One of the pathways by which the scientific community confirms the validity of a new scientific discovery is by repeating the research that produced it. When a scientific effort fails to independently confirm the computations or results of a previous study, some fear that it may be a symptom of a lack of rigor in science, while others argue that such an observed inconsistency can be an important precursor to new discovery. Concerns about reproducibility and replicability have been expressed in both scientific and popular media. As these concerns came to light, Congress requested that the National Academies of Sciences, Engineering, and Medicine conduct a study to assess the extent of issues related to reproducibility and replicability and to offer recommendations for improving rigor and transparency in scientific research. Reproducibility and Replicability in Science defines reproducibility and replicability and examines the factors that may lead to non-reproducibility and non- replicability in research. Unlike the typical expectation of reproducibility between two computations, expectations about replicability are more nuanced, and in some cases a lack of replicability can aid the process of scientific discovery. This report provides recommendations to researchers, academic institutions, journals, and funders on steps they can take to improve reproducibility and replicability in science.

Next Generation Science Standards identifies the science all K-12 students
Constructing Representations to Learn in Science Current research into student learning in science has shifted attention from the traditional cognitivist perspectives of conceptual change to socio-cultural and semiotic perspectives that characterize learning in terms of induction into disciplinary literacy practices. This book builds on recent interest in the role of representations in learning to argue for a pedagogical practice based on students actively generating and exploring representations. The book describes a sustained inquiry in which the authors worked with primary and secondary teachers of science, on key topics identified as problematic in the research literature. Data from classroom video, teacher interviews and student artifacts were used to develop and validate a set of pedagogical principles and explore student learning and teacher change issues. The authors argue the theoretical and practical case for a representational focus. The pedagogical approach is illustrated and explored in terms of the role of representation to support quality student learning in science. Separate chapters address the implications of this perspective and practice for structuring sequences around different concepts, reasoning and inquiry in science, models and model based reasoning, the nature of concepts and learning, teacher change, and assessment. The authors argue that this representational focus leads to significantly enhanced student learning, and has the effect of offering new and productive perspectives and approaches for a number of contemporary strands of thinking in science education including conceptual change, inquiry, scientific literacy, and a focus on the epistemic nature of science.

Math and Science for Young Children, 5e is a unique reference that focuses on the integration of math and science with the other important areas of child development during the crucial birth through eight age range. It also carefully addresses the ever changing and significant national standards of the following organizations: The National Association for the Education of Young Children (NAEYC), National Council of Teachers of Math (NCTM), National Science Teachers Association (NSTA), American Association for the Advancement of Science (AAAS), and the National Research Council (NRC). A valuable resource for the student learner, working professional, as well as the involved parent, Math and Science for Young Children, 5e is the most current volume of information of its' kind available on the market today.
Science process skills are the skills that scientists use to study and investigate the world. They are the vehicle for generating content and a means by which concepts are formed. This book is presented in three parts. Part 1 attends to the kinds of science skills appropriate for preschool and the lower elementary grades including observation, classification, communication, measurement, prediction and influence. Part 2 includes the more complex, integrated skills that are needed to plan and conduct controlled scientific investigations. Part 3 provides a guide to teaching scientific facts and concepts through process skills. Each chapter contains objectives, lists of materials, suggested directions and blanks for responses, self-check questions, and extension activities. The activities are designed to allow students to work at their own pace. At the end of each chapter, a mastery test is provided. An appendix lists simple, inexpensive materials that are needed to do the exercises in this book. (CW)

Science, engineering, and technology permeate nearly every facet of modern life and hold the key to solving many of humanity's most pressing current and future challenges. The United States' position in the global economy is declining, in part because U.S. workers lack fundamental knowledge in these fields. To address the critical issues of U.S. competitiveness and to better prepare the workforce, A Framework for K-12 Science Education proposes a new approach to K-12 science education that will capture students' interest and provide them with the necessary foundational knowledge in the field. A Framework for K-12 Science Education outlines a broad set of expectations for students in science and engineering in grades K-12. These expectations will inform the development of new standards for K-12 science education and, subsequently, revisions to curriculum, instruction, assessment, and professional development for educators. This book identifies three dimensions that convey the core ideas and practices around which science and engineering education in these grades should be built. These three dimensions are: crosscutting concepts that unify the study of science through their common application across science and engineering; scientific and engineering practices; and disciplinary core ideas in the physical sciences, life sciences, and earth and space sciences and for engineering, technology, and the applications of science. The overarching goal is for all high school graduates to have sufficient knowledge of science and engineering to engage in public discussions on science-related issues, be careful consumers of scientific and technical information, and enter the careers of their choice. A Framework for K-12 Science Education is the first step in a process that can inform state-level decisions and achieve a research-grounded basis for improving science instruction and learning across the country. The book will guide standards developers, teachers, curriculum designers, assessment developers, state and district science administrators, and educators who teach science in informal environments.

Thirty ready-to-use science activities from the book, Whizbangers and Wonderments, which correlate to the National Science Education Content Standards, K-8.

Study conducted among the secondary school students of Prakasam District, Andhra Pradesh, India.
Remember those great teachers who made you excited about learning? Remember how it felt to be in their classes and to experience how they made their classrooms come alive? What made those teachers special? What qualities and skills did they have to ignite student learning? Most important, how did those teachers help their students become successful? In Qualities of Effective Teachers, 2nd edition, James H. Stronge shows educators how to recreate this same excitement and enthusiasm in their own classrooms by describing the characteristics and skills of effective teachers. Stronge synthesizes research to identify specific teacher behaviors that contribute to student achievement. Rather than look at outside factors like demographics, district leadership, and state mandates, Stronge focuses specifically on what teachers can control: their own preparation, personality, and practices. Learn how effective teachers
*Prepare to be effective educators. *Establish, manage, and maintain learning-focused classroom environments. *Organize time, communicate expectations, and plan instruction. *Present curriculum to support active and engaged learning. *Monitor student progress, identify student potential, and meet the needs of special populations in the classroom. This second edition includes new tips and tools for engaging at-risk students and high-ability students. It also includes skills checklists and an expanded, annotated bibliography to provide a springboard for further insight and exploration. Teachers, educators who hire teachers, teacher leaders, supervisors, and teachers-in-training can all use this book to learn to how to develop better teachers and to improve the quality of learning for all students.

"Teaching Science to Every Child provides timely and practical guidance about teaching science to all students. Particular emphasis is given to making science accessible to students who are typically pushed to the fringe - especially students of color and English language learners. Central to this text is the idea that science can be viewed as a culture, including specific methods of thinking, particular ways of communicating, and specialized kinds of tools. By using culture as a starting point and connecting it to effective instructional approaches, this text gives elementary and middle school science teachers a valuable framework to support the science learning of every student. Written in a conversational style, it treats readers as professional partners in efforts to address vital issues and implement classroom practices that will contribute to closing achievement gaps and advancing the science learning of all children. Features include "Point/Counterpoint" essays that present contrasting perspectives on a variety of science education topics; explicit connections between National Science Education Standards and chapter content; and chapter objectives, bulleted summaries, key terms; reflection and discussion questions. Additional resources are available on the updated and expanded Companion Website www.routledge.com/textbooks/9780415892582 Changes in the Second Edition Three entirely new chapters: Integrated Process Skills; Learning and Teaching; Assessment Technological tools and resources embedded throughout each chapter Increased attention to the role of theory as it relates to science teaching and learning Expanded use of science process skills for upper elementary and middle school Additional material about science notebooks "-- Provided by publisher.

A prescient warning of a future we now inhabit, where fake news stories and
Internet conspiracy theories play to a disaffected American populace “A glorious
book . . . A spirited defense of science . . . From the first page to the last, this
book is a manifesto for clear thought.”—Los Angeles Times How can we make
intelligent decisions about our increasingly technology-driven lives if we don’t
understand the difference between the myths of pseudoscience and the testable
hypotheses of science? Pulitzer Prize-winning author and distinguished
astronomer Carl Sagan argues that scientific thinking is critical not only to the
pursuit of truth but to the very well-being of our democratic institutions. Casting
a wide net through history and culture, Sagan examines and authoritatively
debunks such celebrated fallacies of the past as witchcraft, faith healing,
demons, and UFOs. And yet, disturbingly, in today’s so-called information age,
pseudoscience is burgeoning with stories of alien abduction, channeling past
lives, and communal hallucinations commanding growing attention and respect.
As Sagan demonstrates with lucid eloquence, the siren song of unreason is not
just a cultural wrong turn but a dangerous plunge into darkness that threatens
our most basic freedoms. Praise for The Demon-Haunted World “Powerful . . . A
stirring defense of informed rationality. . . Rich in surprising information and
beautiful writing.”—The Washington Post Book World “Compelling.”—USA Today
“A clear vision of what good science means and why it makes a difference. . . . A
testimonial to the power of science and a warning of the dangers of unrestrained
credulity.”—The Sciences “Passionate.”—San Francisco Examiner-Chronicle

The author discusses how thinking programmes, learning activities and teachers'
pedagogy in the classroom can fundamentally affect the nature of pupils'
thinking, and considers the effects of the learning environment created by peers
and teachers.

Educators know it’s important to get students to engage in "higher-order
thinking." But what does higher-order thinking actually look like? And how can
K-12 classroom teachers assess it across the disciplines? Author, consultant, and
former classroom teacher Susan M. Brookhart answers these questions and more
in this straightforward, practical guide to assessment that can help teachers
determine if students are actually displaying the kind of complex thinking that
current content standards emphasize. Brookhart begins by laying out principles
for assessment in general and for assessment of higher-order thinking in
particular. She then defines and describes aspects of higher-order thinking
according to the categories established in leading taxonomies, giving specific
guidance on how to assess students in the following areas: * Analysis, evaluation,
and creation * Logic and reasoning * Judgment * Problem solving * Creativity and
creative thinking Examples drawn from the National Assessment of Educational
Progress and from actual classroom teachers include multiple-choice items,
constructed-response (essay) items, and performance assessment tasks.
Readers will learn how to use formative assessment to improve student work and
then use summative assessment for grading or scoring. Aimed at elementary,
middle, and high school teachers in all subject areas, How to Assess Higher-Order
Thinking Skills in Your Classroom provides essential background, sound advice,
and thoughtful insight into an area of increasing importance for the success of
students in the classroom--and in life.
What types of instructional experiences help K-8 students learn science with understanding? What do science educators, teachers, teacher leaders, science specialists, professional development staff, curriculum designers, and school administrators need to know to create and support such experiences? Ready, Set, Science! guides the way with an account of the groundbreaking and comprehensive synthesis of research into teaching and learning science in kindergarten through eighth grade. Based on the recently released National Research Council report Taking Science to School: Learning and Teaching Science in Grades K-8, this book summarizes a rich body of findings from the learning sciences and builds detailed cases of science educators at work to make the implications of research clear, accessible, and stimulating for a broad range of science educators. Ready, Set, Science! is filled with classroom case studies that bring to life the research findings and help readers to replicate success. Most of these stories are based on real classroom experiences that illustrate the complexities that teachers grapple with every day. They show how teachers work to select and design rigorous and engaging instructional tasks, manage classrooms, orchestrate productive discussions with culturally and linguistically diverse groups of students, and help students make their thinking visible using a variety of representational tools. This book will be an essential resource for science education practitioners and contains information that will be extremely useful to everyone including parents directly or indirectly involved in the teaching of science.

The popular author of Classroom Instruction That Works discusses 10 questions that can help teachers sharpen their craft and do what really works for the particular students in their classroom.

How Students Learn: Science in the Classroom builds on the discoveries detailed in the best-selling How People Learn. Now these findings are presented in a way that teachers can use immediately, to revitalize their work in the classroom for even greater effectiveness. Organized for utility, the book explores how the principles of learning can be applied in science at three levels: elementary, middle, and high school. Leading educators explain in detail how they developed successful curricula and teaching approaches, presenting strategies that serve as models for curriculum development and classroom instruction. Their recounting of personal teaching experiences lends strength and warmth to this volume. This book discusses how to build straightforward science experiments into true understanding of scientific principles. It also features illustrated suggestions for classroom activities.

Effective science teaching requires creativity, imagination, and innovation. In light of concerns about American science literacy, scientists and educators have struggled to teach this discipline more effectively. Science Teaching Reconsidered provides undergraduate science educators with a path to understanding students, accommodating their individual differences, and helping them grasp the methods—and the wonder—of science. What impact does teaching style have? How do I plan a course curriculum? How do I make lectures, classes, and laboratories more effective? How can I tell what students are
thinking? Why don’t they understand? This handbook provides productive approaches to these and other questions. Written by scientists who are also educators, the handbook offers suggestions for having a greater impact in the classroom and provides resources for further research.

What is science for a child? How do children learn about science and how to do science? Drawing on a vast array of work from neuroscience to classroom observation, Taking Science to School provides a comprehensive picture of what we know about teaching and learning science from kindergarten through eighth grade. By looking at a broad range of questions, this book provides a basic foundation for guiding science teaching and supporting students in their learning. Taking Science to School answers such questions as: When do children begin to learn about science? Are there critical stages in a child's development of such scientific concepts as mass or animate objects? What role does nonschool learning play in children's knowledge of science? How can science education capitalize on children’s natural curiosity? What are the best tasks for books, lectures, and hands-on learning? How can teachers be taught to teach science? The book also provides a detailed examination of how we know what we know about children's learning of science--about the role of research and evidence. This book will be an essential resource for everyone involved in K-8 science education--teachers, principals, boards of education, teacher education providers and accreditors, education researchers, federal education agencies, and state and federal policy makers. It will also be a useful guide for parents and others interested in how children learn.

Addressed to K-12 teachers, discusses enhancing student achievement through project-based learning with multimedia and offers principles and guidelines to insure that multimedia projects address curriculum standards.

CD-ROM contains a database of information on thousands of children's literature titles, which helps you find titles for a lesson, unit, or read-aloud, or for one specific reader. User can search by topic, author, genre, or title. Software must be installed from CD.

In this clear-cut guide, Hartman and Glasgow decipher the latest educational research and translate it into easy-to-use classroom applications that foster effective science learning and professional development.

Humans, especially children, are naturally curious. Yet, people often balk at the thought of learning science--the "eyes glazed over" syndrome. Teachers may find teaching science a major challenge in an era when science ranges from the hardly imaginable quark to the distant, blazing quasar. Inquiry and the National Science Education Standards is the book that educators have been waiting for--a practical guide to teaching inquiry and teaching through inquiry, as recommended by the National Science Education Standards. This will be an important resource for educators who must help school boards, parents, and teachers understand "why we can’t teach the way we used to." "Inquiry" refers to the diverse ways in which scientists study the natural world and in which students grasp science knowledge and the methods by which that knowledge is produced. This book explains and illustrates how inquiry helps students learn
science content, master how to do science, and understand the nature of science. This book explores the dimensions of teaching and learning science as inquiry for K-12 students across a range of science topics. Detailed examples help clarify when teachers should use the inquiry-based approach and how much structure, guidance, and coaching they should provide. The book dispels myths that may have discouraged educators from the inquiry-based approach and illuminates the subtle interplay between concepts, processes, and science as it is experienced in the classroom. Inquiry and the National Science Education Standards shows how to bring the standards to life, with features such as classroom vignettes exploring different kinds of inquiries for elementary, middle, and high school and Frequently Asked Questions for teachers, responding to common concerns such as obtaining teaching supplies. Turning to assessment, the committee discusses why assessment is important, looks at existing schemes and formats, and addresses how to involve students in assessing their own learning achievements. In addition, this book discusses administrative assistance, communication with parents, appropriate teacher evaluation, and other avenues to promoting and supporting this new teaching paradigm.

At a time when scientific and technological competence is vital to the nation's future, the weak performance of U.S. students in science reflects the uneven quality of current science education. Although young children come to school with innate curiosity and intuitive ideas about the world around them, science classes rarely tap this potential. Many experts have called for a new approach to science education, based on recent and ongoing research on teaching and learning. In this approach, simulations and games could play a significant role by addressing many goals and mechanisms for learning science: the motivation to learn science, conceptual understanding, science process skills, understanding of the nature of science, scientific discourse and argumentation, and identification with science and science learning. To explore this potential, Learning Science: Computer Games, Simulations, and Education, reviews the available research on learning science through interaction with digital simulations and games. It considers the potential of digital games and simulations to contribute to learning science in schools, in informal out-of-school settings, and everyday life. The book also identifies the areas in which more research and research-based development is needed to fully capitalize on this potential. Learning Science will guide academic researchers; developers, publishers, and entrepreneurs from the digital simulation and gaming community; and education practitioners and policy makers toward the formation of research and development partnerships that will facilitate rich intellectual collaboration. Industry, government agencies and foundations will play a significant role through start-up and ongoing support to ensure that digital games and simulations will not only excite and entertain, but also motivate and educate.

Developing a positive attitude towards science and mathematics is essential to developing proficiency in these subjects. Recognizing this, Bringing Science and Mathematics to Life for All Learners provides interesting teaching methods and connects them to recent pedagogical approaches that span the scientific and mathematical curricula. It builds upon the expanding knowledge of what works in classrooms, and suggests how new approaches to teaching and learning can
transform science and mathematics instructions. The book is designed to help students in learning science and mathematics. It has many research-based and standards-driven activities, lesson plans, and active learning techniques to reach diverse student groups. Active group engagement and continuity in scientific and mathematical experiences are stressed as motivating factors for students. Presented in a creative manner, the ultimate goal of this book is to deepen the collective conversation, challenge existing ways of thinking, and provide up-to-date tools for educators so that they can help improve the science and mathematics skill levels of others.

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