter topics. Six special chapter sections are devoted to the methods of science (for example, measurement and classification). No attention is given to ethical issues.

Biological Science

The main stress is on human beings (organ systems, nutrition, and health) in grades one through five and on ecosystems in grades three through six. One chapter is devoted to cells (grade four), and animals and plants are covered in two chapters each for grades one and two and in three chapter sections for later grades. Growth and development are covered in two chapters for grades one and four. Topics dealing with protists, evolution, and California flora and fauna are left to the teacher to introduce.

Earth Science

Single chapters are devoted to astronomy and meteorology at every grade level. Geology chapters are included for grade one (soil), grade five (rocks and rock layers), and grade six (changes in the land). One chapter for grade four and chapter sections at two other levels present topics on oceanography.

Physical Science

Single chapters present topics in mechanics at every level while chapters on light and sound appear in alternate levels beginning for grade one. Matter is discussed in two chapters for grade two and in one chapter for grade five; heat energy is discussed in chapters for grades two and three; electricity is discussed in chapters for grades four and six; and magnetism is discussed in a chapter for grade five.

Relationships among the sciences and other disciplines. Each of the three main science areas is presented as a separate subdivision of the textbooks for grades one through six. The teacher must describe relationships among them. The lesson plans often include a section entitled "Subject Integrating" in which activities involving the use of skills from other subjects, such as language arts and mathematics, are suggested (for example, having students discuss reasons for mass movements of people after they have seen a presentation on bird migration or making a graph showing the comparison of the distances different objects slide down a slanted board). Beginning for grade three, lesson plans for the chapter review pages also suggest creative writing activities that involve chapter topics.

Learning Activities

Range of learning activities in the sciences. The main learning activities require students to read textbook passages and answer questions, discuss passages and experiments, carry out manipulative activities, and complete follow-up exercises suggested in the textbook or by the teacher or both. The program consistently provides hands-on learning experiences in each lesson so that the concepts presented in the narrative are reinforced constantly.

Manipulative activities. Numerous hands-on activities appear at all levels of this program under the headings of "Something to Try," "Find Out on Your Own," and "Science Project Ideas." Additional activities appear in the "Parent Involvement" and other work sheets. Most of these exercises involve common or easily obtained materials and comprise the main

learning activities besides reading the text. These exercises require students to compare, analyze, predict, and summarize. For example, activities for grade four include using a battery, wires, and bulbs to produce and compare series and parallel currents. These activities lead to the developmental activities integrated into chapter content; those activities that tap higher order thinking skills may require students to perform several steps according to the teacher's directions.

The students' experience and record books are correlated with the content and provide additional activities different from those presented in the text for most daily lessons. The record book contains a vari of recordkeeping aids, such as charts, tables, and se tence completion exercises, to help students organi data. Teaching plans and answers are provided in the teacher's edition of the experience and record books.

Thinking and science process skills. The introductions to the teachers' editions do not contain a listing or discussion of these skills, but many terms representing the skills are used in the learners' objectives (for example, "To predict and describe several ways electric currents can be produced"). The highest level of thinking involved in most of the lessons is Organizing. However, the activities that are an integral part of the program lead to the development of higher order thinking skills.

Sequence of Topics and Activities

Organized sequence of development. The sequencing of topics across grade levels follows a pattern from simple to more complex and from concrete to more abstract. However, some topics are not covered at all levels. There is spiral organization for most main topic areas (for example, in mechanics topics include push for kindergarten, pushes and pulls as forces for grade two, friction and motion for grade five, and forces in pairs for grade five).

Each textbook is organized in separate divisions devoted to the three main science areas (Life, Earth, and Physical).

Sequence within grade levels. The sequence of some topics within grade levels follows the seasons and allows for appropriate outdoor experiences in fall and spring, such as studying plants and animals. Otherwise, the basis for in-grade sequencing is arbitrary.

Ancillary Materials

Ancillary materials. The reproducible masters and experience and record books are referred to by number in the lesson plans. These materials are mentioned in planning sections that are contained in chapters of the teachers' editions.

Other materials available from the publisher. Kits of materials for hands-on activities for grades one through six are available from the publisher.

Teachers' Materials

Teachers' guidance for lessons. Teachers' editions include chapter and lesson plans. Chapter plans include background information, a chapter planning guide with citations to all needed program components, a listing of supplementary materials, and suggested opening activities for each chapter. Individual lesson plans open with lesson concepts, objectives, and vocabulary and suggest specific strategies for teaching each page of the textbook. These strategies include questions to direct learning activities, explanations of hands-on activities and demonstrations, and follow-up activities. Additional background information, answers to text exercises, and occasional parent involvement activities are also included in the teaching plans.

Questions to direct learning activities. Questions designed to direct learning activities vary from merely requiring students to look at visuals ("What is the boy in the second picture on page 34 doing?" [grade two]), to drawing conclusions ("What makes something a good unit with which to measure the length of something else?" [grade two]), to merely recalling facts presented earlier in the text ("Why does the soapy water cause the boy to slip?" [grade four]). Discussion questions for the most part do not tap the upper ranges of critical thinking, such as hypothesizing and inferring, but mainly require students to interpret visuals and draw conclusions.

Provisions for individual differences. Reinforcement work sheets are intended to provide students who have difficulty with "another chance to understand and drill the main topics." However, most of these work sheets promote drill rather than understanding and require students to answer questions rather than learn to build concepts. (For example, fifth grade students are required to match the "type of forces" in one column with a list of activities in another column.)

Extension and enrichment activities. In addition to reinforcement work sheets, "Supplementary Activity" and "Enrichment" work sheets also are included on reproducible masters. Many of the "Enrichment" work sheets require higher levels of thinking than is typical of enrichment activities in most other programs. For example, a grade three work sheet requires students to answer why seatbelts are worn around the hips rather than the waist and why it is important to have many separate bones rather than just a few big bones. The "Supplementary Activity" projects consist

primarily of simplified, short, hands-on activities, such as describing how water circulates in a coffee percolator (grade six) and completing a chart indicating the hardness of certain materials (grade five). Most activities are designed for more capable students.

Assessment and Evaluation Techniques

Variety of assessment techniques. Printed tests for each lesson and chapter are included on reproducible masters in the teachers' resource books. The tests require students to complete sentences by drawing from lists of words; the chapter tests consist of two pages of multiple-choice and matching items. "Test Your Understanding" sections are located at the end of each chapter of the textbooks for grades three through six. These sections include up to ten multiple-choice, matching, or short-answer questions; the answers appear in the teachers' editions. In addition, the teachers' editions suggest that students' performance on the end-of-chapter "Problem" and "Find Out on Your Own" exercises and teachers' observations may be used as informal indicators of students' progress.

Assessing a range of learning outcomes. The lesson and chapter tests and end-of-chapter "Test Your Understanding" items require students to recall chapter content, although isolated exercises require students to interpret diagrams (for example, grade six students are required to study a drawing to determine whether or not either the sun or earth revolves around each other according to their placement in the diagram). However, many of the "Problems" and "Find Out on Your Own" exercises located at the end of each chapter require students to think at the levels of Relating or Applying, as defined in the *Addendum* (for example, "Name an animal and state one way it is adapted to its environment." [grade six] and "Many places on Earth have more hours of daylight on a summer day than on a winter day. How would this affect the way a sundial 'works?' " [grade six]). These exercises also afford the teacher the opportunity to assess problem-solving skills. No provisions are made for assessing attitudes.

Implementation Requirements

What the teacher has to do. Teacher preparation time is minimal and mainly consists of collecting materials needed for hands-on activities and demonstrations. An optional materials kit is available from the publisher. The textbook contains nonstandard English usage. Sentence structure often is awkward, and choice of words is often inappropriate. The teacher will have to compensate for this deficiency in the textbook by substituting the appropriate language.

Staff development. The program is self-contained and does not represent an unfamiliar approach to the teaching of elementary school science. For teachers particularly well grounded in science fundamentals, no in-service training is necessary to implement this program; for those teachers not as well grounded in science fundamentals, guidelines in adapting the more complex hands-on activities to a wide range of students may be helpful.

Harcourt Brace Jovanovich, Inc.
HBJ Science (1985), K—6

Summary

Relationship to the *Science Framework* and the *Science Framework Addendum*

Contents coverage. The science topics listed in the *Science Framework* and the *Science Framework Addendum* are covered as follows. In the area of Science, Technology, and Society, the strongest emphasis is given to careers in science and the nature of science. In Biological Science the topics of protists, plants, animals, health, and ecosystems are heavily stressed. The main emphases in Earth Science are on astronomy, geology, and resources. The stress in Physical Science is on matter and energy (including sources, transformations, light, and sound). Less stress is given to genetics, ethical issues, cells, meteorology, oceanography, mechanics, electricity, and magnetism. Minimal coverage is given to the history and methods of science, evolution, and human organ systems. Throughout the program, content from the three science areas generally is kept separate.

Teaching and learning activities. A wide range of learning activities is suggested in the textbooks, teachers' editions, and teachers' resource books. The hands-on and demonstration activities are outlined in clearly numbered steps and require students to participate in experiments that are related to the content of the lessons. Teaching plans introduce units, daily lessons, including background information, motivational activities, teaching strategies, and suggestions for reinforcement and enrichment activities. A planning chart for each unit outlines activities that will take place and identifies the reproducible masters that are coordinated with each lesson. Key features of this program are the organization of the text and the completeness of the lesson plans.

Areas needing supplementation. The following areas need supplementation to meet the California textbook standards: (1) topic coverage of evolution; (2) assessment of students' progress to include provisions to tap higher levels of thinking; and (3) provisions for individualizing instruction to include work sheets and other activities geared to below-average students.

Textbooks and Related Materials

Topic Coverage

Topic	*Content emphasized*	*Content emphasized to a limited extent or not in evidence*
Science, Technology, and Society	Careers Environmental issues Nature of science Scientists	Methods of science Ethical issues
Biological Science	Protists Plants Animals Human beings (health) Ecosystems	Cells Genetics Evolution Human beings (organ systems)
Earth Science	Astronomy Geology and resources	Meteorology Oceanography
Physical Science	Matter Energy: sources and transformations Energy: light Energy: sound	Mechanics Energy: heat Energy: electricity and magnetism

Science, Technology, and Society

Single-page "Science All Around You" (grades one and two) and "Science and Your Career" (grades three through six) sections located at the end of textbook units describe careers in science. Scientists from the past are mentioned in connection with their discoveries in the text narrative and in the "You Can Discover" sections in chapters. Environmental issues, which focus on pollution and conservation, are discussed. Little attention is given to ethical issues.

Biological Science

Cells (mainly protists) are discussed in one unit each for grades four through six. A section on dinosaurs and fossils is included for grades one and five. Adaptation and survival are discussed in this section, but evolution is not mentioned. A unit is devoted to plants at every level from kindergarten through grade six. The level five book contains a discussion on plants; however, a single unit is not devoted to a discussion of plants. Varieties of animals are described in units for kindergarten through grade three; animal reproduction or development or both are presented for grades one and four. A discussion on body systems is provided in a single unit for grade five, although information on health and nutrition is included at two other levels. Heredity is discussed only for grade six, although information on animal reproduction and life cycles is included at two other levels. Evolution is not covered. A discussion of at least 15 California flora and fauna is included for all grade levels, but no special sections are devoted to flora and fauna.

Earth Science

Astronomy topics are discussed and presented in a spiral organization throughout the program. Geology topics are discussed in units for kindergarten through grade six. The textbooks for grades one through four each cover environmental topics (pollution and resources). The earth's oceans are discussed in one unit for grade five, and ponds and seas are also mentioned in a unit for grade two on homes for plants and animals. Meteorology topics are presented in single units for kindergarten and grade four.

Physical Science

Matter is discussed and presented in a spiral organization for kindergarten through grade six; matter, energy, and change are discussed in two units for grade three, in one unit for grade four, in three units for grade five, and in a section for grade six. Light is discussed in single units for grades two, four, and six. Single units are devoted to motion and forces at grades one (push and pull, up and down) and five (simple machines). Single sections on electricity and magnets are included for grades one, three, and six.

Relationships among the sciences and other disciplines. Concepts from the three main science areas are usually treated separately in this program, and each unit also is treated separately and contains no bridges between the units.

Activities related to other disciplines are suggested in most of the lesson plans in the teacher's edition in the form of extension or enrichment activities (for example, analyzing roots and affixes in scientific terms drawing a spider web, predicting a number of cells on the basis of the rate of division, and writing a paragraph explaining the difference between static and current electricity).

Learning Activities

Range of learning activities in the sciences. The main learning activities require students to read and discuss textbook passages; answer questions posed in the textbook and teaching plans; carry out hands-on exercises; and complete follow-up exercises suggested in the textbook, in the teacher's edition, or in the supplementary materials.

Manipulative activities. Hands-on activities are designed to introduce units, daily lessons, or enrichment and reinforcement activities and are presented frequently on separate "Activity" pages in the text as well as in some teaching plans. Very simplified laboratory experiments also appear in some of the "Home Activity" and "Activity" reproducible masters. For example, under parents' supervision students are required to make sand prints, soak celery stalks in food coloring to watch the transpiration process, and so forth. Experiments in the textbook are well outlined and include simple directions for each stage of the experiment (for example, "Fill. . .," "Pour. . .," "Add. . . ."). The experiments are related to the lessons and are equally provided for each of the three main areas. Students may record their answers and observations on "Processes in Science Data Sheets" available on reproducible masters in the teachers' resource books for grades one through six.

Thinking and science process skills. Goals listed for students include "fundamental skills" involving "thinking, reasoning, and problem solving" and specific skills, such as identifying problems, analyzing information, and drawing conclusions. However, the majority of the activities presented are at the Observing and Comparing levels, as identified in the *Addendum*. Most hands-on exercises consist of observing a phenomenon followed by reading text narrative that explains the phenomenon (for example, a grade five activity requires students to use colored, cold and warm water to simulate a warm ocean current, describe what happens when the warm and cold water mix, and then relate their observations to the explanation given on the following page).

Some of the "You Can Discover" sections at the end of chapters suggest investigation activities, and many of these require students to use higher levels of thinking. The following activity is included for grade four: "If you go outside on a cold day, you may see your breath as a little cloud in front of you. How do you explain this?" Students are directed by the teacher to design an experiment to test their predictions.

Sequence of Topics and Activities

Organized sequence of development. The sequencing of topics from lower to higher grade levels follows a pattern from simple to complex and from concrete to abstract. The authors identify seven content strands that provide a "solid foundation in science" across the grade levels. These strands include plants and animals, the environment, the human body, planet earth, space, matter, and energy. Some topics from the areas of life, earth, and physical science encompassed by these strands (for example, astronomy and animals) may be organized in a spiral manner to encompass two or more grade levels.

Sequence within grade levels. The content within the grade levels is divided into the three main science areas and further divided into strands. Content and concepts related to the seven basic strands are developed sequentially within each text allow students to move from the familiar to the unfamiliar, from the simple to the complex, and from concrete to abstract activities.

Ancillary Materials

Ancillary materials. The introductory section of each unit plan contains a matrix that indicates (with page numbers) the reproducible masters (for example, workbook, tests, "home activity" pages, reading comprehension, vocabulary, and science skills) and the ancillary materials that relate to each lesson. These same components are also mentioned at the appropriate places in each lesson and often appear in reduced size. The teachers' resource books also contain "Bonus Copying" masters, laboratory record sheets, and home activities. Copying masters are available as reproducible masters in the teachers' editions and teachers' resource books. Separate workbooks and test booklets are available.

Other materials available from the publisher. A two-disk software program titled "Software: Investigations and Simulations" is available for grades three through six.

Teachers' Materials

Teachers' guidance for lessons. Teaching plans are included that introduce each unit and assist in teaching daily lessons. Unit plans include a content overview, bulletin board ideas and activities, book and audiovisual resources, a motivational activity, and a planning guide that identifies the various activities in each lesson and the copying masters needed for each lesson. Daily lesson plans provide background material, motivational activities, teaching strategies keyed to the student's textbook, and reinforcement and enrichment activities. Guidance plans are provided for the hands-on activities in the textbooks.

Questions to direct learning activities. Although the lesson plans suggest some integrating questions (for example, "How is the ocean food chain like the land food chain?" [grade six] and "Why do you think your pupils open up when it is dark?" [grade two]), many of the questions presented in both the text and the teaching plans emphasize factual recall of information and interpretation of graphics. "Checkup" questions that follow short narrative sections in the text focus on vocabulary, facts, and concepts; and students are able to choose from suggested answers. Each set of "checkup" questions ends with a question that requires students to use a wide range of critical thinking skills. These skills include designing an investigation (for example, students in grade four are directed to design an experiment to explain why on a cold day a person's breath appears as a little cloud) and making simple observations (for example, students in grade four are directed to observe how furniture, ceilings, and walls make a room less noisy).

Provisions for individual differences. At the front of the teacher's edition, a section entitled "Meeting the Needs of Mainstreamed Students" offers suggestions, such as providing special seating arrangements for vision-impaired and hearing-impaired students, assigning partners, and so forth. Basic, average, and enriched activities provide extension and enrichment; however, the teacher must decide how to adapt the lessons to accommodate differences in students' abilities and interests.

Extension and enrichment activities. Daily lesson plans contain reinforcement and enrichment sections of the basic, average, and enriched activities. Each activity is different from the others and is not simply a modification of one basic activity. For example, a basic activity for grade four requires students to make a weather movie flipbook in which weather fronts appear to move across maps of the United States. The average activity requires students to record daily pressure readings and observations of the weather and to note whether any relationship exists between air pressure and weather conditions. In the "enriched" activity, students are required to make a model of a cold front and are directed to pile cooled plastic bags of sand in one end of a container and set a bowl of hot water in the opposite end. Students are instructed to

observe what happens as the cold air above the sand bags descends into the warm, moist air above the hot water and to answer the questions, "Where do the 'clouds' form?" and "Where does 'rain' appear on the sides of the container?" Reproducible masters in the teacher's resource book include work sheets for additional reinforcement or extension of hands-on exercises and skill development.

Assessment and Evaluation Techniques

Variety of assessment techniques. The following two types of assessment techniques are available: unit-end questions in the textbook and printed unit tests in booklet form or on copying masters in the teacher's resource book. The unit-end questions usually require students to recall facts, and answers appear only in the teachers' editions. The unit tests consist mainly of multiple-choice and short-answer items, and occasionally students must refer to diagrams to answer some questions.

Assessing a range of learning outcomes. The unit-end questions usually require students to recall facts but occasionally require students to exhibit higher levels of thinking (for example, a question for grade three reads, "We burn wood to get energy. How does wood get energy?" A question for grade six reads, "Bacteria multiply very quickly. How is it they do not overrun the entire earth?"). Unit-end questions also contain "Find Out More" and "Puzzler" sections intended as additional challenges to push brighter students to higher levels of thinking, particularly at the upper grade levels. For example, students in grade five are told, "A river sometimes lengthens where it empties into the sea. How do you explain this?" Multiple-choice items in the unit tests are limited to factual recall. Means of assessing attitudes or values are not included.

Implementation Requirements

What the teacher has to do. Teacher preparation time is minimal and consists mainly of acquiring laboratory supplies and equipment and arranging for supplementary materials, including audiovisual and print materials.

Staff development. This science program does not differ from familiar standards, so no special training is indicated for experienced teachers.

D.C. Heath & Company
Heath Earth Science (1984), 7—8
Heath Life Science (1984), 7—8
Heath Physical Science (1984), 7—8

Summary

Relationship to the *Science Framework* and the *Science Framework Addendum*

Contents coverage. The science topics listed in the *Science Framework* and the *Science Framework Addendum* are covered as follows. In the area of Science, Technology, and Society, approximately equal emphasis is given to topics related to environmental issues having to do with conservation and to descriptions of careers and the work of individual scientists. In Biological Science the topics of plants, animals, human organ systems, and ecosystems are heavily stressed. The main emphases in Earth Science are on astronomy, geology, and meteorology. The stress in Physical Science is on matter and energy (sources and transformations and heat), mechanics, and electricity and magnetism. Lesser treatment is given to ethical and environmental issues, cells, genetics and evolution, protists, oceanography, and light and sound. Minimal or no coverage is given to California flora and fauna. Individual textbooks address each major discipline.

Teaching and learning activities. The main learning activities are reading and discussing passages and answering questions in the textbook, carrying out hands-on activities, observing and discussing demonstrations by the teacher, and completing work sheet activities and optional projects. Many hands-on activities reinforce specific concepts, but these activities do not involve science process skills beyond comparing and measuring. Teaching plans provide background information, specific teaching strategies, and optional activities for reinforcement and enrichment. Key features of this program include coverage of most *Addendum* topics, abundant hands-on activities, a bibliography, and information on careers.

Areas needing supplementation The following areas need supplementation to meet the California textbook standards: (1) topic coverage, particularly California flora and fauna, but also more extensive treatment of ethical and environmental issues other than conservation, cells, genetics and evolution, protists, oceanography, light, and sound; and (2) levels of thinking in the narrative and main learning activities that regularly go beyond comparing and measuring.

Textbooks and Related Materials

Topic Coverage

Topic	*Content emphasized*	*Content emphasized to a limited extent or not in evidence*
Science, Technology, and Society	Careers Scientists Ethical and environmental issues (conservation) Nature of science Methods of science	Ethical and environmental issues (other)
Biological Science	Plants Animals Human beings (organ systems) Ecosystems	Cells Genetics Evolution Protists
Earth Science	Astronomy Geology and resources Meteorology	Oceanography

Topic	*Content emphasized*	*Content emphasized to a limited extent or not in evidence*
Physical Science	Matter Mechanics Energy: sources and transformations Energy: heat Energy: electricity and magnetism	Energy: light Energy: sound

Science, Technology, and Society

Brief opening chapters in each textbook introduce the nature and methods of science. Single units in each of the volumes deal with environmental problems, protection of wildlife, and the use of natural resources. A page at the end of each chapter either describes a career related to the chapter topic or presents a short biographical sketch of a scientist whose work has been presented.

Biological Science

Information on cells is included in two chapters; information on genetics is included in one chapter; and information on evolution is included in one chapter (including the work of Lamarck, Darwin, and DeVries). Information on plants is included in a four-chapter unit. Information on protists is included in a discussion of cells and plants and appears in two chapters. Six chapters in two units are devoted to animals, and a single chapter addresses learning and behavior. A four-chapter unit on human organ systems is included, and a chapter on health includes sections on drugs and tobacco, and seven pages on human development. Information on ecosystems is included in two chapters in one unit; a chapter on water systems is included in a unit on animals. California flora and fauna are not mentioned.

Earth Science

Information on astronomy is included in a three-chapter unit in the earth science volume and in one chapter in the physical science volume. Information on geology is included in five chapters in one unit, and information on resources is included in three chapters. Information on oceanography is included in two chapters, one on fresh water and the other an overview of the oceans.

Physical Science

Information on matter is included in five chapters in two units. Information on mechanics is included in four chapters. Information on energy sources and transformations is included in four chapters in three units; information on heat energy is included in two chapters. Information on light is included in two chapters, and information on sound is included in one chapter contained in a unit on wave action. Four chapters are devoted to electricity and magnetism, including one chapter on electronics.

Relationships among the sciences and other disciplines. A life science chapter on the oceanography topic of water ecosystems is included in the textbook; a physical science chapter on the astronomy topic of the universe is included; and a physical science chapter section on atmospheric pressure is also included. Otherwise, no attempt is made in the textbooks to interrelate the three science areas, although some of the "Tie-in" segments of the lesson plans suggest some relationships. Skills intended to integrate science and other disciplines are identified as comprehension, word, mathematics, and reference skills. For example, a life science activity identified in the teaching plans as "problem solving in mathematics" requires students to find the number of wrong turns an animal can make in a variety of mazes.

Learning Activities

Range of learning activities in the sciences. The main student learning activities are reading and discussing textbook passages, answering chapter section and review questions, carrying out hands-on activities, and completing follow-up activities presented on work sheet and workbook pages.

Manipulative activities. Many hands-on activities are presented throughout each unit on activity pages. Additional hands-on activities are found on the laboratory pages of the student's workbook and are occasionally suggested as long-term projects in the teaching plans for each unit. Most of the hands-on activities presented in the textbook and workbook consist of observing and recording results, with little opportunity to apply higher levels of thinking, such as hypothesizing or planning experiments. Some activities are merely paper-and-pencil exercises but most

require students to follow directions and answer questions from the results of their experiments. For example, an earth science activity asks students to determine "How much water can a rock hold?" Students measure and record the mass of different rock specimens (for example, sandstone and shale), soak them in water overnight, and again measure and record the mass of each rock to answer the questions, "What data did you obtain about the rocks? Which rock would make the best aquifer? How would this rock compare to sand as an aquifer?" In many cases the teaching plans misname the skill required in the hands-on activity. For example, in the activity described above, the first question is listed as interpretive even though students are merely reporting data.

Thinking and science process skills. A "Matrix of Skills Development" in the teacher's edition lists two categories of laboratory skills, "Experimentation and Demonstration" ("develops observation skills; encourages application of safety regulations") and "Manipulation of Materials" ("develops skills of constructing, calibrating, and reading instruments as well as techniques involved in making measurements and setting up equipment"). The highest level of thinking reached is that identified in the *Framework* and *Addendum* as Comparing. Students routinely observe, compare, and record data, but they do not extrapolate new information from an activity.

Sequence of Topics and Activities

Organized sequence of development. The presentation of topics varies within each science-area volume. The life science textbook begins with the simplest forms of life (cells), builds from simple to complex in both animal and plant kingdoms, and ends with units on continuity and change (reproduction and genetics and evolution) and human body organs. Earth science begins with a unit on astronomy; continues with units on meteorology, oceanography, and geology; and ends with a unit on resources. The physical science volume begins with a unit on motion and then moves from matter to heat, to magnetism and electricity, to wave action (light and sound), and ends with a unit on energy in the future. Sequencing within individual chapters in each textbook follows a pattern of general to specific.

Ancillary Materials

Ancillary materials. Activity book pages are referred to in the teaching plans for each chapter. Copies of the chapter and unit tests are included in the back of the teacher's edition. These tests are also available in a booklet of reproducible masters and a booklet of copymasters. Also included in the copymasters booklet are reproducible masters to use for transparencies and "Parent Involvement Sheets." The masters and the parent involvement sheets are not referenced in the teaching plans, but the masters and the sheets contain the name of the chapter or unit with which they should be used. A teacher's resource binder provides lists of aids and resources but is not referenced in the teaching plans.

Other materials available from the publisher. None.

Teachers' Materials

Teachers' guidance for lessons. The teachers' editions include overviews of the program features and components, course outlines, lists of skills, and suggestions for science safety, followed by teaching plans for units and chapter introductions for daily lessons. Unit plans consist of suggestions for long-term projects (for example, student teams are directed to record the weather for one month; students are directed to make a scrapbook about local birds and mammals) and bulletin board displays. Chapter plans include background information and a "Lesson Organizer" identifying advance planning needs and listing follow-up activities. Daily lesson plans include objectives, science terms, strategies to reinforce or demonstrate concepts, answers to the study questions, background information, and reinforcement, enrichment, and tie-in activities. Teaching strategies are mainly to "Tell . . . , Remind . . . , Show . . . , Explain. . . " rather than to elicit information from students or to have students show how to apply the information in new situations or in solving problems.

Questions to direct learning activities. Questions that follow reading passages and the few questions posed in the teaching plans mainly require students to recall information; however, an "Applying What You Have Learned" section at the end of each chapter sometimes contains questions that require students to apply information to new situations (for example, "Name something in your classroom that was once a mineral. Describe three of its physical properties."). Questions posed in the narrative serve as guideposts to reading; they introduce the topic in the form of a question. The narrative contains information that can be used to answer the questions promptly.

Provisions for individual differences. Beyond the suggestions for extension and enrichment activities, the teacher decides how to adapt lessons to differences in students' abilities and interests. Reinforcement activities, presented in daily lesson plans, are provided primarily "for students who need additional help in grasping the lesson concept," but often reinforcement is only incidental (for example, "Have students make posters in which chemical and physical changes are illustrated.").

Extension and enrichment activities. Enrichment activities, suggested in the daily teaching plans, are "for faster learners, or for students who have a special interest in the lesson topic" and often involve a research project. For example, students are directed to research how seat belts and air cushions prevent injury in car crashes or to find out the physical adaptations and behavioral patterns that help different polar animals survive. Additional research and investigation projects are suggested at the end of each chapter (for example, students are directed to research and describe how different desert plants have adapted to their environments).

Assessment and Evaluation Techniques

Variety of assessment techniques. Chapter and unit tests, with answer keys, are available. Chapter test items are multiple-choice, matching, true-false, short-answer, and some essay questions; students must refer to diagrams or illustrations to answer questions. Unit tests are strictly multiple-choice. In addition, there is a review page for each chapter in the student activity book.

Assessing a range of learning outcomes. Test items focus on the key concepts introduced and require students to recall factual information presented in the textbook. Questions related to diagrams or illustrations require students to respond to graphic information (for example, "At what position is there a warm front?" and "Which graph best represents the climate for City A?"). Provisions for assessing higher levels of thinking, science process skills, or affect are not included.

Implementation Requirements

What the teacher has to do. Teacher preparation time is minimal and consists mainly of collecting materials for the hands-on activities and arranging for audiovisual and other supplementary materials.

Staff development. No special training is necessary to implement this program.

Holt, Rinehart & Winston, Inc.
Holt Science (1986), K—8*

Summary

Relationship to the *Science Framework* and the *Science Framework Addendum*

Contents coverage. The science topics listed in the *Science Framework* and the *Science Framework Addendum* are covered as follows. In the area of Science, Technology, and Society, the strongest emphasis is on representing careers in science and the contributions of male and female scientists. In Biological Science all topics identified in the *Addendum* are covered, particularly the topics of animals and plants. The main emphases in Earth Science are on astronomy, geology. meteorology, and oceanography. The stress in Physical Science is on matter, mechanics, sound, light, and electricity and magnetism. Less treatment is given to genetics, energy sources and transformations, heat, and evolution (K—6). Throughout the program, content from the three science areas is kept separate.

Teaching and learning activities. A variety of learning activities is suggested in the textbooks, teachers' editions, and activity sheets. The hands-on activities presented in the textbooks and work sheets are clearly written, relate to the lesson content, and involve students in science skills such as observing, comparing, and communicating. Outlined lesson plans give step-by-step suggestions for daily lessons, identify supplementary materials, and offer a variety of suggestions for extension and enrichment activities. Key features of this program are the discussion questions in the teaching plans that take students beyond a mere discussion of the narrative by allowing them to apply higher levels of thinking skills and the motivational activities suggested to introduce daily lessons.

Areas needing supplementation. The following areas need supplementation to meet the California textbook standards: (1) topic coverage, particularly ethical and environmental issues, genetics, and evolution at the kindergarten through grade six levels; (2) provisions for individualizing instruction specifically for slow learners (the suggestions given are mainly for students with learning disabilities); and (3) assessment of student progress provisions to tap higher levels of thinking, skill acquisition, and affect.

Textbooks and Related Materials

Topic Coverage

Topic	*Content emphasized*	*Content emphasized to a limited extent or not in evidence*
Science, Technology, and Society	Careers Scientists Nature of science	Methods of science Ethical and environmental issues
Biological Science	Cells Evolution (7—8) Protists Plants Animals Human beings (organ systems) Ecosystems	Genetics Evolution (K—6)
Earth Science	Astronomy Geology and resources Oceanography Meteorology	

*The Curriculum Development and Supplemental Materials Commission recommended that this series be used as a kindergarten through grade eight program, a kindergarten through grade six program, or a grade six through grade eight program but not as a grade seven through grade eight program.

Topic	Content emphasized	Content emphasized to a limited extent or not in evidence
Physical Science	Matter Mechanics Energy: light Energy: electricity and magnetism Energy: sound	Energy: sources and transformations Energy: heat

Science, Technology, and Society

Science-related careers are described throughout the series ("People and Science," grades one and two; "Careers," grades three through eight). Special "People in Science" sections include information on one or two scientists for each science area at each grade level. Little information on the scientific method is included except for the information that is implicit in the directions for many manipulative activities. The following six separate narrative sections on the methods of science are included: observation (grades one and two) and classification (grades five and six), and the opening sections of the textbooks (grades seven and eight). Environmental problems involving conservation and pollution are introduced in six chapter sections in the upper grades.

Biological Science

Genetics and animal reproduction are discussed in three chapters for grade six only, and a discussion on evolution is included. All remaining topics occur only at two or three grade levels throughout the series. Information on California flora and fauna and resources is included on 15 to 20 reproducible masters for each grade level (grades one through eight).

Earth Science

Geology topics receive the most complete treatment of all topics covered in this area, and information on geology is contained in chapters for five grade levels. Information on meteorology is contained in chapters for three levels. The three main chapters on the earth's resources are designed for students in grade six, and the five oceanography chapters are designed for students in grades two and five.

Physical Science

Mechanics is given the main stress in this area, and information on mechanics is included in ten chapters designed for students in grades two, four, six, and eight. Heat and energy transformations are discussed in a single chapter for grade seven. Information on other topics in Physical Science is included in three grade-level clusters of chapters, including magnetism and electricity for grades three, five, and seven; light for grades two, four, and eight; and sound for grades two, five, and eight.

Relationships among the sciences and other disciplines. Each of the three main science areas is presented in a separate subdivision of the textbooks for grades one through six, and no attempt is made to describe relationships among them. Some extension activities titled "Research—Library" and "Science Skills—Library" are included, but this program does not attempt to directly relate concepts and skills from other subject areas to science activities.

Learning Activities

Range of learning activities in the sciences. The main student learning activities are observing teachers' demonstrations, reading textbook passages, answering oral and written questions, participating in teacher-led discussions, carrying out hands-on activities, and completing work sheet exercises.

Manipulative activities. Hands-on activities are presented in "Activity" and "Investigating" pages of the textbooks, in "Activity" and "At Home" work sheets, and in many of the introductory and extension activities suggested in the lesson plans. The most fully developed activities are described in the textbook sections and work sheets, which include directions that help most students to work independently. These hands-on experiences are correlated with the narrative content of the chapters and often depend on students' understanding of that content.

Thinking and science process skills. The introductions to the teachers' editions describe 15 science skills that are comparable to those listed in the *Addendum*, although three of the 15 skills are from the category, Communicating (reading illustrations, building vocabulary, and finding the main idea). Using the hierarchy introduced in the *Addendum*, the highest levels of thinking reached in the main learning activities are those included under the heading of Organizing. Many science process terms are used with meanings that are different from those in the *Addendum* (for example, a grade six activity requires students to infer the shape of an object inside a sealed box by manipu-

lating the box—that is, by Observing, Communicating, and Comparing). Although the terms used in the program are different from those used in the *Addendum*, the program generally covers the process skills consistent with the *Addendum* and encourages the development of higher order thinking and processing skills.

Sequence of Topics and Activities

Organized sequence of development. The sequencing of topics across grade levels follows a pattern of simple to more complex and of concrete to abstract. Information in the ten topic areas (plants, animals, geology, meteorology, oceanography, astronomy, matter, mechanics, light, and electricity and magnetism) is arranged in a spiral pattern, and concepts are introduced in a lower grade and discussed later in more detail. However, most of these topics are covered only twice in grades four through six The authors state that "understanding the content of one grade does not depend on having learned any previous grade's material."

Sequence within grade levels. Within grades three through six, each unit is devoted to one science area. Usually the chapters within each unit are devoted to the same topic (for example, the "Rocks and Fossils" unit for grade three includes chapters on rocks, changing rocks, and fossils), but in a few cases the range is broader than the range of the unit for grade three (for example, a "Living Organisms" unit for grade five contains chapters on cells, plants, animals without backbones, and animals with backbones).

Ancillary Materials

Ancillary materials. The regular reproducible masters for work sheets and tests and the materials required for hands-on activities are referred to in the teaching plans and are identified on matrices in the unit introductions of the teachers' editions. Identical work sheets and tests are available in the separate teachers' resource books. Other ancillary materials include a "Jumbo Book" (kindergarten), teachers' guides (grades one through six), pupils' and teachers' editions of the "Skillbooks" (grades three through six), and the "Voyage of the Mimi" software program. The skillbooks are not mentioned in the teaching plans.

Other materials available from the publisher. None.

Teachers' Materials

Teachers' guidance for lessons. Teachers' editions contain unit, chapter, and section (daily) lesson plans. The unit plans consist of a two-page overview matrix that interrelates topics, materials, and activities, followed by reproducible masters for work sheets and chapter tests, and a suggestion for a unit opening activity. Following a listing of chapter objectives, daily lesson plans provide background information on each section, a "Basic Teaching Plan" (motivational ideas, teaching tips, questions to pose, and points to emphasize), a list of materials needed, and activities for reinforcement, enrichment, and application of science concepts. Information on safety in the science classroom and the proper care of animals is included in the back of the teacher's edition for each level, and some "Activity" teaching plans include "Safety Tips" as well. The teachers' resource books for grades seven and eight also contain a "Safety in the Science Classroom" section that includes safety symbols, safety guidelines, suggestions for labeling and storing chemicals, and a model student safety contract, which can be signed by both students and parents to ensure a proper attitude and respect for safety in the science classroom.

Questions to direct learning activities. The formal questions students are required to answer are included in the following sections of the textbook: in the directions for the hands-on activities at the ends of sections and chapters, in the work sheets, and in the "Text Questions" and "Extensions" parts of the lesson plans. Although many of the questions posed in the lesson plans require students to literally interpret information ("How many bones can you count in the drawing of a skeleton?" [grade five]), some questions require students to hypothesize ("What do you think you will find on these planets?" [grade three]) and infer ("Why do you think faster-flowing water is able to carry more material?" [grade six]). Chapter and section questions require students to recall facts.

Provisions for individual differences. A page in each teacher's edition is devoted to general suggestions for helping the exceptional student and includes special emphasis on individualizing educational planning (IEP). In each chapter plan an IEP chapter goal is given, and activity suggestions for students with specific learning disabilities (such as visual impairment) are located at regular intervals in the daily lesson plans.

Extension and enrichment activities. Regular "Extension" parts of the lesson plans suggest activities for reinforcement (clarification), enrichment, or application (to everyday living) of section topics. The separate teachers' resource books contain "Skill" work sheets and "Activity" work sheets (sample activities include simple hands-on activities and puzzles) for each text chapter as well as many "At Home" work sheets (some activities include simple hands-on activities, passages to read, or graphics to study to answer

questions). The teacher must determine which work sheets are appropriate for individual students.

Assessment and Evaluation Techniques

Variety of assessment techniques. The program contains reproducible chapter tests in the teachers' editions (also available as reproducible masters in the separate tests and activities and work-sheet booklets) and semester tests (on reproducible masters for grades three through six). These tests consist primarily of fill-in and matching items for grades one and two and multiple-choice items for grades three through six. Test questions infrequently require students to interpret literally information presented in drawings (for example, students in grade four are required to look at a drawing of a clothesline to identify what type of simple machine it illustrates). The teacher may also use the discussion questions posed in the "Text Questions" and "Teaching Tips" sections of the lesson plans to assess informally, in a limited way, scientific attitudes and various levels of critical thinking, such as predicting and observing. For example, in a grade five lesson on magnetism the "Teaching Tips" suggest that the teacher have students "predict what will happen if you bring either end of another magnet near the north and south poles of the suspended magnet" and then "test the students' predictions." Also, some of the "At Home" questions are designed to measure students' abilities to observe, interpret, and draw conclusions. For example, a grade two activity requires students to compare seeds placed in a jar of stones and covered with water with seeds placed in a jar of foil and covered with water. After two weeks' observation the students are to answer the questions, "Do seeds need soil to sprout? Do plants need soil to grow?" Chapter tests on reproducible masters include test items such as matching (terms with definitions), true-false, sentence completion, multiple choice, essay (for example, "Explain how a sand dune moves." [grade seven]), and some questions to be answered by studying charts and diagrams.

Assessing a range of learning outcomes. Chapter test questions focus on chapter objectives and require students to recall factual information. No provisions (all levels) are made for the assessment of attitudes or values, although the program provides opportunity for informal assessment when the students perform certain activities.

Implementation Requirements

What the teacher has to do. Teacher preparation time outside of classroom hours is minimal and consists mainly of arranging the materials for manipulative activities and reviewing students' work sheets.

Staff development. No special in-service training is necessary to implement this program. The program is self-contained and does not represent an unfamiliar approach to the teaching of elementary school science.

Macmillan Publishing Company, Inc.
Earth Science (1986), 7—8
Life Science (1986), 7—8
Physical Science (1986), 7—8

Summary

Relationship to the *Science Framework* and the *Science Framework Addendum*

Contents coverage. The science topics listed in the *Science Framework* and the *Science Framework Addendum* are covered as follows. In Science, Technology, and Society, the strongest emphasis is given to scientists and the nature and methods of science. In Biological Science the topics of genetics, animals, plants, protists, and human organ systems receive the most stress. In Earth Science geology receives heavy emphasis, and some stress is given to astronomy and meteorology. In Physical Science most attention is given to matter, mechanics, heat energy, electricity and magnetism, light, and sound. Lesser emphasis is given to careers, ecosystems, and oceanography. Minimal coverage is given to ethical and environmental issues, California flora and fauna, resources, and energy sources and transformations. Separate textbooks address life, earth, and physical science.

Teaching and learning activities. The main learning activities are reading and discussing passages and answering questions in the textbook, carrying out hands-on activities, and completing a variety of work sheets and optional projects. Hands-on activities are provided in the textbook chapters, at the end of each textbook, and in separate laboratory booklets. Teaching plans are abundant, specific, and coordinated with the textbook narrative. Key features of the program are the completeness of the teaching plans, which include various provisions to accommodate different interests and abilities of students; the introductory chapter in each textbook, which establishes a purpose and foundation for studying the particular discipline; and the variety of projects suggested at the end of each chapter in the student's textbook (for example, research, setting up a school recycling center, and conducting and graphing results of surveys).

Areas needing supplementation. The following areas need supplementation to meet the California textbook standards: (1) topic coverage, particularly ethical and environmental issues, ecosystems, energy sources and transformations, and oceanography; (2) additional activities involving levels of thinking beyond Organizing, as defined in the *Addendum;* and (3) additional means for assessing students' progress beyond factual recall.

Textbooks and Related Materials

Topic Coverage

Topic	*Content emphasized*	*Content emphasized to a limited extent or not in evidence*
Science, Technology, and Society	Nature of science Methods of science Scientists	Ethical and environmental issues Careers
Biological Science	Cells Genetics Evolution Animals Plants Protists Human beings (organ systems)	Ecosystems
Earth Science	Astronomy Geology and resources Meteorology Oceanography	Oceanography

Topic	*Content emphasized*	*Content emphasized to a limited extent or not in evidence*
Physical Science	Matter Mechanics Energy: heat Energy: light Energy: electricity and magnetism Energy: sound	Energy: sources and transformations

Science, Technology, and Society

Two introductory chapters in each volume include overviews of the nature of science and scientific methods. A third of the chapters devote a half-page to each of two career descriptions. Individual scientists are mentioned in connection with their discoveries, many are pictured, and biographical sketches of six astronomers appear in the earth science volume. One chapter on the environment in the life science volume discusses the problems of pollution and conservation of resources.

Biological Science

Cells are discussed in one chapter and are mentioned throughout the textbook. Genetics is discussed in two chapters, and information on evolution composes part of one chapter. Two chapters on the varieties of animals are included, and two chapters include information on animals' organ systems and how these systems function. Three chapters are devoted to plants but do not include information on California flora and fauna. Human organ systems are described in five chapters. There is one chapter on ecosystems.

Earth Science

Information on astronomy is included in three chapters; in addition, appendix entries on the seasons and the constellations are included. Eleven chapters are devoted to geology, and information on the relationship of resources to other topics is included. Information on meteorology is included in four chapters, and information on oceanography is included in two chapters.

Physical Science

Eight chapters, plus four appendix sections, are devoted to matter. Information on mechanics is included in four chapters. Information on energy sources and transformations is included in a chapter on alternative energy resources. Information on heat energy is included in one chapter. Information on light and sound is included in separate chapters of a unit that also includes single chapters on wave motion and electromagnetic waves. Information on electricity and magnetism is included in two chapters, one of which includes a section on electronics.

Relationships among the sciences and other disciplines. A separate textbook is included for each of the three science areas, earth, life, and physical science; and a modest attempt is made to show relationships among them. The main exception to this occurs in the earth science chapter, "The Basics of Earth Science," that describes the basic structure of matter. Mathematics and language arts skills are employed in carrying out various kinds of learning activities throughout the program, and the lesson plans suggest curriculum tie-in projects consisting mainly of topics relating to outside interests, other classes, or to topics for library research (for example, students are directed to determine which people of the world use algae as part of their diets and to explain how they prepare algae for consumption, or to learn more about the dust bowl by reading the *Grapes of Wrath*).

Learning Activities

Range of learning activities in the sciences. The main student learning activities are reading and discussing the narrative and answering questions in the textbook, participating in teacher-led discussions, carrying out hands-on activities, completing a variety of work sheets, and completing optional library research assignments.

Manipulative activities. Three types of hands-on activities are included in the textbook for each chapter. Simple "Explore by Trying" activities that use easy-to-obtain materials are included in the narrative sections, but about one-quarter of these activities are based on interpreting photographs or drawings rather than on actual manipulations. A more elaborate laboratory activity ends each chapter, and one additional chapter investigation is presented within a special section at the end of the textbook; laboratory report forms for both these types of activities are provided in the teacher's resource book. There is an additional laboratory exercise for each chapter in a separate laboratory and skills manual. For each activity in

the manual, an objective, a list of needed materials, step-by-step instructions, and questions are provided. Most of these activities could be completed by students working independently, although a few activities require close teacher supervision (for example, one activity involves the use of hydrochloric acid and another requires the teacher to check for accuracy at a certain point before the student can continue).

Thinking and science process skills. At the close of each chapter, a special one-page "Study Skill" section guides students through one skill (for example, classification or making generalizations) and requires students to first practice the skill. Students are required to apply the skill according to passages in the chapter. The highest level of thinking consistently required by the questions and activities in this program is Organizing, as defined in the *Addendum*.

Sequence of Topics and Activities

Organized sequence of development. All three volumes begin with an introduction to the appropriate science area. The first chapter includes information on the most basic elements of those science areas, such as information on cells for life science and information on matter for earth and physical science. The life science volume deals successively with simple organisms, plants, animals, animal organ systems, human organ systems, and heredity and change (including the earth's history) and concludes with a unit on ecology and environmental problems. The earth science units are arranged in an unusual order and begin with a unit on meteorology and continue with units on oceanography, geology (minerals, surface features, the earth's interior, earthquakes and plate tectonics, and the earth's history) and conclude with a unit on astronomy. The physical science textbook begins with units on mechanics; matter (atoms, elements, compounds, applied chemistry); electricity and magnetism; waves, sound, and light, and concludes with a unit on energy (heat, nuclear energy, and prospects for the future).

Ancillary Materials

Ancillary materials. The teacher's resource book for each discipline contains reproducible masters for study aids, laboratory exercises, review exercises, skill applications, and tests. These are keyed to specific pages within chapters in the respective textbooks and are also referred to in the chapter and daily lesson teaching plans in the teachers' editions of each text.

Other materials available from the publisher. None.

Teachers' Materials

Teacher's guidance for lessons. The teachers' editions open with an overview of the content organization; descriptions of the features of the pupil and teacher editions of the textbook; a chart showing how the program can be adapted to individual student needs; a discussion of classroom safety; a listing of print, software, and audiovisual teacher resources; and an itemized list of materials needed for the hands-on activities. Teaching plans are provided for unit, chapter, and daily lesson plans and are located in a color-coded margin at the top of the textbook pages. Unit plans state a purpose for studying the content (for example, to "familiarize students with the composition of the earth's crust and its mineral resources"), list the goals for each chapter, and identify advance planning needs (for example, collecting materials for the experiments). Chapter plans consist of a main goal, discussion suggestions for the chapter-opening visual aid and narrative, a "Motivation" activity (for example, a classroom treasure hunt for minerals and discussion topics), and a "Suggested Chapter Plan." This plan coordinates workbook and work sheet pages with the textbook lessons. Teaching plans for chapter sections (which constitute the daily lessons) consist of a three-step introduce-teach-test approach. Plans to introduce the lesson include a summary of the topics and skills covered, the relationship of visuals to the narrative, and a "Motivation" activity (for example, using a globe to show locations, discussion questions, and puzzles). Plans for teaching the lesson include "Points to Consider" (for example, discussion topics, reference to graphic aids, and interesting facts), "Science Notes" (background information), and answers to the "Explore" features. Brief guidance, consisting of answers, clarification of procedures for experiments (for example, students are required to pack layers of clay firmly), project suggestions, and a "Topic for Critical Thinking" are also provided for the end-of-chapter "Study Skill" page, laboratory activity, and for the summary and review pages.

Questions to direct learning activities. A variety of questions are presented to direct the learning activities. Teaching plans include motivational questions to pique students' interest in the lesson (for example, "Why are there more collisions on a weekend than in a comparable period in mid-week?") and discussion questions to reinforce the narrative (for example, "[Ask] students what happens to the rainwater that collects on the ground after a storm."). Occasionally students must consider issues requiring thinking skills beyond the recall level (for example, "Are farmers in the Midwest being sensible when they kill prairie dogs that compete with cattle for forage, thus reducing the number of ferrets that eat the prairie dogs and thereby allowing the prairie dog population to increase?"). Questions are presented in margins of the students' textbooks to guide their reading (for example, "What

are some important nonliving parts of the ocean biome?") and are directly answered in the narrative. Chapter section questions (called "Objectives" and "Words to Review") are generally factual recall questions but occasionally may require students to summarize information, make diagrams, or complete equations (for example, "In a diagram, show how water is cycled through an ecosystem" and "Balance this equation. . . ."). Chapter review questions are strictly factual recall items except in the "Writing About Science" section where questions may tap higher levels of thinking (for example, "Suppose you hear that one of the guests was a catalyst at a party. What do you think the person meant by this?").

Provisions for individual differences. Planning charts at the front of the teachers' editions suggest ways that the program can be modified to accommodate the needs of "students with reading problems and poor science background." Suggestions include previewing [before assigning] the marginal "Explore" activities in the student's textbook and the laboratory exercises in the teacher's resource book and having students regularly complete the "Study Aid" work sheets (involving completing tables, studying and answering questions about diagrams and drawing, and so forth) and "Review Exercise" work sheets (for example, word puzzles, true-false questions, and use of graphics) provided in the teacher's resource book. It is suggested that teachers not assign the "Skill Applications" work sheets or the test essay questions to slower students. Many of the textbook activities and activities in the supplementary materials are keyed in the teaching plans to indicate ability level (for example, above average or below average).

Extension and enrichment. Chapter projects for extension and enrichment are presented at the end of each chapter in the student's textbook under the heading "Investigating Chapter Ideas." Projects include simple experiments, such as finding out where on a spinning record the centripetal force is greatest, finding evidence of earth movement in a geologically active area, and researching a sport to show how different parts of the body are affected by exercise. The laboratory and skills manual for each textbook provides a hands-on laboratory exercise for each chapter and a "Skill Applications" work sheet (for example, making graphs, preparing slides, and reading diagrams) for each chapter. Additional laboratory exercises are provided in the teacher's resource book for each textbook. To accommodate the needs of above-average students, teachers are advised to assign the "Explore" activities in the student's textbook as independent work; to have students write about or discuss the topics suggested in the "Writing About Science" and "Investigating Chapter Ideas" sections in the chapter reviews and in the "Topics for Critical Thinking" suggested in the teaching plans; to have students work individually or with partners on hands-on activities; and to assign students "Skill Applications" work sheets, ensuring that students complete all test items.

Assessment and Evaluation Techniques

Variety of assessment techniques. Chapter and semester tests are available in the form of reproducible masters in a separate booklet and in the teacher's resource book. Chapter test items consistently include matching, sentence completion, multiple-choice, true-false, and short-essay questions and occasionally include drawings and diagrams that students must use to answer questions. Semester tests consist only of multiple-choice questions. "Student Mastery Charts" for each chapter contain assignments and test items that correspond to each chapter section. If students miss any test item, teachers can direct students to review the appropriate chapter.

Assessing a range of learning outcomes. Most test items are included in the teacher's resource book and are limited to factual recall; however, some short essay questions on the chapter tests tap higher levels of thinking (for example, "Set up a mathematical solution to determine the ratio of hybrid genotypes produced by two purebred varieties of peas" and "Why will it become necessary for more of our diet to be made up of plant material as the population of the world increases?"). The teacher must devise ways of assessing students' attitudes and values.

Implementation Requirements

What the teacher has to do. Teacher preparation time is minimal and consists mainly of collecting materials for the hands-on activities, arranging for the use of outside resources, and making copies of the work sheets.

Staff development. No special in-service training is necessary for implementation of this program.

Charles E. Merrill Publishing Company
Accent on Science (1985), K—6

Summary

Relationship to the *Science Framework* and the *Science Framework Addendum*

Contents coverage. The science topics listed in the *Science Framework* and the *Science Framework Addendum* are covered as follows. In the area of Science, Technology, and Society, the strongest emphasis is given to careers related to science, methods of science, and conservation of resources. In Biological Science, topics related to plants, animals, human organ systems, and ecosystems are emphasized. In Earth Science all topics identified in the *Addendum* are covered. The stress in Physical Science is on matter, sound and light energy, mechanics, and magnetism and electricity. Minimal coverage is given to the work of prominent scientists, the nature of science, environmental issues other than conservation, cells, evolution, oceanography, energy sources and transformations, heat, and mechanics. Throughout the program, content from the three science areas generally is kept separate.

Teaching learning activities. A wide range of learning activities is presented in the textbooks, teachers' editions, and activity sheets found in both the teacher's resource book and the separate California teacher's resource book. The hands-on activities are detailed, contain a variety of thinking skills, and clarify the content. The teaching plans include guidance for the special feature pages and correlate ancillary materials to appropriate lessons. Key features of the program include the background information provided in most lessons, the variety of lesson extension activities available for average learners, and the reproducible masters relating the study of science to information about California.

Areas needing supplementation. The following areas need supplementation to meet the California textbook standards: (1) topic coverage, particularly recognition given to major scientists, the nature of science, ethical and environmental issues other than conservation, cells, evolution, and oceanography; (2) provisions for meeting the needs of below-average students that include additional learning experiences beyond the many factual recall review activities; and (3) assessment of students' progress beyond the level of factual recall.

Textbooks and Related Materials

Topic Coverage

Topic	*Content emphasized*	*Content emphasized to a limited extent or not in evidence*
Science, Technology, and Society	Careers Ethical and environmental issues (conservation) Methods of science	Nature of science Ethical and environmental issues (other) Scientists
Biological Science	Plants Animals Human beings (organ systems) Ecosystems Protists	Cells Genetics Evolution
Earth Science	Geology Astronomy Meteorology	Oceanography
Physical Science	Matter Energy: light Energy: magnetism and electricity Energy: sound	Mechanics Energy: sources and transformations Energy: heat

Science, Technology, and Society

One-page "People and Science" features included in all chapters provide pictures and information on science-related careers and hobbies. Single chapters that focus on science processes, such as measurement and classification, occur at all but one grade level. Brief treatment is given to topics that focus on the nature and history of science. The scientific method is directly described in a unit for grade five and indirectly described in connection with other topics for grades three through six. Some chapter sections on pollution and on the need to conserve resources comprise the extent of the coverage on problems and issues related to science.

Biological Science

Cells are discussed in a chapter for grade four, and protists are discussed in a unit for grade six. Plants are discussed in either chapters or units for all grade levels except grade six. Full units on human organ systems are included for grades four, five, and six. Animals are discussed in chapters or units for all grade levels except grade six. Information for grade six is integrated in units on ecology, genetics, and the environment, but details on animal classification and characteristics are presented only for grade six. A chapter on plant propagation is included for grade four, although chapters on growth and change in animals and humans are included in the grade two text. However, other material on genetics is included only for grade six. Entire units on ecosystems are included for grades three and six. California flora and fauna are described in the California teachers' resource books that include reproducible masters for work sheets that are comparable to those in the regular workbooks.

Earth Science

Geology is discussed in chapters or units written for all grade levels. Entire units are devoted to astronomy starting with grade three. Meteorology is introduced first in a chapter for grade one and in entire chapters or units for grades two, three, and five. Oceanography is introduced in a description of the water cycle and water habitats for grade three; and a three-chapter unit on oceanography is included for grade four.

Physical Science

Topics dealing with matter are first introduced in kindergarten through grade two. Entire units on matter are included for grades three, five, and six. Matter is discussed in a chapter for grade three and in units for grades five and six. Entire units on mechanics are included for grades three and five, and presentations on magnets are included in chapters for grades one, four, and six. Chemical and nuclear reactions and changes (except heat) are discussed only in chapters for grades two and five. Light and sound are discussed in single chapters written for grade two and in two-chapter units for grade four. Electricity is discussed in two chapters for grade four and in one chapter for grade six.

Relationships among the sciences and other disciplines. Content from the three main science areas is treated separately except for some clustering of this material in chapters (for example, successive accounts of changing states of matter, the water cycle, and weather), in some special feature pages in the textbooks, and in suggestions in the lesson plans in the teachers' editions. Many chapter plans include a section titled "Integrating Skills." This section includes suggestions for utilizing skills from language arts, mathematics, and other subjects in connection with science content (for example, a social studies activity designed for grade five requires students to research famous earthquakes and measures for preventing earthquake damage in building construction; an activity on plant life designed for grade two requires students to find out how Native Americans used cactus for food, shelter, fuel, and water).

Learning Activities

Range of learning activities in the sciences. The main learning activities require students to read textbook passages and respond to oral and written questions, engage in hands-on exercises, participate in teacher-led discussions, and complete work sheets. Lessons are followed by reinforcement and enrichment activities that extend beyond the classroom (for example, observing animal behavior, recording results of physical fitness efforts, and so forth).

Manipulative activities. Two sets of hands-on activities are included in each chapter; each starts with a question to be answered (for example, "How can you make a spectrum?") and includes step-by-step instructions for the students to follow. The activities end with two sets of questions, the first of which can be answered on the basis of the activity (for example, "What colors did you see?") and the second of which involves application or extension (for example, "What would have happened if you had used a colored light for this activity?"). Each activity includes a range of skills, such as data gathering, tabulating, predicting and inferring (for example, having determined the heat retention properties of various materials, students in grade five "hypothesize various means to insulate a given space"), and generalizing. These activities are related directly to the textbook lessons and help to clarify the content.

Thinking and science process skills. A page in the front matter of the teachers' editions presents an annotated listing of "Critical Thinking Process Skills" that are supposed to be developed in this program. These skills are divided into a "basic" set for kindergarten through grade three (observing, classifying, inferring, communicating, using spatial relationships, measuring, predicting, and using numbers) and a "complex" set for grades four through six (forming hypotheses, separating and controlling variables, experimenting, formulating models, and defining operationally). However, the highest level of thinking represented in this program is the one labeled Organizing in the *Addendum,* since the students are not required to carry out completely higher level skills identified in the hands-on activities. (For example, in an activity designed for grade six, students are instructed to "hypothesize means to insulate a given space" and "experimentally determine where to locate windows as a function of energy loss," but directions in the textbook do not take them beyond trial and error manipulations.)

Sequence of Topics and Activities

Organized sequence of development. The sequence from level to level moves from simple and concrete to more complex and abstract There is spiral organization for some topics, including plants, animals, geology, meteorology, astronomy, and matter (for example, discussions on meteorology for grade three are descriptive and introduce simple measuring devices; for grade five discussions on weather patterns, causes of change, and more complex measuring devices are introduced).

Sequence within grade levels. Within grade levels, topics relevant to each of the three science areas are clustered in units dealing exclusively with each area. The units on the three science areas alternate at each grade level (for example, units for grade five deal successively with animals, matter, weather, the human body, mechanics, astronomy, energy, geology, and plants in the environment). Successive chapters within units build systematically, but no attempt is made to interrelate the science areas.

Ancillary Materials

Ancillary materials. Listings of adopted component parts needed for daily lessons are provided in the unit and lesson plans; reduced facsimiles of work sheets and tests are reproduced in the teachers' editions. Neither the separate poster packets nor California teachers' resource booklets are mentioned in either the front matter of the teachers' editions or in the lesson plans. However, pages in the California teachers' resource booklets are keyed to follow specific text pages, and the poster packets contain unit designations.

Other materials available from the publisher. Equipment and materials kits containing the consumable and nonconsumable materials needed to perform all in-text activities are available for each grade level.

Teachers' Materials

Teachers' guidance for lessons. After presenting introductory front matter that includes an overview of program content and specific suggestions for classroom safety measures, the teachers' editions are composed of unit, chapter, and daily lesson plans. Unit plans include a listing of needed program components and materials for hands-on activities, plus a summary of the content covered and suggestions for unit opener activities. Chapter plans list objectives, materials needed for hands-on activities, and suggestions for starting each chapter. Daily lesson plans include objectives, background information for the teacher, strategies for presenting the textbook passages and related activities, answers to exercises, follow-up activities, and suggestions for drawing on skills from other subject areas in connection with science topics.

Questions to direct learning activities. Different types of questions in the program require students to utilize different levels of thinking skills. Usually, after reading a short narrative passage, students are required to answer a question in the text. This question is intended to summarize the main point of the passage or to lead students to make applications (for example, following information on nuclear energy, students in grade six are asked, "What might happen if the wastes got in the environment?"). Chapter review questions generally are restricted to factual recall, and unit review questions are extended to include interpretation of graphic information. Questions in the hands-on activity pages allow students to generalize, compare, infer, and predict. Discussion questions provided in the teaching plans vary from those that encourage students to discover new information by closely examining visuals (for example, the teacher refers students in grade three to text visuals to "look for evidence of gases" although the gas cannot be seen) to questions which are merely repetitions of the text questions and simply require students to restate text information.

Provisions for individual differences. While the activities presented in both the textbook and supplementary components are geared to average and above-average students, alternate activities for the below-average students are presented in some reinforcement sections of the lesson plans (for example, students in grade five are required to identify sources of kinetic

and potential energy in pictures). Although work sheets labeled "Review" are available in the teachers' resource books, the work sheets contain exercises in which students answer multiple-choice factual questions, rather than providing actual learning experiences.

Extension and enrichment activities. The daily lesson plans include sections labeled "Reinforcement" and "Enrichment." Both sections consist of simple activities to support the lesson topic (for example, rubbing wood with sandpaper to demonstrate friction, classifying a collection of objects, or making a map of the school grounds), and both sections offer additional opportunities for teachers to present a concept or skill.

Assessment and Evaluation Techniques

Variety of assessment techniques. Chapter and unit tests consisting of matching and short-answer items are provided for all grade levels with reduced facsimiles reproduced for each unit in the teachers' editions. Questions in the margins of the lesson plans included in teachers' editions are also intended to be used for informal assessment of students' progress. Review exercises are included at the end of each textbook chapter. These exercises can be adapted for self-assessment, although the answers appear only in the teachers' editions.

Assessing a range of student outcomes. Test items require mainly factual recall, but some items appear to tap higher level thinking skills (for example, "Why are there different kinds of matter?" and "How can you tell that water in a puddle is changing into gas?"). Although each chapter test contains at least one or more items requiring students to interpret or complete graphics (for example, students in grade five are required to label parts in a diagram of the skin and complete a chart by naming, locating, and giving the function of muscles; students in grade two are required to complete an animal habitat chart and interpret information given in a picture), questions referring to these graphics usually remain at the literal interpretation level or literal recall level. Assessment of attitudes and values is left to the teacher.

Implementation Requirements

What the teacher has to do. Teacher preparation time outside the classroom is minimal and consists mainly of gathering materials for the hands-on activities and arranging for the use of outside resources.

Staff development. Teachers need no special training to implement the program.

Charles E. Merrill Publishing Company
Focus on Earth Science (1984), 7—8
Focus on Life Science (1984), 7—8
Focus on Physical Science (1984), 7—8

Summary

Relationship to the *Science Framework* and the *Science Framework Addendum*

Contents coverage. The science topics listed in the *Science Framework* and the *Science Framework Addendum* are covered as follows. In the area of Science, Technology, and Society, the strongest emphasis is given to careers in science, methods of science, and the environmental problems of pollution, conservation, and overpopulation. In Biological Science human beings (organ systems), cells, genetics, plants, animals, and protists receive the most emphasis. Geology topics make up half the Earth Science volume, and astronomy and oceanography are also stressed. In Physical Science major emphasis is given to matter, heat, energy sources and transformations, mechanics, and electricity. Lesser emphasis is given to scientists, evolution, ecosystems, meteorology, light, sound, and magnetism. There is no coverage of California flora and fauna. Separate volumes are devoted to biological, earth, and physical sciences.

Teaching and learning activities. The main learning activities are reading and discussing textbook passages, answering chapter section and review questions, carrying out manipulative activities, and completing a variety of work sheets and some independent projects. Hands-on activities are included regularly in textbook chapters and laboratory manuals. Teaching plans provide an abundance of discussion topics and

easy-to-implement unit motivational ideas (for example, students are directed to hold a nature scavenger hunt outdoors or to obtain models of the eye and ear). Key features of the program include the helpful background information presented in the teaching plans and the variety of skill work sheets and extra manipulative activities available for each chapter. These work sheets and activities are included in the ancillary materials.

Areas needing supplementation. The following areas need supplementation to meet the California textbook standards: (1) topic coverage (particularly on ethical and environmental issues other than pollution, conservation, and overpopulation), individual scientists, evolution, meteorology, light, magnetism, and sound; (2) activities involving levels of thinking beyond Organizing, as defined in the *Addendum;* and (3) means for assessing students' progress beyond factual recall.

Textbooks and Related Materials

Topic Coverage

Topic	*Content emphasized*	*Content emphasized to a limited extent or not in evidence*
Science, Technology, and Society	Nature of science Careers Methods of science Environmental issues (pollution, conservation, overpopulation)	Scientists Ethical and environmental issues (other)
Biological Science	Cells Genetics Plants Animals Protists Human beings (organ systems)	Evolution Ecosystems
Earth Science	Astronomy Geology and resources Oceanography	Meteorology
Physical Science	Matter Mechanics Energy: sources and transformations Energy: heat Energy: electricity	Energy: light Energy: magnetism Energy: sound

Science, Technology, and Society

Introductory chapters in each volume contain overviews of the nature and methods of science. Special sections on careers related to science are included in each chapter; ending features on careers related to science are included in nearly half the chapters. Other chapter-end features highlight skills in other subject areas (for example, understanding maps). Five chapters contain some information on the conservation of resources and on problems related to environmental pollution.

Biological Science

Cells and protists are discussed in four chapters; one chapter focuses on diseases. Genetics is presented in two chapters; one chapter focuses specifically on humans. One chapter includes a two-paragraph account of evolution. Three chapters on plants and four chapters on animals are included. California flora and fauna are not discussed. Human organ systems are discussed in three chapters, which are included in a unit that also contains a chapter on nutrition. Ecosystems are discussed in one chapter of a unit that also includes chapters on conservation and human influence.

Earth Science

Astronomy is discussed in three chapters. Information on geology topics is included in 12 chapters (about half of the volume). At least three chapters include information on resources. Two chapters are devoted to meteorology and two to oceanography.

Physical Science

Ten chapters are devoted to a variety of topics related to matter; two chapters are devoted to heat energy, and two to energy sources and transformations. Three chapters contain information on mechanics, and four chapters contain information on sound and light. Two chapters are devoted to electricity; one of the chapters includes a section on magnetism.

Relationships among the sciences and other disciplines. The three main science areas are organized in separate texts, and the material from each text is not interrelated. However, there are modest numbers of cross-references in each volume (for example, the physical science section on organic compounds in living things, the life science section on aquatic environments, and the earth science chapter on matter). Other subject areas are included to an extent, both indirectly through activities involving the writing of reports or computation and directly through chapter-end features on language arts skills (for example, the development of reading for meaning and taking notes in outline form).

Learning Activities

Range of learning activities in the sciences. The main student learning activities are reading and discussing passages and answering questions in the textbook, carrying out hands-on activities, and completing a variety of follow-up activities, including library research. There is a balance in the learning activities between reading and discussion periods and hands-on activities.

Manipulative activities. Within each chapter, two to eight hands-on activities extend the textbook narrative; an additional set of laboratory activities is included in the student's laboratory manual for each science area. Both sets of activities involve students in observing, comparing and measuring, and organizing. Each step in the activity is clearly described; some activities are short and simple (for example, ways of testing for acids and bases), and others are more complex (for example, constructing an apparatus to relate centripetal force to velocity, recording data and summarizing them on a graph, and then drawing conclusions). These activities are related directly to the accompanying textbook and require easily obtained and inexpensive equipment.

Thinking and science process skills. The introductions to the teachers' editions of the laboratory manuals list the following five categories of "inquiry skills": acquisitive (including observing and gathering data); organizational (including comparing, sequencing, and analyzing); creative (including inventing and synthesizing); manipulative; and communicative (including asking questions, discussing, and describing). Most of the skills in this program do not go beyond the level of Organizing, as defined in the *Addendum*. The textbook exercises require students to recall factual information (for example, define an element and give symbols for common elements or explain how a pyramid represents the levels of a food chain). Activities at the level of Organizing are found in the hands-on exercises.

Sequence of Topics and Activities

Organized sequence of development. All three volumes begin with a one-chapter overview of the applicable science areas. In the earth science volume, aspects of some topics are clustered under common unit themes (for example, chapters on meteorology and oceanography are included in a unit on earth's air and water). Otherwise the sequencing follows the outline suggested in the *Addendum*, except that astronomy is split between an opening chapter on the earth-moon system and a closing unit on the universe. The life science units generally follow the sequence suggested in the *Addendum*. However, the opening unit includes a chapter on cells, the next two units discuss animals and plants, and the fourth unit contains additional information on simple organisms (protists, fungi, and so forth). The first unit in the physical science volume contains information on mechanics. Three additional units contain information on matter that is arranged from simple to complex, from the properties of matter to chemical reactions. The fifth unit contains information on light and sound. The final unit deals with energy resources and contains information on heat, electricity, nuclear energy, and energy alternatives.

Ancillary Materials

Ancillary materials. Ancillary materials, including the teachers' resource books, review and reinforcement guides, "A Learning Strategy for the Laboratory" workbooks, and "Skillcards," are briefly described in the teachers' editions but are not referred to in the teaching plans. Instead, the teacher's resource book includes a program planning guide for each discipline. In this book the appropriate work sheets and workbook pages from all ancillary materials (excluding "Skillcards") are coordinated with each chapter in

the respective textbooks. The teachers' editions of the laboratory manuals also contain references to the corresponding textbook chapters. An evaluation program is also available in the teacher's resource book and on reproducible masters. ("Skillcards" and the "Spirit Evaluation Program" were not available for analysis.)

Other materials available from the publisher. Spanish versions of the students' and teachers' editions of the textbook are available. Laboratory manuals are available only for life science.

Teachers' Materials

Teachers' guidance for lessons. The main source of teaching guidance is provided in a teaching guide located at the front of the teacher's edition. In addition to unit and chapter overviews, suggestions for unit activities (for example, making bulletin board displays and researching topics related to the unit study), chapter performance objectives, and answers to textbook questions the teaching guide offers teaching strategies or additional information or both for the hands-on activities and for each chapter section (for example, "Define the work . . . ," "Introduce this section with a demonstration . . . ," "Point out . . . ," "This activity demonstrates that. . . ."). Additional information presented in the teaching guide includes a discussion of the program's philosophy and the content's organization and sequence. The teaching guide also includes information on the features of the supplementary materials and the program planning guide, suggestions for adapting the program to differences in students' abilities, a list of equipment and supplies needed for the hands-on activities, suppliers' addresses, professional and student reference sources, separate essays on related science careers, directions on how to use the chapters' "Performance Objectives," and reading skills used in science. Minimal marginal annotations on textbook pages consist mainly of simple demonstrations to introduce each chapter, key points to emphasize in lessons, answers to questions, references to textbook graphics, and occasional activity suggestions (for example, requiring students to make tables of human developmental stages).

Questions to direct learning activities. No discussion questions are presented in the teaching plans, but a variety of questions are presented in the students' textbooks. Hands-on activities are introduced with a question indicating the purpose of the activity (for example, "How do you measure mass with a balance?" and "How does chance affect the combination of genes?"); each chapter begins with up to four introductory questions designed to interest students in the topic (for example, introductory questions to a chapter on nonmetals are "How are nonmetals different from metals?" and "What are some of the properties and uses of helium?"). Questions in the margins help students identify the major principles, concepts, and ideas presented in the narrative (for example, "Why is work output less than work input for machines?" and "What are the main characteristics of an angiosperm?"). Section checkup questions (called "Making Sure") and chapter review questions require students to recall mainly factual items although some questions require students to make calculations (for example, "What is the downward velocity of an object dropped from the top of the World Trade Center at the end of four seconds? The building is about 412 meters high.") and use higher levels of thinking (for example, "What advantages are there of landing astronauts on Mars?").

Provisions for individual differences. There are several ways the program can be adapted to differences in students' abilities and interests. A comprehensive program planning guide in the teacher's edition for each textbook indicates chapter sections of "primary" and "secondary" importance, enabling teachers to select and present only the most essential information to slower students. A separate page called "Teaching Special Students" gives general suggestions for providing special seating arrangements and tape-recording instructions. Work sheets in a separate review and reinforcement guide for each discipline reinforce science concepts using reading and mathematical skills exercises (for example, solving word puzzles using science terms and using graphs to answer questions) and are designed to be used with students "functioning at lower performance levels." Skillcards (not made available for analysis) offer additional supplementary activities for students needing "additional reinforcement" or "independent enrichment." In the teacher's resource book, an activity guide for each textbook chapter includes a "Meeting Needs" section that suggests ways to adapt activities to accommodate students with special needs (for example, using a label machine to make raised labels for visually impaired students, allowing students to tape-record responses, partnering students, and so forth). Teachers are also encouraged to use selectively the questions on tests to fit the ability level of the class.

Extension and enrichment activities. "Enrichment Masters" provided in the teacher's resource book for more "highly motivated and interested" students require students to "apply a concept presented in the chapter to a new situation." For example, following a discussion of atoms found in sulfur, students are required to complete a work sheet in which they use mathematical operations with exponents to calculate how many atoms would be in a speck of sulfur and to record their results in a table. Teachers are also encouraged to allow more capable students to com-

plete independently activities presented in the separate laboratory workbook, on "Skillcards," and in the "More Ideas to Explore" sections at the end of each chapter.

Assessment and Evaluation Techniques

Variety of assessment techniques. Chapter tests on reproducible masters are available in the teacher's resource book and include multiple-choice, matching, true-false, sentence completion, and diagrams and illustrations that students must label or use to answer questions (for example, "What is the youngest rock in the sketch? and "Which diagram illustrates a delta formation?").

Assessing a range of learning outcomes. Chapter test items mainly require students to recall factual information although some essay questions tap higher levels of thinking (for example, "How might the changes in the tilt of the earth's axis cause an ice age?" and "What are some of the benefits of landing astronauts on the moon?"). Some skills needed to answer items are mislabeled. For example, a section labeled "Interpreting Concepts" merely requires students to recall correctly and identify cell parts and their functions. There are no provisions for assessing student values and affect.

Implementation Requirements

What the teacher has to do. Teacher preparation time is minimal and consists mainly of collecting materials needed for hands-on activities and making copies of duplicating masters.

Staff development. No special training is necessary to implement this program.

Charles E. Merrill Publishing Company
Principles of Science (1986), 7—8

Summary

Relationship to the *Science Framework* and the *Science Framework Addendum*.

Contents coverage. The science topics listed in the *Science Framework* and *Science Framework Addendum* are covered as follows. In the area of Science, Technology, and Society, the strongest emphasis is given to scientists, methods of science (especially measurement), and the environmental problems of pollution and conservation. In Biological Science the topics dealing with human organ systems receive the most emphasis. The Earth Science topics stressed are astronomy and geology. In Physical Science the main emphasis is on matter, mechanics, heat energy, and energy sources and transformations. Lesser emphasis is given to cells, genetics, evolution, animals, plants, protists, ecosystems, meteorology, oceanography, light and sound, and electricity and magnetism. Minimal or no coverage is given to the nature of science, careers, and California flora and fauna. Two separate volumes address topics in biological, earth, and physical sciences.

Teaching and learning activities. The main learning activities are reading and discussing textbook passages, answering textbook questions, carrying out short hands-on activities, and completing review and skill work sheets and optional projects suggested in the teaching plans. Several simple hands-on activities are located in the body of each chapter. Teaching plans are brief and mainly consist of overview and background information and answers to text and experiment questions. A key feature of the program is the simplicity of the hands-on activities and their direct relationship to and support of the concepts presented in the narrative.

Areas needing supplementation. The following areas need supplementation to meet the California textbook standards: (1) topic coverage, especially for animals and plants, ecosystems, oceanography, light and sound, and electricity and magnetism; (2) activities involving levels of thinking beyond Organizing, as defined in the *Addendum;* (3) specific ways of adapting activities to accommodate individual differences in students' interests and abilities beyond the "Challenge" masters and suggestions for the teacher to create his or her own materials; and (4) additional means of assessment beyond factual recall on formal tests.

Textbooks and Related Materials

Topic Coverage

Topic	*Content emphasized*	*Content emphasized to a limited extent or not in evidence*
Science, Technology, and Society	Scientists Methods of science (measurement) Environmental issues (pollution, conservation)	Nature of science Ethical and environmental issues (other) Methods of science (other) Careers
Biological Science	Human beings (organ systems)	Cells Genetics Evolution Animals Plants Protists Ecosystems
Earth Science	Astronomy Geology and resources	Meteorology Oceanography
Physical Science	Matter Mechanics Energy: sources and transformations Energy: heat	Energy: light Energy: electricity and magnetism Energy: sound

Science, Technology, and Society

Introductory chapters in each volume present brief overviews of the nature of science, and extensive information on scientific methods (especially measurement and notation) is included in these chapters and in the appendixes. A two-page treatment of careers in science is included in the introductory chapter of one volume. "Perspectives" and "Side Roads" sections at the end of most chapters present extensions of chapter content; three sections contain information on individual scientists; and five sections contain information on conservation problems. Two units (four chapters in the two volumes) deal with pollution and the conservation of resources.

Biological Science

Information on cells and protists is included in two chapters in one volume; information on genetics is included in one chapter in each volume; and a single chapter in the first volume contains information on evolution. The chapter on genetics includes four pages on human reproduction. One chapter on plants and two chapters on animals are included in the same volume. No special mention is made of California flora and fauna. Information on human organ systems is included in four chapters, and information on human health (including drugs, alcohol, and tobacco) is included in three chapters—all in the same volume. Information on ecosystems is included in two chapters in one volume.

Earth Science

Information on astronomy is included in four chapters in the second volume. Three chapters in the first volume are devoted to geology, and a separate chapter on the conservation of resources is included in the textbook. Information on meteorology is included in two chapters and information on oceanography is included in one chapter.

Physical Science

A total of six chapters divided between volumes are devoted to the topics related to matter, including a chapter on chemical technology. Information on mechanics is included in four chapters in the first volume, and information on energy sources and transformations is included in three chapters in the second volume. Single chapters in the second volume include information on heat, sound, light, and magnetism and electricity.

Relationships among the sciences and other disciplines. Topics from all three science areas are included in both volumes; but, except for a unit in the second volume that combines resources and pollution, topics

related to each science are located in separate units. Most of the textbook activities involve the use of mathematics skills (for example, making and recording measurements) or the writing of reports. One-third of the special chapter-end features also introduce science-related skills from other subject areas (for example, reading for meaning and organizing notes in outline form). In addition, "Review Guide" masters in the teachers' resource books are provided to help students use reading and mathematics skills with science concepts. For example, students are required to graph the caloric intake of boys and girls at various ages or complete a table by computing the mass of specific elements found in the body.

Learning Activities

Range of learning activities in the sciences. The main learning activities in this program require students to read and discuss textbook passages, answer textbook questions, carry out hands-on activities, and complete a variety of work sheets. Learning activities are divided equally between reading and discussion periods and hands-on activities.

Manipulative activities. Brief hands-on activities appear throughout the two volumes at the rate of two to eight per chapter. These activities are related directly to the accompanying textbook, require easily obtained and inexpensive equipment, and include simple instructions and questions. For example, a passage on levers is accompanied by an activity in which students are instructed to use a ruler for a lever and a pencil for a fulcrum and raise the edge of a book. Students are then asked, "Where are the resistance force, effort force, and fulcrum?"

Thinking and science process skills. The introductions to the teachers' editions list problem-solving and processing skills for each hands-on exercise. Most of these skills involve observation, comparison, or measurement. The highest level of thinking required of students is Organizing, as defined in the *Addendum*.

Sequence of Topics and Activities

Organized sequence of topics. Information on topics from all three science areas is included in both volumes and progresses from simple or familiar to abstract, complex, or unfamiliar. Biological Science begins with basic characteristics of life and then moves to organisms (simplest to most complex), the second volume deals with human organ systems and health. In Earth Science, the first volume contains information about Earth, and the second volume contains information about the universe. In Physical Science, the basic principles of chemistry and physics are described in the first volume, and these descriptions are continued in the second volume and include information on reaction chemistry and interactions between matter and energy. Units are made up of logical clusters of chapter topics. For example, a human life unit encompasses chapters on human organ systems; and an energy unit covers heat, sound and light, magnetism and electricity, and nuclear energy.

Ancillary Materials

Ancillary materials. A description of the teachers' resource books for each textbook is included in the teachers' editions. Organized with tabbed dividers that correspond to each textbook chapter, the teachers' resource books contain reproducible masters for tests, review and reinforcement exercises, and a "Challenge" exercise. Masters for overhead projector transparencies include suggestions for use and aid in reinforcing basic concepts. A chapter planning guide lists by chapter section all activity, review, or enrichment material available in the pupils' textbooks and teachers' resource books. The teachers' resource books include a "Program Planning Guide" that contains a listing of the activities and exercises in the textbook program, a textbook inventory, and a final examination.

Other materials available from the publisher. The "Evaluation Programs" (tests) included in the teachers' resource books are also available as reproducible masters.

Teachers' Materials

Teachers' guidance for lessons Information on teaching guidance appears primarily in the front of the teachers' editions in a separate teaching guide and is supplemented with marginal annotations on the pages of students' textbooks. The information in the teaching guide consists of brief unit and chapter overviews, suggestions for unit projects (for example, setting up a class collection of toys that illustrate different types of forces and motion), chapter goals and objectives, material needs and procedures for carrying out the hands-on activities, answers to chapter review questions, background information, demonstrations, or teaching strategies for each chapter section (for example, "Explain the difference between the process and product of science." "Begin by directing students to Table _____") and "Students should be aware that . . ."). Marginal annotations include suggestions for discussion (for example, "Lead a discussion on how the weather affects our daily lives"), additional background facts, and answers to the chapter section questions and to questions asked in the narrative.

Questions to direct learning activities. No questions are posed in the teaching plans. The teacher must formulate questions from the suggested discussion ideas. Within the students' textbook, questions in the

margins to direct the reading (for example, "Why is a trilobite a guide fossil?") are immediately answered in the narrative that follows. Short-answer section check-up questions (true-false and matching) and short essay "Chapter Review" questions are included. Most textbook questions require students to recall factual information only (for example, "Give three examples to show the Earth is still changing."). However, some section review and short essay questions require students to apply the textbook concepts (for example, "How does a child learn to walk?" and "What are the rewards involved?").

Provisions for individual differences. The teacher must "carefully select those exercises that are best suited to meet the particular needs of each student." However, general suggestions are given in the teachers' resource books for adapting tests to the needs of "underachievers." These suggestions require teachers to use line drawings for visual application of ideas and to use capital letter responses for students who confuse lowercase letters such as *b* and *d* and for devising ways to adjust assignments and help individual students. No provisions are made for mainstreaming students with special needs.

Extension and enrichment activities. The teacher's edition contains ideas for extending and enriching lessons. At the end of each chapter in the student's textbook, a "Challenges" section suggests activities, such as requiring students to find out how cars are made increasingly efficient, to build a weather station at the school, to test different metals with a magnet to determine the presence of unpaired electrons, and so forth. In the teacher's resource book, "Challenge Masters" geared "specifically for highly motivated and interested students" require students to "often apply a concept presented in the chapter to a new situation." For example, students are required to use a portion of the periodic table to answer questions about elements and to use mock medical histories to determine which patients could safely receive and donate blood to certain recipients.

Assessment and Evaluation Techniques

Variety of assessment techniques. "Evaluation Masters" for each chapter are provided in the teacher's resource book and on reproducible masters. Each "Evaluation Master" is divided into the following four parts: "Understanding the Concepts" (multiple-choice items in which students write the letter of the phrase that correctly completes the sentence); "Interpreting Concepts" (true-false, matching, multiple-choice items); "Using the Concepts" (short-answer questions such as "List the five classes of food additives" and diagrams, illustrations, equations, and so forth, that students use to answer questions); and "Completing Concepts" (matching). All test questions are related to the performance objectives stated for each chapter. An "Evaluation Section" in the teacher's resource book explains the testing program and suggests additional evaluation means. The additional ways to evaluate students' performance requires students to correct their own text exercises to identify individual strengths and weaknesses and requires teachers to use the "Review Guide Masters" as a means of diagnosing areas needing reteaching, to observe informally how students approach assignments and apply skills, and to devise their own tests as well as adapt the "Evaluation Masters" (for example, deleting parts of tests for some students, using the test in an open-book testing situation, and so forth). An end-of-the-year test is also available for cumulative review.

Assessing a range of learning outcomes. All four parts of the "Evaluation Masters" require students only to recall facts. Teachers are encouraged to add questions to the tests that will assess higher levels of thinking and to make informal observations of students to assess attitudes and interests. Methods for evaluating laboratory performance and attitudes are included in the teacher's edition and in the "Activity-Centered Program" located in the teacher's guide.

Implementation Requirements

What the teacher has to do. Very little teacher preparation time is required. Most of the hands-on activities are very short and simple and do not require students to assemble equipment or to do numerous tests (for example, students are required to submerge an inverted cup with tissue inside in a container of water, then repeat the activity after making a hole in the bottom of the cup and compare results).

Staff development. No special training is necessary to implement this program.

Prentice-Hall, Inc.
A Voyage of Adventure (1986), 7—8
A Voyage of Discovery (1986), 7—8
A Voyage of Exploration (1986), 7—8

Summary

Relationship to the *Science Framework* and the *Science Framework Addendum*

Contents coverage. The science topics listed in the *Science Framework* and the *Science Framework Addendum* are covered as follows. In the area of Science, Technology, and Society, the strongest emphasis is given to science and technology, careers, and accounts of contemporary scientists. In Biological Science, the topics of human organ systems, plants, animals, and health receive the most emphasis. The Earth Science topics stressed are astronomy, geology and resources, meteorology, and oceanography. In Physical Science the main emphasis is on matter and energy sources and transformations. Lesser emphasis is given to the nature and methods of science (besides measurement), genetics, evolution, protists, ecosystems, mechanics, heat energy, sound and light, and electricity and magnetism. Minimal or no coverage is given to scientists of the past and California flora and fauna. Biological, earth, and physical science topics are addressed in each of the three program volumes.

Teaching and learning activities. The main learning activities are reading and discussing textbook passages, answering textbook questions, carrying out hands-on activities, and completing work sheet activities and optional projects. Hands-on activities within the textbook are limited to one per chapter and generally do not go beyond the level of Organizing, as defined in the *Addendum*. Teaching plans provide background information, but the approach is primarily didactic. Key features of this program include the abundant background information and teaching strategies presented in the teaching plans, the description of purpose for the marginal activities in the student's textbook, and the "Science Gazette" features.

Areas needing supplementation. The following areas need supplementation to meet the California textbook standards: (1) topic coverage, particularly cells, protists, California flora and fauna, and the physical science energy topics, including electricity and magnetism; (2) levels of thinking required in the learning activities to extend beyond that of Organizing; (3) specific provisions for accommodating individual differences in students' interests and abilities; and (4) means for assessing students' progress beyond factual recall.

Textbooks and Related Materials

Topic Coverage

Topic	*Content emphasized*	*Content emphasized to a limited extent or not in evidence*
Science, Technology, and Society	Scientists (contemporary) Careers Science and technology Environmental issues (pollution, conservation)	Methods of science Nature of science Scientists (historical) Ethical and environmental issues (other)
Biological Science	Human beings (organ systems, health) Animals Plants	Cells Protists Genetics Evolution Ecosystems
Earth Science	Astronomy Geology and resources Meteorology Oceanography	

Topic	Content emphasized	Content emphasized to a limited extent or not in evidence
Physical Science	Matter Energy: sources and transformations	Mechanics Energy: heat Energy: light Energy: electricity and magnetism Energy: sound

Science, Technology, and Society

Introductory chapters in each volume contain overviews of the nature of science and scientific methods. Each chapter has a one half-page career description. "Science Gazette" features at the end of each unit present features on individual scientists and their work, issues and problems in science (some ethical and environmental), and speculations about the future of science. Three chapters in two of the volumes contain information on pollution and the conservation of resources.

Biological Science

Information on cells and protists is included in two chapters in one volume; information on genetics is included in two chapters of the second volume; and information on fossil records and primate ancestors of man is included in a single chapter in a third volume. Information on evolution is contained in an entire chapter. Two chapters contain information on plants, and three chapters contain information on animals in the same volume. No special mention is made of California flora and fauna. Human organ systems are discussed in six chapters, and human health (including drugs, alcohol, and tobacco) is discussed in four chapters—all in the same volume. Ecosystems are discussed in three chapters in one volume.

Earth Science

Astronomy is discussed in three chapters in one volume and in a special chapter on space technology in another volume. Nine chapters in two volumes contain information on geology, and a chapter on energy resources is included in the third volume. Meteorology and oceanography are discussed in three chapters each in the same volume.

Physical Science

Three chapters in one volume contain information on matter, and a single chapter on chemical technology is included in the second volume. Mechanics is discussed in two chapters in one volume. Energy sources and transformations are discussed in three chapters, and heat energy is discussed in one chapter in the same volume. Single chapters on sound and light are included in the same volume, as well as two chapters on electricity and magnetism (including one on computers).

Relationships among the sciences and other disciplines. Topics from all three science areas are found in all three volumes, and some topics are interrelated by juxtaposition, both within areas (for example, under the heading of "Forms of Energy," one volume includes chapters on heat, electricity and magnetism, sound, light, and nuclear energy) and across areas (for example, another unit in the same volume includes information on science and technology, including the topics of energy resources, chemical technology, space technology, the computer revolution, and pollution). However, most chapter topics are clustered in units that encompass only one science area. Most of the textbook activities involve the use of mathematics skills (for example, using density values of materials to determine whether they will float on mercury) or the writing of reports (for example, writing about the scientists responsible for identifying relationships between magnetism and electricity). However, neither the textbooks nor the teaching plans provide specific exercises in which skills and concepts in other subject areas are utilized in a science context.

Learning Activities

Range of learning activities in the sciences. The main learning activities require students to read and discuss the textbook narrative, answer oral and written questions, complete extension activities such as library research and report writing, and carry out hands-on activities involving primarily observation, measurement, and recording data.

Manipulative activities. One laboratory-type activity is included at the end of each textbook chapter. The majority of these activities require students to make and describe observations (for example, observe the properties of bones), often after carrying out some manipulations, such as observing the effects of dissolved substances on the freezing point of water. In some cases, students are required to develop generalizations based on their observation (for example, developing a definition of "cycle" on the basis of

observing the life cycle of a housefly and reading about the nitrogen and water cycles). Directions for each activity include its purpose, step-by-step procedures, and follow-up questions to guide observations and the forming of conclusions.

Thinking and science process skills. In the introductions to the teachers' editions, the authors say that the laboratory-type exercises offer students opportunities to "gain first-hand experience with learning skills and processes such as observing, classifying, identifying, measuring, inferring, hypothesizing, interpreting, and predicting." However, these laboratory-type exercises rarely go beyond the level of Organizing, as defined in the *Addendum*. In a few cases students are required to generalize (for example, concerning the relationship between water depth and the settling of sediments) and to develop their own definitions, such as developing a definition of "cycle." One example of an exercise requiring hierarchical classification was found, but that exercise was an exception.

Sequence of Topics and Activities

Organized sequence of development. Topics from each science area are evenly distributed across the three volumes, except that half of *A Voyage of Adventure* is devoted to biological science topics. In some cases, as indicated previously, topics from more than one science area are found in the same unit (for example, chapters on energy resources, chemical technology, space technology, the computer revolution, and pollution are discussed in one unit on science and technology), but the majority of the unit topics are from only one area. Information on topics is expanded from textbook to textbook. For example, a chapter on organ systems in one volume is related to an entire unit in a second volume in which each organ system is discussed in an entire chapter.

Ancillary Materials

Ancillary materials. The introductions to the teachers' editions contain information about the laboratory manuals and general science courseware, but these materials are not mentioned in the teaching plans or in the textbooks.

Other materials available from the publisher. Teachers' resource books containing a variety of masters and tests are available for each textbook and contain one two-page "Lesson Plan" chart per chapter that coordinates activities in the textbook, laboratory manual, and teacher's resource book.

Teachers' Materials

Teachers' guidance for lessons. The main teaching guidance for the program is a separate teaching guide at the front of the teacher's edition. The teacher's edition includes a discussion of the program's rationale, content, organization, features of the students' and teachers' editions, auxiliary materials, laboratory equipment suppliers, materials required for the hands-on activities, and safety guidelines. Also provided are brief overviews of each unit and chapter, answers to the "Discussion Topics" section of the chapter reviews, chapter bibliographies, background information, teaching strategies for the daily lessons (for example, "Demonstrate . . . ," "Discuss . . . ," "Explain . . . ," "Distinguish between. . . ," and so forth), and answers to the short marginal activities in each chapter section. Separate guidance is provided for teaching the special "Science Gazette" features ("chosen and designed to motivate students at all levels") and includes background information, discussion topics, and enrichment projects, such as research and artwork for each "Gazette" topic. Additionally, annotations include answers to the short-answer, objective questions in the section and chapter reviews, answers to questions in the narrative, and occasional background information and points to emphasize (for example, "Emphasize to your students that there is no such thing as 'coldness'.").

Questions to direct learning activities. Discussion questions are not included in the teaching plans; however, some of the background information presented in "Teaching Strategy" sections of the lesson plans could be adapted for discussion. Frequent questions in the textbook narrative focus the reading and can be answered directly (for example, "Why do stars shine?" and "How many cells do you think you are made of?"). Checkup questions (called "Section Review") follow each chapter section and focus on factual recall (for example, "What does protoplasm mean?").

"Chapter Review" questions are multiple-choice, sentence completion, true-false, and short essay. These questions generally require students to recall factual information, but occasionally students are required to respond to information (for example, "When fossil fuels such as coal and oil burn, they release dangerous pollutants, such as sulfur dioxide, into the atmosphere. Discuss some possible solutions you have to this problem.").

Provisions for individual differences. The teacher must adapt individual lessons and manipulative activities to differences in students' abilities and interests.

Extension and enrichment activities. Activities suggested in the margins of the students' textbooks are identified in the teaching plans as average, remedial, or enriched. For example, a remediating activity requires students to make a map of their neighborhood to clarify basic principles of mapmaking; a

remedial-average activity requires students to find the longitude and latitude of points on a map or globe; and an enrichment activity requires students to observe over successive nights the eastward movement of the moon against the background of stars to appreciate the problems of early astronomers who assumed the earth was a fixed reference point. Also, a separate teacher's resource book (not submitted for adoption) contains activities (on blackline masters) for every student ability level.

Assessment and Evaluation Techniques

Variety of assessment techniques. Unless a teacher were to adapt the "Chapter Review" questions for testing purposes, there is no means of assessment provided in either the students' textbooks or teachers' editions. A separate teacher's resource book (not submitted for adoption but available from the publisher) contains pretests and post-tests for each chapter, unit, and final test.

Assessing a range of student outcomes. It is not known what levels of thinking and science process skills are assessed by the formal tests in the teacher's resource book because it was not submitted for adoption and not made available for analysis. There are no provisions for assessing student values and affect in the teachers' editions.

Implementation Requirements

What the teacher has to do. Teacher preparation time is minimal and consists mainly of collecting materials for the hands-on activities and demonstrations and arranging for audiovisual and supplementary materials.

Staff development. No special training is needed to implement this program.

Prentice-Hall, Inc.
Life Science (1986), 7—8*
Physical Science (1986), 7—8*

Summary

Relationship to the *Science Framework* and the *Science Framework Addendum*

Contents coverage. The science topics listed in the *Science Framework* and the *Science Framework Addendum* are covered as follows. In the area of Science, Technology, and Society, the most emphasis is given to the nature of science, scientists, careers, and ethical and environmental issues. In Biological Science the topics of genetics, evolution, plants, animals, and ecosystems receive the greatest stress; and in Physical Science the main stress is on matter and mechanics, heat, energy sources, light, sound, and electricity and magnetism. Lesser emphasis is given to methods of science, cells, protists, and human beings. Minimal or no coverage is given to California flora and fauna.

Teaching and learning activities. The main student learning activities in this program are reading and discussing textbook passages, answering textbook questions, carrying out hands-on activities, going on field investigations, doing library research and a variety of other projects, and completing work sheet activities. Many hands-on activities reinforce specific concepts, but these activities do not involve science process skills beyond Organizing, as defined in the *Addendum*. Teaching plans provide ample background information and a wide variety of enrichment projects for independent and group work. Two key features of this program are the background information included in the teaching plans and the field investigations. These investigations require students to participate in hands-on explorations at home and out in the community.

Areas needing supplementation. The following areas need supplementation to meet the California textbook standards: (1) topic coverage, particularly California flora and fauna; (2) activities involving levels of thinking beyond that of Organizing; (3) provisions for individualizing instruction beyond the general suggestions given for accommodating disabled students and the indications of how more or less of the basic instructional lesson should be taught, depending on the ability level of the student; and (4) assessment of students' progress to tap higher levels of thinking, attitudes, and values.

*On September 13, 1985, the State Board of Education did not adopt the *Earth Science* volume of this series.

Textbooks and Related Materials

Topic Coverage

Topic	*Content emphasized*	*Content emphasized to a limited extent or not in evidence*
Science, Technology, and Society	Careers Nature of science Scientists Ethical and environmental issues	Methods of science
Biological Science	Genetics Evolution Plants Animals Ecosystems	Cells Protists Human beings (organ systems)
Physical Science	Matter Mechanics Energy: sources and transformations Energy: heat Energy: light Energy: electricity and magnetism Energy: sound	

Science, Technology, and Society

Opening and closing chapters in each volume deal with the nature and methods of science. Half-page career descriptions are distributed throughout the program. Scientists are mentioned in connection with their discoveries, background information on several scientists is included in the lesson plans, and scientists are sometimes the subjects of the library research activities. Regular unit-end "Perspectives" sections present a range of ethical and environmental issues (for example, fluoridation and use of life support systems).

Biological Science

Single chapters are devoted to cells and to genetics. Adaptation and natural selection and some theories of evolution are described. There are two chapters on animals and three on plants, but no mention is made of California flora and fauna. Protists are included in a chapter on microbes. Human organ systems are reviewed in a single chapter that also deals with health. Three chapters are devoted to ecosystems.

Earth Science

The textbook *Earth Science* was not adopted by the State Board of Education.

Physical Science

Matter is covered in eight chapters. One chapter each is devoted to heat energy and energy sources and transformations. Two chapters are devoted to mechanics; and one chapter each is devoted to electricity, magnetism, sound, and light.

Relationships among the sciences and other disciplines. Topics from life and physical science are organized in separate volumes, and little attempt is made to make connections between them. Exceptions are the single chapters on the physical science topic of matter that are found in the life science textbook and a chapter on the chemistry of life in the physical science textbook. Subject area applications besides science are brought in through some of the "Supplemental Problems" in the reproducible masters that involve mathematical calculations (for example, applications of Boyle's and Charles's laws) and through the "Library Investigations" that require students to use resource materials and write reports.

Learning Activities

Range of learning activities in the sciences. The main student learning activities are reading and discussing textbook passages, answering textbook questions, carrying out a number of short observation activities (for example, observing behavior in a guinea pig and observing phase change), going on field investigations (for example, visiting a zoo and surveying what people think the community will look like in a hundred years), completing library investigations (for example, writing a report on Archimedes, and using

references to answer the question "What is electronegativity?"), and completing work sheet activities.

Manipulative activities. "Field Investigations," "Library Investigations," and "Hands-On Investigations" activities are included in the margins of each textbook chapter. Brief directions present a problem or topic and suggest a project (for example, writing a brief report on scientists who made important contributions to the physical sciences). Forms for use in recording the results of these activities are located on reproducible masters in the teachers' resource books. In addition, full-page "Laboratory Investigations" in the textbooks (at least one per chapter) are related to the narrative and require inexpensive and easy-to-obtain materials. An additional laboratory investigation for each chapter is provided in the laboratory/activity books. Directions for these investigations include background information, purpose, list of materials, step-by-step procedures, and a section for use in recording conclusions.

Thinking and science process skills. The introductions to the teachers' editions state that "students gain first-hand experience with such learning skills as observing, classifying, measuring, inferring, hypothesizing, interpreting, and predicting." The section and chapter questions in the textbooks and the questions in the lesson plans and tests require students only to recall factual information; many of the investigations involve measuring, comparing, and organizing; most of the hands-on activities call for observation, description, and comparison. However, the highest level of thinking required to answer the questions and perform the activities of this program is Organizing, as defined in the *Addendum*. Organizing is required in many of the laboratory investigations in the separate manual (for example, students are required to determine the relationship of the density of water and the amount of salt dissolved in it or the relationship between the color of an object and the amount of radiant heat it absorbs).

Sequence of Topics and Activities

Organized sequence of development. The science areas, life and physical science, are contained in separate volumes. Although the State Board of Education did not adopt the earth science volume, information on earth science is included in the other two volumes. The teacher must decide the order in which the three areas will be introduced. The introduction in the teacher's edition indicates that the units within each volume are self-contained and can be taught in any order. Each volume begins with an overview of its science area. The life science volume is also organized by themes, starting with the diversity of living things (plants, animals, and microbes), moving on to their distribution and interaction (ecosystems), and returning to individual organisms (cells, plants, and the human body). The final units are on matter, energy, and living things (including photosynthesis, respiration, and decay), continuity (reproduction and heredity), life in the past (evidence and explanations), and the future (environmental problems and new directions in human biology). Unit themes in physical science include diversity of matter (properties and classification), composition of matter (atoms), chemistry of matter, mechanics and energy transformations, electricity and magnetism, heat energy waves, and physical science—present and future.

Ancillary Materials

Ancillary materials. Laboratory/activity books and teachers' resource books with reproducible masters for activity sheets and tests accompany the individual textbooks. A matrix in the "Planning and Scheduling Guide" at the front of each teacher's resource book identifies all the program materials available for use with each chapter.

Other materials available from the publisher. A "Dial-a-Test" service is available to provide "customized tests by phone or mail." "Textbook-based" physical science courseware is also available.

Teachers' Materials

Teacher guidance for lessons. A separate teaching guide at the front of the teacher's edition includes a discussion of the program rationale, readability of the content, content organization, features of the students' and teachers' editions, auxiliary materials, skills from other subject areas utilized in the science study, suggestions for ensuring successful field trips and classroom safety, and approaches for teaching heterogeneous classes (for example, designating performance objectives for the class or individuals, providing manipulative experiences, and so forth). A comprehensive list of materials needed for the hands-on activities is also included along with addresses of suppliers of laboratory equipment and audiovisual materials. Teaching plans include unit and chapter overviews; answers to the chapter review questions; a chapter bibliography; and background information, objectives, and enrichment activities for each chapter section. Additional background information and suggestions for using the "Field Investigations," "Library Investigations," "Laboratory Investigations," and "Career" features are also provided. The following specific teaching strategies for daily lessons are not provided: discussion questions, motivational activities, and key points to emphasize. Annotations indicate chapter objectives and answers to captions, nar-

rative questions, and chapter section checkup questions.

Questions to direct learning activities. Discussion questions are not included in the teaching plans. However, the background information provided in the teaching plans could be adapted for discussion purposes by the teacher. The frequent questions asked in the narrative and in captions help students to think about and review the content (for example, "What other characteristics might you look for to determine whether the rose is a monocot or a dicot?"). Usually the answer to this question can be found by reading the narrative or studying the graphics. "Checkup" questions follow each chapter section and focus on factual recall (for example, "How is an ion different from an atom?"). Chapter review questions also focus on factual recall and consist of vocabulary-matching, sentence completion, multiple-choice, short-answer, and essay questions. Occasionally the essay questions require students to respond to information on a higher level (for example, "Assume that you have discovered a new element. The element turns out to be a poor conductor having a low melting point. Atoms of the element readily gain one electron. They also react with metals to form salts. In what chemical family would you place this element? Why?").

Provisions for individual differences. A "Planning and Scheduling Guide" in the teacher's resource book indicates alternative plans for teaching the following three ability groups: low-level, average/college preparatory, and accelerated. Included in the plans is the number of classes needed to teach a chapter to a particular ability group; the "essential topics/sections" and "optional topics/sections" to be covered in each chapter; the appropriate activities in the text; a separate laboratory/activity book; and a teacher's resource book for each group of students. In addition, a brief discussion in the teacher's edition, "Teaching Heterogeneous Classes," provides suggestions for accommodating students with physical and mental disabilities. Suggestions include designating individual performance objectives, providing frequent manipulative learning activities, and enlisting the aid of the school librarian to locate appropriate high-interest, easy-to-read books; but it is left to the teacher to apply these suggestions in the daily lessons.

Extension and enrichment activities. Numerous and varied projects for students to complete independently or in groups are suggested both in the textbook and in the teaching plans. In the textbook margins, "Library Investigations" (for example, students are directed to look up the meaning of science terms), "Field Investigations" (for example, students are directed to walk in their neighborhood and list possible sources of air pollution), and short-term "Hands-on Investigations" (for example, students are directed to observe the changes in a piece of dry ice at room temperature) are related to chapter content. Available on reproducible masters in the teacher's resource book are "Science Reading Skill," "Vocabulary Bank," and "Activity Bank" work sheets. These work sheets include "Library Investigations," "Field Investigations," and "Hands-On Investigations" activities. Additional "Laboratory Investigations" work sheets and "Vocabulary Activity" work sheets (crossword puzzles, finding hidden words, and so forth) are provided in the laboratory/activity book.

Assessment and Evaluation Techniques

Variety of assessment techniques. There is little variety in the assessment provisions of this program. Chapter review sections in the textbooks contain fill-in, multiple-choice, short-answer, and short-essay items; answers are given in the teachers' editions. Chapter, unit, and final tests with similar items are contained on reproducible masters in the teachers' resource books. Except for the suggestion in the teacher's edition that teachers use the performance objectives for each lesson to help "gauge [their] students' progress," there is no discussion of evaluating or administering tests.

Assessing a range of learning outcomes. Most of the test items require students only to recall factual information, but some of the essay items in the chapter-end sections require students to provide more thorough answers than questions that assess only factual recall (for example, "For which properties could you test a mineral and not damage the mineral sample?"). The teacher must devise ways to assess higher levels of thinking, science skills, attitudes, and values.

Implementation Requirements

What the teacher has to do. Teacher preparation time is minimal and consists mainly of collecting the materials needed for the hands-on activities and arranging field trips and for the use of outside resources.

Staff development. No special training is necessary to implement this program.

Scott, Foresman & Company
Scott, Foresman Science (1986), K—6

Summary

Relationship to the *Science Framework* and the *Science Framework Addendum*

Contents coverage. The science topics listed in the *Science Framework* and the *Science Framework Addendum* are covered as follows. In the area of Science, Technology, and Society, careers in science and scientists are stressed. In Biological Science plants, animals, human health and nutrition, and ecosystems receive the main stress. Earth Science topics emphasized include astronomy, geology, and oceanography. The main stress in Physical Science is on matter, mechanics, sound, and light. Little treatment is given to human organ systems, meteorology, heat, electricity and magnetism, the nature of science, genetics, and evolution. Throughout the program, content from the three science areas is treated separately.

Teaching and learning activities. A variety of learning activities are introduced throughout the textbook, teaching plans, and reproducible masters. Hands-on activities to support the narrative occur at the beginning of each chapter in the textbook as well as at frequent intervals throughout the text. Extensive teaching plans are included for unit, chapter, and daily lessons. Step-by-step procedures are outlined in the lesson plans, and ancillary materials relevant to each lesson are identified. A key feature of this program is its stress on learning activities that enable students to develop thinking skills identified in the *Addendum*.

Areas needing supplementation. The following areas need supplementation to meet the California textbook standards: (1) topic coverage, particularly in the nature of science, genetics, evolution, human organ systems, heat, and electricity and magnetism; (2) specific provisions for accommodating the needs, interests, and abilities of slower learners; and (3) additional means for assessing students' progress beyond factual recall.

Textbooks and Related Materials

Topic Coverage

Topic	*Content emphasized*	*Content emphasized to a limited extent or not in evidence*
Science, Technology, and Society	Careers Scientists Methods of science Environmental issues	Nature of science Ethical issues
Biological Science	Plants Animals Human beings (nutrition, health) Ecosystems Cells Protists	Genetics Evolution Human beings (organ systems)
Earth Science	Astronomy Geology Oceanography	Meteorology
Physical Science	Matter Mechanics Energy: sound Energy: light	Energy: sources and transformations Energy: heat Energy: electricity and magnetism

Science, Technology, and Society

Two-page "Careers" features at the end of each unit provide brief sketches on six to ten careers related to the unit's theme. "Discover" and "Do You Know?" features are located at the end of chapters and highlight scientific and technological applications, scientific methods, and present information on careers and lives of some scientists. Three chapters for grade five and one chapter for grade three deal specifically with pollution problems, and one chapter for grade six contains descriptions of the effects of drugs on the human body.

Biological Science

Two chapters for grade five contain information on cells, and one chapter contains information on protists. One chapter for grade five contains information on genetics, and two chapters for grade four contain information on plant reproduction. Two chapters for grade five contain information on methods of adaptation for survival, including a discussion of the process of natural selection, but evolution is not discussed. A description of plants and animals is included for every grade level. Information on California flora and fauna is contained on sets of 100 to 150 "Western Region" reproducible masters. Organs of the human body are discussed in detail only for grade six, although some chapters emphasize the senses, nutrition, and health for grades two and three. Ecosystems (for which the foundations are built in kindergarten through grade two) are discussed in material designed for grades four through six.

Earth Science

Topics in this area are covered in clusters rather than in a succession of grade-level increments. Information on geology is introduced in one chapter for grade one and is contained in four chapters for both grades four and five. Information on astronomy is included in two chapters for grades two and five and three chapters for grade six. Information on meteorology is briefly introduced for grade one and then discussed in an entire chapter for grade three and in two chapters for grade four. Oceanography is discussed in single chapters for grades one and two and in a cluster of three chapters for grade six. A unit of three chapters for grade five is devoted to the problems of air, water, and land pollution.

Physical Science

The program contains much information on the topic of matter: four units on matter are included for grade one, two chapters are included for grade two, and four chapters are included for grade five. Light and sound are introduced at every other level beginning with grade one. Five chapters are devoted to mechanics, two for grade two and three for grade four. Electricity and magnetism are discussed in one chapter each for grades three and six. Two chapters for grade two and one chapter for grade five contain discussions of heat energy. Energy sources and transformations are discussed primarily in three chapters for grade six.

Relationships among the sciences and other disciplines. Content from the three main science areas is kept separate in the textbook narrative and in most of the lesson plans in the teachers' editions. However, the scope and sequence chart indicates that single units at four grade levels are related to both biological and earth sciences. Activities that involve using skills from other subject areas are provided in the "Options" sections of the lesson plans and some of the reproducible masters. Many of these activities represent an imaginative integration of science with other areas (for example, an activity for grade five requires the school librarian to compare the Dewey decimal system with the taxonomies of plants and animals, and an activity for grade six requires students to research inventors whose inventions made possible the development of practical appliances). Tie-in activities in the teachers' resource books parallel those in the teaching plans.

Learning Activities

Range of learning activities in the sciences. The main learning activities are observing and discussing teachers' demonstrations and other presentations, reading textbook passages and answering accompanying questions, carrying out hands-on activities, interpreting pictures (for example, comparing a meadow to a pond on such characteristics as plant life and habitats), and completing follow-up exercises.

Manipulative activities. A wide variety of hands-on activities is provided in both the texbook and teaching plans. These activities appear in the first lesson of each chapter, in at least two activity sections per unit, in more formal laboratory pages, and in some of the extension activities. Procedures for the hands-on activities are clearly explained and are accompanied by illustrations. The activities relate very well to chapter content, reinforce the development of science concepts, and require students to develop higher thinking skills, especially by answering the "Challenge" questions.

Thinking and science process skills. The teacher's edition identifies 12 process skills, including collecting data, observing, communicating, classifying, measuring, using space and time relationships, experimenting, inferring, predicting, interpreting, and formulating models. All skills are included in the *Addendum*.

All program objectives are written to include these skills, and they are introduced regularly, at appropriate grade levels, especially through the "Challenge" questions in the chapter exercises and hands-on activities. The highest levels of thinking represented in the program are those included in the process Relating in the *Addendum*.

Sequence of Topics and Activities

Organized sequence of development. The sequence of content moves from simple and concrete to more complex and abstract as the program progresses to higher grade levels. This series follows the *Framework* and *Addendum* very closely with respect to the grade levels at which topics are introduced. A few topics (plants, astronomy, meteorology, matter, and light and sound) are arranged according to a spiral organizational pattern.

Sequence within grade levels. Within grade levels chapter topics relevant to each of the three science areas are clustered in units dealing exclusively with that area. Units involving topics related to the outdoors are placed at the beginning and end of each textbook so that they can be studied during the fall and spring.

Ancillary Materials

Ancillary materials. Listings of component parts needed for daily lessons, including microcomputer courseware, are provided in the unit and lesson plans. In addition, a page in the front matter of each teacher's edition lists science and other subject-area skills by unit and indicates the lesson plans and reproducible masters to be used. Not referenced in the teaching plans are the Western Regional reproducible masters or the transparencies on human anatomy. Story tapes (for kindergarten), pupils' textbooks, and teachers' editions for grades one through six are available for clarification.

Other materials available from the publisher. Science equipment kits (for hands-on activities) are available for all grade levels.

Teachers' Materials

Teachers' guidance for lessons. Teaching plans are provided for unit, chapter, and daily lessons. Unit plans include content overview, listings of materials needed for hands-on activities, and suggestions for a unit opener. Chapter plans list objectives, content background, advance preparation needs, and suggestions for introducing the chapter. Lesson plans open with an objective and background information, continue with directions for teaching the lesson, and end with suggestions for follow-up activities. There are separate teaching plans for the textbook hands-on activities.

Questions to direct learning activities. Different types of questions in the program require students to utilize different levels of thinking skills. Following the reading of short narrative passages, students are required to answer questions in the "Think About It" sections. These sections range from requiring students to perform a simple review of new terms and recall of factual information to requiring students to make simple observations (for example, "What happened to the last marble the second time you pushed a marble into the row?"). Students are required to use higher levels of thinking (for example, synthesis, application, evaluation) in the "Challenge" questions, in the "Think About It" and chapter review questions, and in the laboratory and activity sections. For example, grade one students are required in "Challenge" questions to "Invent a new use of paper"; and grade two students are required to "Describe where heat flows when you make toast." In both of these situations, students have been presented with background information in the textbook and are required to use this information in a new way. Regularly included in the lesson plans are questions for the teacher to ask students in the course of discussing the chapter content. The purposes of these questions range from helping students understand basic concepts to provoking them to apply introduced information (for example, "Ask students to conjecture about which is more important, magnetism or electricity").

Provisions for individual differences. At the front of each teacher's edition is an essay, "Classroom Management," which briefly discusses topics such as teaching students of varied abilities and mainstreaming special education students. General suggestions provided in this section include having the teacher give very specific directions, repeat directions, reinforce directions with visual examples, and so forth. In addition, the teaching plans for daily lessons and hands-on activities include suggestions for tailoring lessons to learning disabled students; many of these suggestions would be appropriate for all students (for example, a lesson for grade one on animal sizes requires students to sort animal pictures into groupings of animals that are either larger or smaller than the student). Otherwise, the teacher must decide how to adapt lessons to differences in students' abilities and interests.

Extension and enrichment activities. The daily lesson plans include "Options" sections that include activities to reinforce the development of concepts and skills (often a teacher's demonstration), enrichment activities (often library research topics), and

special education activities. "Have You Heard?" and "Find Out" features are located in the margins of the text for grades three through six and give brief anecdotal information to enrich the content. "Do You Know?" "Discover," and "Imagine" feature pages (one per chapter) provide additional narrative information, and an "On Your Own" page at the end of each unit suggests further projects, such as researching specific topics, conducting simple hands-on activities, and so forth. "Challenge" questions are included in the chapter review questions and in the "Think About It," "Laboratory," and "Activity" features for students with above-average interests and abilities. Reproducible masters in the teacher's resource book include work sheets for additional hands-on exercises, skill development and assessment, and activities relating science to other subject areas.

Assessment and Evaluation Techniques

Variety of assessment techniques. Chapter and unit tests are provided for grades three through six on reproducible masters. These tests consist of multiple choice, matching, true or false questions, and questions requiring short answers; occasionally questions include diagrams or illustrations that students must use to answer questions. Oral chapter tests are provided for grades one and two, with written tests on reproducible masters for each unit. Answer keys are included. But directions for administering, scoring, or interpreting test results are not included.

Assessing a range of learning outcomes. Test items focus on the key concepts introduced in the textbook but require students to factually recall information. However, some of the items that appear in the "Tie It Together" sections tap higher level thinking skills (for example, "Look at the examples of two kinds of evidence. Imagine you were on a field trip and found this evidence. Write a report about what you saw. What can you interpret from this evidence?"). The science square-off courseware tests higher levels of thinking skills.

Implementation Requirements

What the teacher has to do. Teacher preparation time is minimal and consists mainly of collecting materials for hands-on activities and arranging for audiovisual and other supplementary materials.

Staff development. No special training of teachers is necessary for satisfactory implementation of this program because it does not represent an unfamiliar approach to the study of science.

Scott, Foresman & Company
Scott, Foresman Earth Science (1986/83), 7—8
Scott, Foresman Life Science (1986/83), 7—8
Scott, Foresman Physical Science (1986/83), 7—8

Summary

Relationship to the *Science Framework* and the *Science Framework Addendum*.

Contents coverage. The science topics listed in the *Science Framework* and the *Science Framework Addendum* are covered as follows. In the area of Science, Technology, and Society, the strongest emphasis is given to careers of scientists and to pollution as an environmental problem. In Biological Science the topics of cells, evolution, protists, plants, animals, human organ systems, and ecosystems are heavily emphasized. The main emphases in Earth Science are on astronomy, geology, and meteorology. The stress in Physical Science is on matter, mechanics, energy sources and transformations, light energy, and electricity and magnetism. Lesser treatment is given to the nature of science, scientific methods, genetics, oceanography, ethical and environmental issues, heat, energy, and sound. Individual textbooks are devoted to life, earth, and physical science.

Teaching and learning activities. The main learning activities are reading and discussing passages and answering questions in the textbook, carrying out hands-on activities, and completing a variety of skill work sheets and optional projects suggested in the students' textbooks. Hands-on and demonstration activities are integrated regularly in the content, but the skills required usually do not extend beyond Comparing, as defined in the *Adder Form*. Teaching plans contain useful background information and suggest interesting projects and motivational questions but do not include actual teaching strategies or suggestions for modifying lessons to meet students'

needs. Key features of the program include the annotated background notes, the clear language used in presenting procedures for the hands-on activities, the coverage of current topics, and the inclusion of one teacher demonstration for each lesson.

Areas needing supplementation. The following areas need supplementation to meet the California textbook standards: (1) topic coverage of the nature of science; (2) levels of thinking represented in the narrative and main learning activities of the textbook and teaching plans that regularly go beyond the level of Comparing; (3) provisions for individualized instruction; and (4) assessment of students' progress to tap higher levels of thinking, skills acquisition, and affect.

Textbooks and Related Materials

Topic Coverage

Topic	*Content emphasized*	*Content emphasized to a limited extent or not in evidence*
Science, Technology, and Society	Careers Environmental issues (pollution, conservation) Scientists	Nature of science Methods of science Ethical and environmental issues (other)
Biological Science	Cells Evolution Protists Plants Animals Human beings (organ systems) Ecosystems	Genetics
Earth Science	Geology and resources Astronomy Meteorology	Oceanography
Physical Science	Matter Mechanics Energy: sources and transformations Energy: light Energy: electricity and magnetism	Energy: heat Energy: sound

Science, Technology, and Society

The opening unit in each book presents an overview of the science area, its methods, and laboratory safety. A chapter on classification and identification is included in the life science volume. Separate units in each science area present problems primarily related to pollution, energy resources, and conservation. Individual scientists are mentioned in connection with their discoveries. Two-page spreads at the end of each unit give brief sketches on six careers related to unit topics.

Biological Science

Two chapters on cells are included in the introductory unit. Single chapters are devoted to genetics and to fossil records, mutations, and natural selection. Evolution is addressed. A unit on the "functioning organisms" contains two chapters on protists and two chapters on plants. Animals are discussed in four chapters in a single unit. Human organ systems are described in six chapters in a single unit. A separate chapter in human behavior includes information on drugs, alcohol, and tobacco. Ecosystems are described in three chapters in a unit on ecology. Nine lessons and activities on California flora and fauna are included in the "Regional Activities: West" reproducible masters, which contain special lessons for each of the three science areas.

Earth Science

Four chapters are devoted to astronomy. Geology is covered in ten chapters in two units. Five chapters

on meteorology are included in a unit that also contains two chapters on oceanography.

Physical Science

Matter is discussed in eight chapters, including chapters on acids, bases, and salts. Six chapters on mechanics and three chapters in two units on energy sources and transformations are included. Heat energy is described in one chapter. Four chapters—two devoted to light and two devoted to sound—are included in a unit introduced by a chapter on waves. Three chapters on electricity and magnetism, including one on electronics, are included.

Relationship among the sciences and other disciplines. Concepts and information related to each of the disciplines are treated separately. Although the earth science textbook includes a discussion of energy sources, these concepts are not related to concepts in physical science. Special provisions for utilizing skills from other subject areas in the program are not included, although students consistently measure, graph, and record information and frequently are required to research special interest projects.

Learning Activities

Range of learning activities in the sciences. The main student learning activities are reading and discussing textbook passages, answering chapter section and review questions, carrying out hands-on activities, completing follow-up activities presented on work sheet and workbook pages, and observing demonstrations.

Manipulative activities. Hands-on experiences are provided in the textbook and in a separate activity guide for each discipline. In the textbook two hands-on activities are presented in each chapter; each activity is closely related to the chapter's content. Activities primarily require students to manipulate objects or to assemble simple models from which they observe, compare, and record data (often on graphs). For example, students are required to observe and describe the various functions of different feathers, to observe and record the changes in heart rate under different conditions, to observe and classify soil types, to manipulate jigsaw pieces of the earth to understand shifting continents, to assemble a model of the elliptical Milky Way galaxy, and so forth. Laboratory activities are well explained in simple terms, and each activity is presented in outline form (for example, Tear. . . , Place. . . , Take. . . , Divide. . . .). The activity guides offer one to three hands-on activities to complement each chapter and also feature simple manipulative exercises in which students are required to observe and relate data to real life situations. For example, in earth science students are required to investigate the effect of pressure on glacial ice layers by using an ice cube to simulate a glacier. Following the experiment, students are asked to identify factors that could influence glacial movement. In addition, some demonstrations presented in the teaching plans for each chapter section require students to participate. For example, a life science demonstration requires students to design an experiment to test the presence of a growth hormone that certain tadpoles may release.

Thinking and science process skills. A separate scope and sequence chart identifies the science process skills presented in each chapter. Using the *Framework* definitions, the highest level of thinking contained in the hands-on activities is Comparing. Students regularly observe, compare, and record data but are not required to apply the information in new situations. "Analysis" questions that follow each hands-on activity merely refer students to the main activity. (For example, in an activity involving air pressure, students are asked to "Explain why the water does not run out of the straw while your finger is on one end." In another activity, students are asked to explain "What type of star have you graphed on the line?") Questions in both the narrative portion of the textbook and in the tests require students to recall information (for example, "Where does soil come from? What are the three soil zones?). Chapter objectives are also written at the recall level (for example, "Define four types of galaxies." "Compare the outer planets." "Describe asteroids.").

Sequence of Topics and Activities

Organized sequence of development. Each textbook begins with a unit that establishes a reason for studying the discipline, presents the recent findings of research in the discipline, and concludes with arguments for conversation and a list of alternative sources of resources. Within disciplines the order of topic presentation varies. For example, the life science textbook begins with small concepts and builds to larger ones. For example, cells are discussed, followed by discussions on organisms and classification systems. The textbook concludes with a discussion of global relationships, including information on ecosystems and biomes. Earth science topics begin with a discussion of the concept of the universe, continue with a discussion of the Earth, and end with a discussion on atoms. The order of physical science topics follows the outline suggested in the *Addendum* except for the following two exceptions: a chapter on work and machines is located in a unit on energy rather than in the previous unit on motion, and a chapter on exploring the universe has been added at the end of the textbook. The order of topics within chapters primarily moves from simple to complex (for example, from simple to

compound machines). Information from the three disciplines is kept separate.

Ancillary Materials

Ancillary materials. The work sheets in the activity guide and study guide are referenced in the chapters' teaching plans. The reproducible masters in the teacher's resource book and in the test packet are not mentioned in the teaching plans but are clearly marked to indicate their use. "Science Square Off" computer software is also available but is not referenced in the teaching plans.

Other materials available from the publisher. None.

Teachers' Materials

Teachers' guidance for lessons. In the teachers' editions, brief discussion of the content organization and supplementary materials is followed by a section ("Answers" and "Teacher's Notes") that suggests teachers' demonstrations, answers to chapter section and activity questions, and audiovisual and professional resources to use with each chapter section. Additional guidance for each unit and chapter appears in the margins of the teacher's edition and identifies materials needed for future lessons (for example, seeds, organs, and so forth) and briefly summarizes related computer software programs. Chapter guidance consists of a chapter overview, "Icebreaker" questions to introduce each chapter section (for example, "How do you go about solving a problem?"), suggestions for activities to enrich the lessons (for example, students are directed to invite a guest speaker, to collect pictures for a bulletin board display. or to obtain literature or specimens for the class to examine), and answers to the chapter review questions. Daily lesson plans are not included, but annotations in the teacher's edition contain background information that can be used to supplement the narrative and vocabulary terms.

Questions to direct learning activities. Each chapter section begins with questions designed to focus attention on the reading assignments (for example, "What is a compound machine?" "What are the functions of blood?"). Answers to these questions are provided in the lesson. "Reviewing It" questions require students to recall factual information presented in sections of the chapters. "Icebreaker" questions located in the teaching plans and chapter review questions are designed so that students will learn a "correct" answer (for example, "What is the strongest muscle in your body?"). However, some of the chapter review questions require students to demonstrate skills other than recall (for example, "Do you think mammals would occupy as many environments as they do now if they all had identical limbs?").

Provisions for individual differences. The teacher's edition contains sample activities that teachers can use for developing lessons and chapter projects that correspond to differences in students' abilities and interests.

Extension and enrichment activities. Features located in the margins of students' textbooks include "Challenge" (suggestions for extension projects for each chapter section) and "Have You Heard?" (narrative enrichment information). Topics for additional research projects are suggested at the end of each chapter. Other extension and enrichment activities are included in separate components. A teacher's resource book contains overhead transparency masters and reproducible masters for "Regional Activities" (for example, students are required to interpret a monthly food intake chart and to answer questions on the food habits of the bobcat) and "Urban Activities" (for example, students are required to observe fish in an aquarium feeding from containers of different types of food). All masters are keyed to specific units or chapters. A study guide contains three reproducible masters for each chapter. Two of the masters are designed to be used with review exercises, and the masters often include diagrams. The third master includes a puzzle. A separate activity guide describes additional manipulative exercises (for example, drawing the effect of salt solution on an onion cell).

Assessment and Evaluation Techniques

Variety of assessment techniques. Assessment techniques are included in the student's textbook, teacher's edition, test packets, and teacher's resource book for each discipline. Chapter tests in the student's textbook consist of vocabulary matching items and general multiple-choice items. Two alternate forms of chapter tests in the teacher's resource book frequently include diagrams and illustrations related to the matching, multiple-choice, and essay questions. These same alternate chapter tests are available (without the "Regional Activities" and "Urban Activities" work sheets) in a separate test packet. Unit tests or end-of-year tests are not included.

Assessing a range of student outcomes. Test items require students to focus on chapter concepts and to recall factual information. Although tests in the teacher's resource book contain essay questions, these questions merely require students to summarize (for example, "Why are there more craters on the moon than on the earth?"). However, some of the illustrated questions require students to use higher levels of thinking. For example, students are required to draw arrows on plant diagrams to show the direction of carbon dioxide, oxygen, and water movement and to make predictions based on illustrated variables, such as beakers of water with ice cubes at sea level and

without ice cubes at sea level. Provisions for assessing affect or students' values are not included.

Imple.nentation Reqt ements

What the teacher has to do. Teacher preparation time is minimal and consists mainly of collecting materials for the hands-on activities and demonstrations and arranging for audiovisual and suppiementary materials.

Staff development. No special training is needed to implement this program because it does not represent an unfamiliar approach to the study of science.

Silver Burdett Company
Silver Burdett Science (1985), K—6

Summary

Relationship to the *Science Framework* and the *Science Framework Addendum*

Contents coverage. The science topics listed in the *Science Framework* and the *Science Framework Addendum* are covered as follows. In the area of Science, Technology, and Society, the strongest emphasis is given to careers in science, to scientists, and to environmental issues. In Biological Science the topics of animals, plants, human beings, and ecosystems are heavily stressed. The main emphases in Earth Science are on astronomy, geology and resources, and meteorology with a lesser emphasis placed on oceanography. The stress in Physical Science is on matter, mechanics, energy, and electricity and magnetism. Little treatment is given to the nature of science, evolution, genetics, cells, protists, and ethical issues. Throughout the program, content from the three science areas is treated separately.

Teaching and learning activities. A wide range of learning activities is suggested in the textbooks, teachers' editions, and activity sheets. The hands-on and demonstration activities are detailed and involve students in a variety of experiences. Complete lesson plans give step-by-step suggestions for daily lessons, including a variety of exercises and the correlation of duplicating masters in the teacher's resource book. Key features of this program are the variety of activities suggested to enrich and extend the program for average learners, the treatment of scientific and environmental problems as processes rather than as isolated problems or case studies, and the motivational activities suggested for daily lessons that involve students (for example, examining seed parts, artwork, discussion, and so forth).

Areas needing supplementation. The following areas need supplementation to meet the California textbook standards: (1) topic coverage, particularly the nature of science, evolution, genetics, and cells: (2) provisions for addressing the needs of below-average students beyond the limited concrete learning experiences (handling objects) offered in some lessons; (3) more laboratory experiences that branch out from merely reinforcing the content of the text to allowing for students' speculation of outcome; and (4) assessment of students' progress, including scientific attitude and appreciation.

Textbooks and Related Materials

Topic Coverage

Topic	*Content emphasized*	*Content emphasized to a limited extent or not in evidence*
Science, Technology, and Society	Careers Scientists Environmental issues Methods of science	Ethical issues Nature of science
Biological Science	Animals Plants Human beings (organ systems) Ecosystems	Cells Genetics Evolution Protists
Earth Science	Astronomy Geology and resources Meteorology	Oceanography
Physical Science	Matter Mechanics Energy: sources and transformations Energy: heat Energy: light Energy: electricity and magnetism Energy: sound	

Science, Technology, and Society

Pollution is discussed in Earth Science sections for grades one, two, three, and five. Natural resources are discussed for grades two, three, four, five, and six. Energy sources are studied throughout the program. These include fossil fuels (grades three through six), ocean power (grade four), fusion (grades five and six), and nonconventional forms of energy (solar, hydroelectric, geothermal bioconversion, and wind), along with nuclear power and its controversial nature (grade five). "People in Science" sections, which are featured regularly for grades three through six, provide brief sketches of one scientist for each science area. From three to six careers are described in "Science in Careers" sections for grades three through six. There is no direct treatment of the nature of science or of the basic methods of science, although information on these two topics is implicit in much of the narrative and in the hands-on activities.

Biological Science

Information on cells is introduced briefly for grade four and then discussed in an entire chapter for grade six. Animals and their young are described in chapters designed for grades one and three, and a full chapter for grade six is devoted to animal reproduction and development. A discussion of protists is included in one chapter section for grade six. Full units are devoted to human organ systems, and full chapters are devoted to ecosystems for grades four through six. Chapters for grades one through three deal with health and safety. Separate booklets of ten reproducible masters that include outlined illustrations and explanatory text on California flora and fauna are available for each grade level.

Earth Science

At least one chapter for each grade level is devoted to astronomy, geology (except grade two), and meteorology topics. The main chapter on oceanography is included for grade four, although chapters on water and the water cycle are included for grades two and three, and a chapter on ocean resources is included for grade six. Also, a single *Earthquake Awareness* booklet consisting of nine copymasters is available for use with all grades.

Physical Science

Chapters on matter are found for all grade levels, and chapters on changes in matter are included for grades three through six. Information on energy sources and transformations is included for grades two through six; information on mechanics is included for grades one through four; information on heat is included for grades two and four; information on light is included for grades one and six. The main chapters on electricity and magnetism are intended for grades four through six.

Relationships among the sciences and other disciplines. Textbook units and chapters are organized in the following four separate blocks: Life Science, Earth Science, Physical Science, and the Human Body. Although there is no bridging of subject matter from one block to another, some topics within units are extended and interrelated, especially at the upper grade levels. For example, a Life Science unit for grade four contains separate chapters on plants and animals and chapters that deal with the relationships between plants and animals.

Many of the program's activities require students to draw on skills from other subject areas. "Tie-in" activities from the lesson plans involve the use of mathematics, language arts, art, social studies, and reading skills; unit-end "Developing Skills" pages focus on vocabulary development and the use of graphs and charts.

Learning Activities

Range of learning activities in the sciences. The main learning activities require students to attend teachers' presentations, read textbook passages, participate in discussions, draw on personal experiences, answer questions (from textbooks and lesson plans), and carry out hands-on exercises.

Manipulative activities. The main hands-on experiences are provided in the "Activity" pages found in each chapter. Procedures are written in simple, clear prose and contain a sequenced set of directions. The intent of most experiments is to support or verify what has already been taught in the narrative. For example, students in grade five are required to read in a narrative that bird bones are hollow and that this feature helps birds to fly. An experiment four pages later invites the students to observe chicken bones and concludes with the question, "What feature of a bird's feathers and bones helps it to fly?" However, some experiments offer new and discrepant events for students to consider and provide an opportunity to discover or apply new information. For example, when studying the moon and sun and why they look the same size, students in grade one are required to experiment by holding a basketball and baseball at different arm lengths to see how the distances affect the balls' perceived sizes.

While most laboratory experiments do not label specifically the higher level of thinking skills that are required for the students to complete the activity, experiments can be extended beyond the lower level skills of observing, comparing, describing, and recalling information.

Thinking and science process skills. A listing of three categories of "basic thinking skills" is presented in the introduction to the teacher's edition. Although the teacher's edition often is lax in labeling the higher level thinking skills that are present in a given lesson, these skills are addressed throughout. For example, in material for grade three, the only skills identified in the objective are classifying and describing; however, while following the suggested lesson plan, the teacher is required to ask students to hypothesize, to make inferences, to make and label a diagram, and to identify cause and effect relationships.

Sequence of Topics and Activities

Organized sequence of development. The sequencing of topics from lower to higher grade levels mainly follows a pattern of simple to more complex and detailed (for example, discussions of roots for grade one, root hairs for grade five, basic plant needs for grade one, and chlorophyll and photosynthesis for grade five) and from concrete to more abstract.

Much of the topic development follows a spiral sequence and includes frequent reviews of major topic areas. However, gaps in some topic strands, such as oceanography, sound, and electricity, also exist in material written for the primary grades.

Sequence within grade levels. Within grade levels, the major science blocks may be taught in any sequence, especially to take advantage of the best seasonal conditions for taking field trips or obtaining specimens. Also, chapters within grade levels are unrelated and could be taught independently.

Ancillary Materials

Ancillary materials. The lesson plans include regular references to a variety of work sheets and workbook pages. Other ancillary components such as the *Invention Convention* and *Science Olympics* booklets, picture packets, sound and color filmstrips, and science labs containing materials for carrying out the hands-on activities for each level are not referred to in the lesson plans. However, the materials are keyed so that teachers will know with what lesson the materials should be used.

Other materials available from the publisher. None.

Teachers' Materials

Teachers' guidance for lessons. Daily lesson plans in the teachers' editions offer detailed guidance for teachers, including an introductory/motivational activity (typically a demonstration and discussion by the teacher), background information on the topic and vocabulary, step-by-step teaching strategies keyed directly to each textbook page, suggested "Tie-In" activities that are directly related to other subject areas (social studies, mathematics, art, language arts), suggested "Enrichment Activities," "Application Strategies," and review questions.

Questions to direct learning activities. Each lesson opens with a question that usually requires students to recall facts (for example, "What is a light year?" and "How do muscles move?" [grade five]). The very same question is asked again as a review question at the end of the lesson and provides closure for the lesson. However, teachers are provided with numerous and varied questions to ask the students. These questions cover a gamut of thinking skills from the lowest skills to the highest skills and emphasize skills at the lower level. Review questions are provided at the end of every chapter. These questions usually require students to recall facts, but some extension or application questions are included.

Provisions for individual differences. Teaching plans for each chapter include suggestions for mainstreaming that usually consist of concrete learning experiences involving the manipulation of objects as well as one "IEP Goal for Mainstreaming" (for example, "Using common objects as examples the student should be able to name three simple machines and give an example of each." [grade three]).

Extension and enrichment activities. The program provides ample activities for average and above-average students. The teacher's resource packet contains "Science Olympics" reproducible masters for the academically gifted (for example, "Make and design a functioning water clock." [grade four]), "Invention Convention" work sheets requiring students to apply science knowledge as they design their own inventions (suggestions include design of helpful products that will work in a weightless environment), and "Challenge" work sheets designed to develop "higher levels of critical thinking and problem-solving skills" (for example, "In one place you observe a school of fish that forms every morning but breaks up at night. Why do you think this happens?" [grade four]). Daily lesson plans frequently offer suggestions for reinforcement and extension that can be directed towards selected students (for example, "Have interested students read about the recent creation, by volcanic eruption, of the island off the coast of Iceland. They can report their findings to the class."). Lesson plan sections titled "Science for the Exceptional Student" offer suggestions for gifted students (for example, solving word puzzles, writing puzzles about specific science words, writing a research report, and so forth).

Assessment and Evaluation Techniques

Variety of assessment techniques. Printed chapter and unit tests are provided for grades three through six on reproducible masters. The chapter tests consist

of fill-in, true-false, matching, and multiple-choice items, plus one or two short essay items. The unit tests are made up of 20 multiple-choice items. In addition, many of the questions in the margins of the teachers' editions (with answers in parentheses) could be used for informal assessment; some of the end-of-chapter questions in the textbooks and problems included on the work sheets could be used for informal assessment as well.

Assessing a range of learning outcomes. Most of the objective and short essay items on the printed tests require students to recall facts. Some of the short answer items attempt to draw on higher levels of thinking (for example, "Explain how the oceans are important to us" [grade four] and "Describe some ways in which people may use space in the future" [grade six]). Other provisions for the assessment of skills can be found in the work sheets on reproducible masters. A few of the suggested teaching strategies provide for the informal assessment of attitudes and values (for example, "Point out that these sources of energy will last longer if people conserve them.").

Implementation Requirements

What the teacher has to do. Teacher preparation time is minimal and consists mainly of acquiring laboratory supplies and equipment and arranging for supplementary materials, including audiovisual and print materials.

Staff development. This science program does not differ from familiar standards. Special training is not indicated for experienced teachers.

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