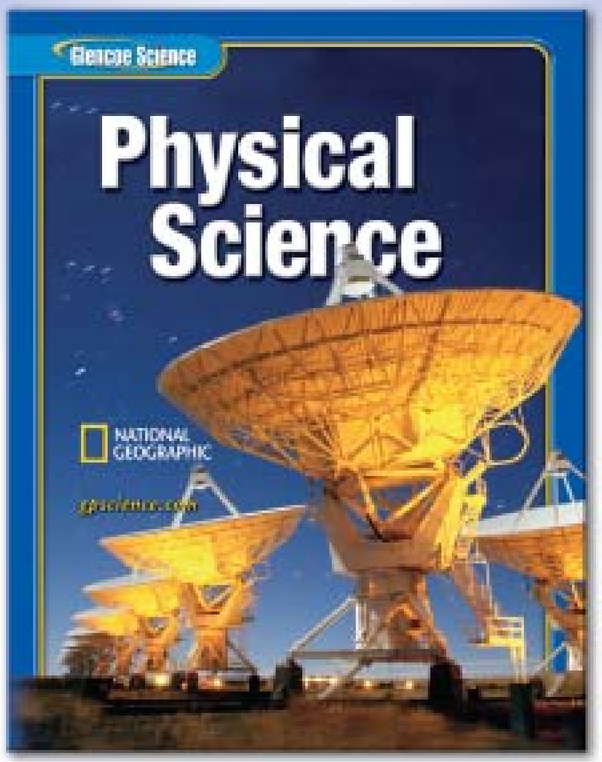
Glencoe Science White Paper

Research-Based Strategies Used to Develop



Glencoe Physical Science

RAISING THE BAR

The National Science Education Standards

The National Science Education Standards consist of four over-arching principles **(Figure 1)** and a total of 50 specific standards in the areas of Science Teaching, Professional Development for Teachers of Science, Assessment in Science Education, Science Content (broken down by topic area and grade levels), Science Education Program, and Science Education System. To say that the Science Standards have raised the bar for science education in the United States is truly an understatement. Never before has science education been guided by a national set of principles and standards. Never before have our science education goals been set this high. And never before have science teachers and administrators been this challenged to meet goals of excellence in science programs.

Science teachers always have worked to motivate students to read science texts, coordinate visual and verbal information, and study using effective, research-proven strategies. However, most teachers also have limited resources and must choose how much time and energy to devote to helping students develop these strategies while still allowing them to become self-reliant and independent learners. Administrators and teachers are challenged to reach multiple goals, simultaneously helping students to:

- understand and remember standards-based science and apply it to new contexts,
- perform well on high-stakes achievement tests,
- prepare to succeed in their next science course, and
- become productive and scientifically literate citizens.

The Science Standards describe a vision of the scientifically literate person and present criteria for science education that will allow that vision to become reality. But now, more than ever, science educators are struggling to find appropriate resources to help them meet the ideals set by the Science Standards. This paper focuses on the Science Standards as they apply to middle and high school, as well as the resources now available to those involved in physical science education.

Figure 1

Science Standards' Four Principles

- Science is for all students.
- Learning science is an active process.
- School science reflects the intellectual and cultural traditions that characterize the practice of contemporary science.
- Improving science education is part of systemic educational reform.

For more information, see the National Research Council's *National Science Education Standards* (1996) available at www.nap.edu.

Figure 2

Statements on Inquiry Learning and Laboratory Activities

NSTA Position Statement – *The National Science Education Standards:*

The National Science Teachers Association strongly supports the National Science Education Standards by asserting that:

- Teachers, regardless of grade level, should promote inquiry-based instruction and provide classroom environments and experiences that facilitate students' learning of science…
- Professional development activities should involve teachers in the learning of science and pedagogy through inquiry…
- Inquiry should be viewed as an instructional outcome (knowing and doing) for students to achieve in addition to its use as a pedagogical approach…
- Science programs should provide equitable opportunities for all students and should be developmentally appropriate, interesting and relevant to students, inquiry-oriented, and coordinated with other subject matters and curricula.

(Adopted by the NSTA Board of Directors, January 1998. For more information, see www.nsta.org.)

National Research Council's Committee on Developing the Capacity for Selecting Effective Instructional Materials – *Selecting Instructional Materials: A Guide for K–12 Science:*

> The *Standards* encourage teachers to engage students in the process of scientific inquiry by directing them to ask questions about the natural world, design experiments to answer these questions, interpret the experimental results, and discuss the results with their peers. Such inquiry-based teaching enhances student understanding of scientific concepts and it is intended to equip all students with the analytical skills they will need in the future to interpret the world around them (p. 6).
>
> (For more information, see the National Academy Press Web site at www.nap.edu.)

CHANGING PEDAGOGY: INQUIRY-BASED SCIENCE LEARNING

To support the Teaching, Professional Development, Assessment, Content, Program, and System Standards, the Science Standards begin with four guiding principles. One principle stressed consistently throughout the standards is that learning science should be an active process.

> **Teaching Standard A:**
> Teachers of science plan an inquiry-based science program for their students.
>
> **Content Standards—(Grades 5–8 and 9–12)**
> **Science as Inquiry/Content Standard A:**
> As a result of activities in grades 5–8 and grades 9–12, all students should develop
>
> - Abilities necessary to do scientific inquiry.
> - Understandings about scientific inquiry.
>
> **Science Education Program Standard B:**
> The program of study in science for all students should be developmentally appropriate, interesting, and relevant to students' lives; emphasize student understanding through inquiry; and be connected with other school subjects.

This stress on inquiry learning, through laboratory activities and other methods, has been echoed in the position statements of the National Science Teachers Association and the National Research Council's Committee on Developing the Capacity for Selecting Effective Instructional Materials, shown in **Figure 2,** that strongly support the Science Standards. The repeated recommendations to use an inquiry approach reflect the growing trend toward constructivism in science education. Constructivism is based on the idea that students construct their own knowledge in a process that is both individual and social. Research shows us that teachers cannot simply transfer knowledge to students by lecturing or assigning readings. Students have to take an active role in their own learning. To accomplish this, science programs must include ample opportunities for students to explore, experiment, question, debate, discuss, and discover.

This is not to say that teachers are removed from the educational process. Rather, the learning experience should include an appropriate balance of explicit and implicit instruction.

Implicit instruction occurs when students figure out for themselves how to grapple with problems and construct conceptual knowledge (Pressley et al., 1992; Shulman & Keislar, 1966). This occurs when students engage in project-based and subject-integrated science activities, open-ended science labs, and science fair projects.

Explicit instruction occurs when teachers and textbook authors clearly explain science concepts and problem-solving strategies to students in a direct, low-inference fashion (Duffy, 2002). Explicit instruction provides students with needed background knowledge on how, why, and when to use learning and studying strategies. This leads to learner independence (Zimmerman, 1998, 2000, 2001) and productive dispositions toward achievement (Alderman, 1999). Explicit instruction is critical to good science teaching, because exclusively using implicit instruction often fails to equip developing students with the necessary reading, writing, and studying strategies (Graham & Harris, 1994, 2000).

Teachers, curricula directors, and administrators are left with a difficult task: How can we design a science program that provides the right balance of implicit and explicit instruction and includes a curriculum with the proper age-appropriate content and ample opportunities for exploration and inquiry learning?

History of the Science Reform Movement

- **1983** – National Commission on Excellence in Education releases *A Nation at Risk: The Imperative for Educational Reform. A Nation at Risk* sparks a wealth of studies and evaluations comparing U.S. students' skills in literacy, science, and mathematics to students in other countries.
- **1986** – American Association for the Advancement of Science launches "Project 2061" to develop a high level of science literacy among all U.S. citizens.
- **1989** – "Project 2061" publishes *Science for All Americans,* which outlines the knowledge and characteristics necessary for a scientifically literate citizen.
- **1990** – National Governors' Association and President Bush release the National Education Goals during the State of the Union Address. Goal Four states: "…by the year 2000, U.S. students will be first in the world in science and mathematics achievement."
- **1991** – National Research Council begins coordination of the development of *National Science Education Standards.* NRC convenes a National Committee on Science Education Standards and Assessment and a Chair's Advisory Committee that begin development of national content, teaching, and assessment standards in science education.
- **1993** – "Project 2061" publishes *Benchmarks for Science Literacy* which establishes minimum goals for what students should know and be able to do at various grade levels in a number of content areas.
- **1995** – National Research Council publishes the *National Science Education Standards.*

For more detailed information on the history of the science education reform movement, see *NSTA Pathways to the Science Standards: Guidelines for Moving the Vision into Practice, Second High School Edition* (2004) available at www.nsta.org.

SUPPORTING THE SCIENCE STANDARDS WITH *GLENCOE PHYSICAL SCIENCE*

One of the concepts explained in the Science Standards is that the Standards themselves are meant as descriptive ideals and guidelines. They represent what can be accomplished, but leave the specifics of implementation to others. The responsibility for putting the vision of the Standards into action belongs to everyone with an interest in science education: teachers, students, administrators, supervisors, policymakers, assessment specialists, scientists, teacher educators, parents, businesses, local community members, curricula developers, and publishers. Glencoe / McGraw-Hill, one of the nation's largest textbook developers, has risen to the challenge of the Science Standards and created an inquiry-based program for middle school and high school physical science.

Glencoe Physical Science responds to the need of science educators for curricula that accomplish multiple goals. To help educators reach the Science Standards' goals, such curricula must:

- Support the recommended Content Standards,
- Give students consistent opportunities for active and extended science inquiry,
- Provide opportunities for scientific discussion and debate,
- Provide various tools to regularly assess student understanding, and

The Inquiry Teaching Approach

Teaching science using an inquiry approach means teachers must go far beyond merely lecturing students and encouraging them to memorize fact-based lecture notes and textbook explanations in preparation for exams. Rather, students should be allowed to experience the scientific process as scientists do, developing critical-thinking and problem-solving skills through the use of engaging activities and active learning strategies. Both the *National Science Education Standards'* Teaching Standards and Content Standards put high value on inquiry as an important component of science teaching and learning.

According to the National Science Teachers Association's *Pathways to the Science Standards: Guidelines for Moving the Vision into Practice, Middle School Edition* (2000):

> Students develop new knowledge for themselves when they make connections between the evidence they gather through their own observations and the main body of knowledge accumulated by science. Teachers should facilitate extensive and varied experiences that allow students to examine enough evidence to develop logical descriptions, explanations, predictions, and models (p. 44).
>
> An inquiring mind, curiosity, and the ability to apply critical thinking to problems are basic to scientific inquiry. Carefully phrased questions will lead the students toward the scientific method of investigation. Students should be allowed to ask questions, make observations, and ask more questions, thus refining the investigative process. How to ask a good science question should be part of every science class (p. 46).

For more detailed information on the inquiry teaching approach, see *NSTA Pathways to the Science Standards: Guidelines for Moving the Vision into Practice, Middle School Edition* (2000) available at www.nsta.org.

- Connect science to other areas of learning, including natural phenomena and science-related social issues that students discover in everyday life.

The approach of the *Glencoe Physical Science* program allows students to discover concepts within each of the Content Standards, giving them opportunities to make connections between scientific concepts and the real world. The *Teacher Wraparound Edition* includes Chapter Organizers at the beginning of each chapter which clearly outline the Science Standards covered in each section.

REACHING THE SCIENCE STANDARDS—RESEARCH-BASED STRATEGIES USED IN *GLENCOE PHYSICAL SCIENCE*

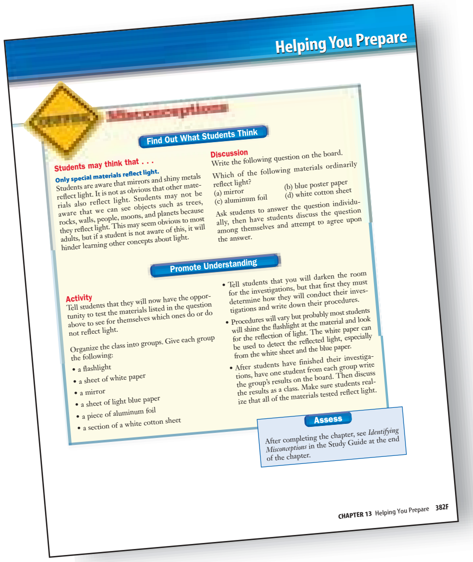
To fulfill the characteristics of standards-supporting curricula, *Glencoe Physical Science* was developed using six specific, research-based instructional strategies. These strategies support inquiry-based instruction by providing ideas for and examples of how scientific inquiry can be conducted and by providing the highest quality information to support student inquiry. The six strategies are as follows:

1. Using prior knowledge to learn new information and correct misconceptions

When students recall previously learned information, they can learn new, related information more effectively. Strategies to do this include: 1) recalling information, asking questions, and using analogies; and 2) elaborating on information from the textbook or teacher. Asking students to use prior knowledge located in a text may remind them of information already in their long-term memory that, for some reason, is not easily remembered (Bransford, 1979; Pressley & McCormick, 1995). This research-based strategy is also central to successful reading and writing performances (Guthrie & Alvermann, 1999; Holliday, Yore & Alvermann, 1994).

Glencoe Physical Science references information previously explained to facilitate learning of new information. Tie to Prior Knowledge features in the *Teacher Wraparound Edition*, refer to concepts in previous chapters, different branches of science, other school subjects, and to students' personal experiences to make the concepts more relevant.

Another advantage of using prior knowledge and linked topics to learn new information is that it provides an opportunity to correct misconceptions.


Helping You Prepare

Find Out What Students Think

Students may think that . . .

Only special materials reflect light.

Students are aware that mirrors and shiny metals reflect light. It is not as obvious that other materials also reflect light. Students may not be aware that we can see objects such as trees, rocks, walls, people, moons, and planets because they reflect light. This may seem obvious to most adults, but if a student is not aware of this, it will hinder learning other concepts about light.

Discussion

Write the following question on the board.

Which of the following materials ordinarily reflect light?

(a) mirror (b) blue poster paper

(c) aluminum foil (d) white cotton sheet

Ask students to answer the question individually, then have students discuss the question among themselves and attempt to agree upon the answer.

Promote Understanding

Activity

Tell students that they will now have the opportunity to test the materials listed in the question above to see for themselves which ones do or do not reflect light.

Organize the class into groups. Give each group the following:

- a flashlight
- a sheet of white paper
- a mirror
- a sheet of light blue paper
- a piece of aluminum foil
- a section of a white cotton sheet

- Tell students that you will darken the room for the investigations, but that first they must determine how they will conduct their investigations and write down their procedures.
- Procedures will vary but probably most students will shine the flashlight at the material and look for the reflection of light. The white paper can be used to detect the reflected light, especially from the white sheet and the blue paper.
- After students have finished their investigations, have one student from each group write the group's results on the board. Then discuss the results as a class. Make sure students realize that all of the materials tested reflect light.

Assess

After completing the chapter, see *Identifying Misconceptions* in the Study Guide at the end of the chapter.

CHAPTER 13 Helping You Prepare 382F

Figure 3 Strategies to help address students' misconceptions about science are included in each *Teacher Wraparound Edition.*

Effective teaching elicits students' preconceptions and provides opportunities to extend or challenge those understandings (Donovan et al., 1999). With *Glencoe Physical Science,* students learn to recognize their preconceptions and evaluate them using scientific evidence. The *Teacher Wraparound Edition* includes sections on Identifying Misconceptions that suggest strategies for eliciting and correcting student misconceptions about specific topics, as seen in **Figure 3.**

2. Practicing important tasks

Providing students opportunities to practice important tasks has long been considered a successful strategy to improve understanding and memory. Giving students individual feedback on their practice helps in monitoring and fostering their science learning (Baker, 1991). Practicing helps students acquire additional information as they search and productively struggle, with teacher help, for the understanding and application of science information. *Glencoe Physical Science* was designed with the philosophy that practice is absolutely necessary for learning to occur.

Glencoe Physical Science has a variety of features to allow for extensive practice in scientific skill development and test preparation. These features include: practice problems, online self-check quizzes, Applying Science and Applying Math features (as shown in **Figure 4A**), Section Reviews, Chapter Reviews, Study Guides, and multiple laboratory activities (including MiniLabs, Launch Labs, Use the Internet Labs, Design Your Own Labs, Model and Invent Labs, and Extra Try at Home Labs). These opportunities for practice allow students to fine-tune their problem-solving abilities and learn new information, which will be indispensable for solving problems on standardized tests. *Glencoe Physical Science* also offers Standardized Test Practice sections that include the multiple choice, short response/grid in, and open ended questions usually found on standardized tests.

3. Using high-quality visuals to communicate, organize, and reinforce science learning

Visuals—such as complex diagrams and elaborate line drawings—used in conjunction with verbal descriptions increase students' chances of learning, understanding, and remembering relationships and subtle properties of science concepts and problems. Visuals often are the only way to effectively communicate the central concepts needed to understand topics in physical science. Students are able to organize and group ideas better when visuals illustrate different and common characteristics (Hegarty, Carpenter & Just, 1991). Also, the mental images that high-quality visuals stimulate are an indispensable tool for recalling information, especially compared to information presented with only text or lower-quality visuals (Willows & Houghton, 1987).

Glencoe Physical Science was designed with consistent, clear structures and easy-to-follow page layouts with effective use of color, graphics, and fonts. The program includes high-quality charts, tables, diagrams, art, and photographs, as shown in **Figure 4B.** National Geographic "Visualizing" and TIME Magazine "Science & History" and "Science & Society" features illustrate important concepts with eye-catching diagrams and photographs. *Glencoe Physical Science* is also accompanied by an array of supplementary materials that allow for the use of visuals, including: Interactive Chalkboard CD-ROMs, Video Labs, Virtual Labs CD-ROMs, WebQuest online research projects, MindJogger Videoquizzes, Internet Labs, and additional online resources available at gpscience.com.

4. Motivating all students to achieve

Students are motivated to learn when materials provide explicit, attractive, relevant-to-student presentations of key concepts (Alderman, 1999; Corno, 1994). Motivational strategies can include long-term projects of real-world relevance, and carefully constructed problem-solving activities that require effort, persistence, and flexibility. Effective strategies also include using examples from many cultures, using a variety of teaching techniques, and incorporating cooperative learning activities (Banks, 2001; Winzer & Mazurek, 1998). Research has shown that the inquiry learning and cooperative learning approaches work well for all students, including English-language learners and those with learning disabilities (Rosebery et al., 1992; Stoddart, 2002; Scruggs et al., 1993). Such motivational strategies stimulate scientific curiosity and instill confidence through scientific exploration and discovery. Group activities also promote positive attitudes towards learning by building a community of learners (Brown & Campione, 1994).

Glencoe Physical Science provides students with exciting opportunities to explore concepts in physical science from many different perspectives, shown in **Figure 4C.** Many features—Launch Labs, Model and Invent Labs, and Use the Internet Labs—encourage student curiosity and link scientific topics to everyday life. Group activities, discussions, and multiple labs help students become part of an engaged community of learners.

Glencoe Physical Science also includes multiple strategies in the *Teacher Wraparound Edition* for reaching all students, including struggling students, gifted students, and English-language learners. Features include: Alternative Inquiry Labs, Differentiated Instruction, Daily Intervention, Visual Learning, and the English / Spanish Glossary.

5. Developing reading comprehension strategies and mathematical skills

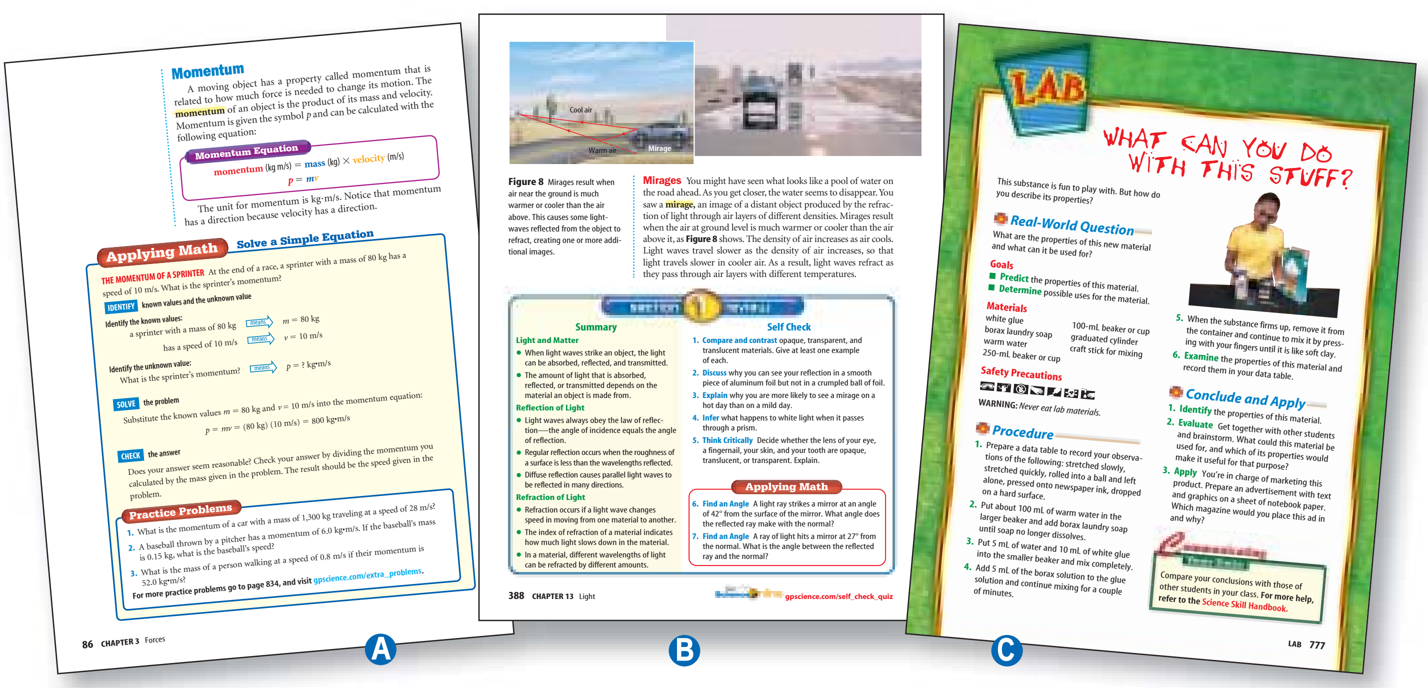
Success with scientific skills is strongly tied to competency in reading and mathematics. Important reading and decoding strategies include: 1) pronunciation and word origin guides to facilitate decoding of unfamiliar words; 2) questions and practice items for self-assessment of reading comprehension and conceptual understanding; and 3) reading exercises designed for students to solve verbally presented problems and comprehend complex prose. Students need to read from textbooks that are challenging and that contain science vocabulary compatible with their prior knowledge and academic abilities (Guthrie & Alvermann, 1999; Holliday et al., 1999). Students also need pronunciation and other language-learning information to decode words, a prerequisite to reading comprehension (Pressley & Block, 2002). Students must have opportunities to engage in writing (Graham & Harris, 2000) and establish reading comprehension strategies such as

Figure 4

A Applying Math activities provide students with opportunities to practice important tasks.

B High-quality illustrations and photos help communicate concepts.

C Relevant activities, such as Labs, motivate students to achieve.



questioning, visualizing, clarifying, elaborating, inferring, concluding, summarizing, and predicting (Pressley, 2002). These reading, decoding, and writing skills help students to remember important ideas needed to learn new information, understand information required to practice important tasks, and develop verbal skills needed to perform well on achievement tests and later in life. Another area strongly related to science learning is mathematics. Mathematical concepts such as ratio, rates, proportion, percent, measurement, graphing, data analysis, statistics, and probability are crucial in the development of scientific reasoning (Lehrer, 2003).

Glencoe Physical Science was designed with thorough and consistent integration of reading and mathematics skills. The *Student Edition* and *Teacher Wraparound Edition* incorporate reading and writing development sections such as: Dinah Zike's Foldables™ Study Organizers, Reading Guides with New and Review Vocabulary, Chapter Vocabulary summaries, Active Reading Strategies, Reading Checks, Science Journal activities, and Caption Questions. Supplementary materials such as Vocabulary PuzzleMaker software, *Reading and Writing in the Science Classroom*, and *Reading Essentials: An Interactive Student Workbook* offer further ideas for incorporating reading and writing activities.

Mathematical concepts are also consistently integrated throughout the text, through such features as: Applying Math, EXTRA Math Problems, and the Math Skill Handbook. Each Applying Math activity provides students with the opportunity to practice and apply some of the mathematical concepts and applications described in the National Council of Teachers of Mathematics' (NCTM) *Principles and Standards for School Mathematics*. These activities serve to reinforce mathematical skills in real-life situations, thus preparing students to meet the challenges of an ever-changing world.

6. Learning by using study strategies

According to the research literature, there are no shortcuts to learning, but study strategies help students understand, organize, remember, and apply new information presented in science textbooks (Bransford, 1979; Corno, 1994). Study strategies used in textbooks include concept mapping, highlighting, outlining, note taking, summarizing, and underlining (Peverly et al., 2003). These study skills promote learner activity, improve metacognition, and provide an effective form of review for tests (Hattie et al., 1996; Carter & Van Matre, 1975).

Study strategies and organizational tools offered in *Glencoe Physical Science* include: Chapter Study Guides, Section Reviews, Chapter Reviews, Test-Taking Tips, Standardized Test Practice, concept maps, outlines, and tables. Supplemental materials such as *Study Guide and Reinforcement* and online Self-Check Quizzes offer additional assistance. *Glencoe Physical Science* also includes Dinah Zike's Foldables at the beginning of each chapter. Foldables are easy-to-make, three-dimensional, interactive paper organizers that students create. These unique hands-on study tools were created exclusively for Glencoe by education specialist Dinah Zike. (Refer to the example in **Figure 5.**)

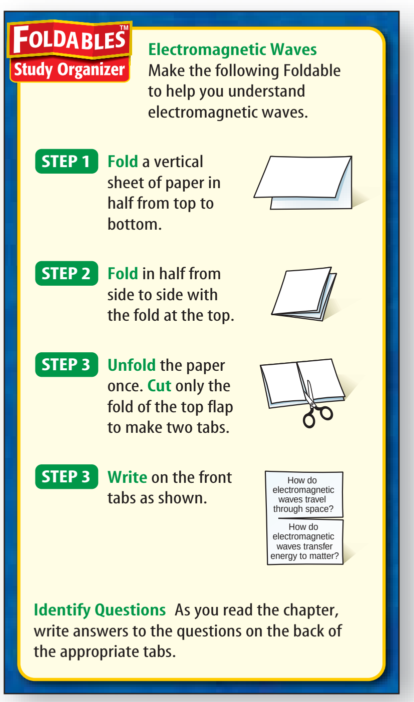


Figure 5

Dinah Zike's Foldables™ Study Organizers develop reading comprehension skills and focus students on key concepts so they can study more efficiently.

VERIFYING LEARNING—ASSESSMENTS OF STUDENT UNDERSTANDING IN *GLENCOE PHYSICAL SCIENCE*

Another key concept stressed in the Science Standards is the importance of continuously assessing student understanding.

> **Teaching Standard C:**
> Teachers of science engage in ongoing assessment of their teaching and of student learning. In doing this, teachers use multiple methods and systematically gather data about student understanding and ability.

Assessment provides opportunities for feedback, and research has shown that the most improvement occurs when feedback is given often and immediately following tests or activities (Bangert-Drowns et al., 1991). *Glencoe Physical Science* offers teachers many choices to probe students' understanding of key concepts and skills. Assessment features include: Reading Checks, Self Check questions, Chapter Assessments, Science Journal activities, Standardized Test Practice, online self-check quizzes, and Daily Intervention. Supplemental materials such as *Performance Assessment in the Science Classroom*, Exam*View*® Pro Testmaker CD-ROM, MindJogger Videoquizzes, and Fast File Chapter Resources provide additional support for ongoing assessment.

REACHING EVERY LEARNER—SCIENCE FOR ALL STUDENTS WITH *GLENCOE PHYSICAL SCIENCE*

Another key principle of the National Science Education Standards is that science is for all students. *Glencoe Physical Science* offers a variety of instructional methods for all ability levels—reading, writing, graphics, hands-on labs, and much more. Resources include:

- Differentiated Instruction—These features in the *Teacher Wraparound Edition* provide ideas to engage all students, including gifted students, English-language learners, and students with special needs.
- *ELL Strategies for Science*—offers specific strategies for integrating science and language learning.
- Intervention and Remediation—the "Daily Intervention" feature in the *Teacher Wraparound Edition* and supplementary materials offer additional assistance for struggling students and English-language learners. Supplementary materials include: the Science Skill Handbook, StudentWorks Plus, *Reading and Writing in the Science Classroom, Study Guide and Reinforcement*, and *Reading Essentials: An Interactive Student Workbook.*

Glencoe Physical Science is complemented by a full line of multimedia resources that offer a range of technology options to enhance skills, promote critical thinking, and connect the classroom to the world in which students live. Multimedia resources include: MindJogger Videoquizzes, TeacherWorks and StudentWorks Plus, Exam*View*® Pro Testmaker, Vocabulary PuzzleMaker, and Virtual Labs. By offering such diverse resources and learning tools, the *Glencoe Physical Science* program ensures that every student can reach the goals set by the National Science Education Standards.

SUMMARY

The National Science Education Standards have provided a new gold standard in science education. More than ever before, physical science teachers are being called upon to challenge their students to become inquisitive and active science learners. To achieve the high goals set by the Science Standards, educators and others involved in science education reform will need to use an array of state-of-the-art strategies and tools. Their toolbox must include inquiry-based curricula that support the Science Standards in every way. Glencoe/McGraw-Hill is proud to offer *Glencoe Physical Science.* With its focus on inquiry-learning and continuous assessment, teachers can achieve the goals set by the National Science Education Standards, now and in the coming years.

Examples of Research-Based Strategies in Glencoe Physical Science

Learning Strategy	Select Examples from *Glencoe Physical Science*
Using prior knowledge to learn new information and correct misconceptions	**Student Edition (SE):** 135, 336, 458, 490 **Teacher Wraparound Edition (TWE):** 135, 143, 158, 355, 382F, 551, 696 **Section Focus Transparencies** **Interactive Chalkboard CD-ROM** **McGraw-Hill Learning Network Web site at mhln.com**
Practicing important tasks	**SE:** 122–123, 252–253, 350–351, 419, 423, 438–439, 561, 788–799 **TWE:** 412–413, 598–599 ***Physical Science Lab Manual, Probeware Lab Manual, Science Inquiry Lab Manual, Science Skill Handbook, Study Guide and Reinforcement, Critical Thinking/Problem Solving*** **Interactive Chalkboard CD-ROM, Video Labs**
Using high-quality visuals to communicate, organize, and reinforce science learning	**SE:** 118, 140, 197, 314, 340, 346, 376, 510, 594, 719 **TWE:** 261, 341, 425, 487 **Teaching Transparencies** **Virtual Labs CD-ROM, Video Labs, MindJogger Videoquizzes, Interactive Chalkboard CD-ROM, StudentWorks Plus**
Motivating all students to achieve	**SE:** 323, 423, 777, 800–812 **TWE:** 7T, 323, 326, 419, 433, 466, 520 ***Probeware Labs, Science Inquiry Labs*** **MindJogger Videoquizzes, Virtual Labs, Video Labs**
Developing reading comprehension strategies and mathematical skills	**SE:** 126, 194, 211, 235, 299, 301, 317, 339, 536, 817–833, 834–845 **TWE:** 124, 254, 382, 600 ***Reading and Writing in the Science Classroom, Reading Essentials: An Interactive Student Workbook, Reading and Writing Skill Activities*** **Vocabulary PuzzleMaker**
Learning by using study strategies	**SE:** 37, 289, 321, 353, 561, 631 **TWE:** 272, 304, 334, 573, 711 ***Study Guide and Reinforcement, Reading Essentials: An Interactive Student Workbook*** **Vocabulary PuzzleMaker**
Verifying learning with assessment	**SE:** 217–219, 412–413, 511 **TWE:** 359, 545, 698 ***Performance Assessment in the Science Classroom*** **Fast File Chapter Resources** **Online quizzes at gpscience.com** **Exam*View*® Pro Testmaker, Vocabulary PuzzleMaker**

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