Metacognition in Science Education Trends In Current Research Contemporary Trends And Issues In Science Education


This volume examines the challenges weighing on the future of education in the face of globalization in the twenty-first century. Bringing together eleven authors who explore the paradox of an [after] to the future of education, each chapter in this book targets three important areas: ecology as understood in the broader framework of globalization and pedagogy; curriculum concerns which impact learning; and the pervasiveness of technology in education today.

This book provides contemporary examples of the ways in which educators can use digital technologies to create effective learning environments that support improved learning and instruction. These examples are guided by multiple conceptual and methodological traditions evolving from the learning sciences and instructional technology communities as well as other communities doing important work on learning technologies. In particular, the book provides examples of technology innovations and the ways in which educators can use them to foster deep understanding, collaboration, creativity, invention, and reflection. Additional examples demonstrate the ways in which emerging mobile and networked technologies can help extend student learning beyond the confines of the classroom wall and support student-directed learning and new media literacies.

Mapping Biology Knowledge addresses two key topics in the context of biology, promoting meaningful learning and knowledge mapping as a strategy for achieving this goal. Meaning-making and meaning-building are examined from multiple perspectives throughout the book. In many biology courses, students become so mired in detail that they fail to grasp the big picture. Various strategies are proposed for helping instructors focus on the big picture, using the ‘need to know’ principle to decide the level of detail students must have in a given situation. The metacognitive tools described here serve as support systems for the mind, creating an arena in which learners can operate on ideas. They include concept maps, cluster maps, webs, semantic networks, and conceptual graphs. These tools, compared and contrasted in this book, are also useful for building and assessing students’ content and cognitive skills. The expanding role of computers in mapping biology knowledge is also explored.

GIFT, the Generalized Intelligent Framework for Tutoring, is a modular, service-oriented architecture developed to lower the skills and time needed to author effective adaptive instruction. Design goals for GIFT also include capturing best instructional practices, promoting standardization and reuse for adaptive instructional content and methods, and methods for evaluating the effectiveness of tutoring technologies. Truly adaptive systems make intelligent (optimal) decisions about tailoring instruction in real-time and make these decisions based on information about the learner and conditions in the instructional environment. The GIFT Users Symposia were started in 2013 to capture successful implementations of GIFT from the user community and to share recommendations leading to more useful capabilities for GIFT authors, researchers, and learners.

Deeper learning, dialogic learning, and critical thinking are essential capabilities in the 21st-century environments we now operate. Apart from being important in themselves, they are also crucial in enabling the acquisition of many other 21st-century skills/capabilities such as problem solving, collaborative learning, innovation, information and media literacy, and so on. However, the majority of teachers in schools and instructors in higher education are inadequately prepared for the task of promoting deeper learning, dialogic learning, and critical thinking in their students. This is despite the fact that there are educational researchers who are developing and evaluating strategies for such promotion. The problem is bridging the gap between the educational researchers’ work and what gets conveyed to teachers and instructors as evidence-based, usable strategies. This book addresses that gap: in it, leading scholars from around the world describe strategies they have developed for successfully cultivating students’ capabilities for deeper learning and transfer of what they learn, dialogic learning and effective communication, and critical thought. They explore connections in the promotion of these capabilities, and they
provide, in accessible form, research evidence demonstrating the efficacy of the strategies. They also discuss answers to the questions of how and why the strategies work. A seminal resource, this book creates tangible links between innovative educational research and classroom teaching practices to address the all-important question of how we can realize our ideals for education in the 21st century. It is a must read for pre-service and in-service teachers, teacher educators and professional developers, and educational researchers who truly care that we deliver education that will prepare and serve students for life.

Over the last decade, the field of distance education (and elearning) has substantially strengthened and assumed a more international scope. There has been an impressive growth in the conceptual, empirical and experiential foundations of the field. Trends and Issues in Distance Education: International Perspectives (2nd Ed) captures a representative snapshot of the breadth of current global trends and issues in distance education theory, research, and practice. Through 21 chapters (from over 30 international authors), the book documents new developments in distance education scholarship and practice, presenting a diverse set of viewpoints on the trends and issues affecting this increasingly central discipline. The book is for researchers, practitioners, and students. Chapters speak to the many creative ways in which distance education addresses learning and human development needs around the world. They focus on distance education in dissimilar settings that extend beyond the limitations of the dominating paradigms of the highly developed economies. Contributing authors touch upon conceptual as well as practical issues. They critically reflect on both large and smallscale distance education initiatives, discussing the use of everything from the most advanced technologies (e.g., 3D computing) to the most rudimentary technologies (e.g., windup radios).

Why is metacognition gaining recognition, both in education generally and in science learning in particular? What does metacognition contribute to the theory and practice of science learning? Metacognition in Science Education discusses emerging topics at the intersection of metacognition with the teaching and learning of science concepts, and with higher order thinking more generally. The book provides readers with a background on metacognition and analyses the latest developments in the field. It also gives an account of best-practice methodology. Expanding on the theoretical underpinnings of metacognition, and written by world leaders in metacognitive research, the chapters present cutting-edge studies on how various forms of metacognitive instruction enhance understanding and thinking in science classrooms. The editors strive for conceptual coherency in the various definitions of metacognition that appear in the book, and show that the study of metacognition is not an end in itself. Rather, it is integral to other important constructs, such as self-regulation, literacy, the teaching of thinking strategies, motivation, meta-strategies, conceptual understanding, reflection, and critical thinking. The book testifies to a growing recognition of the potential value of metacognition to science learning. It will motivate science educators in different educational contexts to incorporate this topic into their ongoing research and practice.

Over the past twenty years, much has been written about the knowledge bases thought necessary to teach science. Shulman has outlined seven knowledge domains needed for teaching, and others, such as Tamir, have proposed somewhat similar domains of knowledge, specifically for science teachers. Aspects of this knowledge have changed because of shifts in curriculum thinking, and the current trends in science education have seen a sharp increase in the significance of the knowledge bases. The development of a standards-based approach to the quality of science teaching has become common in the Western world, and phrases such as [evidence-based practice] have been tossed around in the attempt to [measure] such quality. The Professional Knowledge Base of Science Teaching explores the knowledge bases considered necessary for science teaching. It brings together a number of researchers who have worked with science teachers, and it address what constitutes evidence of high quality science teaching, on what basis such evidence can be judged, and how such evidence reflects the knowledge basis of the modern day professional science teacher. This is the second book produced from the Monash University- King's College London International Centre for the Study of Science and Mathematics Curriculum. The first book presented a big picture of what science education might be like if values once again become central while this book explores what classroom practices may look like based on such a big picture.

This book specifies the foundation for Adapted Primary Literature (APL), a novel text genre that enables the learning and teaching of science using research articles that were adapted to the knowledge level of high-school students. More than 50 years ago, J.J. Schwab suggested that Primary Scientific Articles "afford the most authentic, unretouched specimens of enquiry that we can obtain! and raised for the first time the idea that such articles can be used for [enquiry into enquiry]. This book, the first to be published on this topic, presents the realization of this vision and shows how the reading and writing of scientific articles can be used for inquiry learning and teaching. It provides the origins and theory of APL and examines the concept and its importance. It outlines a detailed description of creating and using APL and provides examples for the use of the enactment of APL in classes, as well as descriptions of possible future prospects for the implementation of APL. Altogether, the book lays the foundations for the use of this authentic text genre for the learning and teaching of science in secondary schools.

The Routledge International Handbook of Research on Teaching Thinking is a comprehensive guide to research on teaching thinking. Teaching thinking is key to growing a more successful economy, is needed for increased democratic engagement and is vital for the well-being of individuals faced with the complexity of a globalised world. However, there are questions about what we mean by teaching thinking, how best to teach it and how best to assess it, and it is these questions that this handbook explores and addresses. Containing surveys and summaries of international, cutting-edge research on every aspect of teaching thinking in a range of contexts, the handbook is thorough in its delivery, examining many different approaches and methods to help readers understand what teaching thinking is and how we can best take this movement forward. Key topics include: • Theoretical perspectives on teaching thinking • Approaches for teaching thinking • Developing creative thinking • Developing critical thinking and metacognition • The assessment of thinking • Teaching thinking in the context of STEM • Collaborative thinking and new technology • Neuro-educational research on teaching thinking This book is an essential guide for policy-makers, teachers and researchers who are interested in teaching thinking.
Science Learning and Instruction describes advances in understanding the nature of science learning and their implications for the design of science instruction. The authors show how design patterns, design principles, and professional development opportunities coalesce to create and sustain effective instruction in each primary scientific domain: earth science, life science, and physical science. Calling for more in-depth and less fleeting coverage of science topics in order to accomplish knowledge integration, the book highlights the importance of designing the instructional materials, the examples that are introduced in each scientific domain, and the professional development that accompanies these materials. It argues that unless all these efforts are made simultaneously, educators cannot hope to improve science learning outcomes. The book also addresses how many policies, including curriculum, standards, guidelines, and standardized tests, work against the goal of integrative understanding, and discusses opportunities to rethink science education policies based on research findings from instruction that emphasizes such understanding.

This volume provides a window into cutting-edge research in cognitive psychology on inhibition in memory, metacognition, educational applications of basic memory research, and many other topics related to the groundbreaking research of Robert Bjork. It will appeal to graduate students and researchers in learning and memory.

How can educators bridge the gap between "big" ideas about teaching students to think and educational practice? This book addresses this question by a unique combination of theory, field experience and elaborate educational research. Its basic idea is to look at science instruction with regard to two sets of explicit goals: one set refers to teaching science concepts and the second set refers to teaching higher order thinking. This book tells about how thinking can be taught not only in the rare and unique conditions that are so typical of affluent experimental educational projects but also in the less privileged but much more common conditions of educational practice that most schools have to endure. It provides empirical evidence showing that students from all academic levels actually improve their thinking and their scientific knowledge following the thinking curricula, and discusses specific means for teaching higher order thinking to students with low academic achievements. The second part of the book addresses issues that pertain to teachers' professional development and to their knowledge and beliefs regarding the teaching of higher order thinking. This book is intended for a very large audience: researchers (including graduate students), curricular designers, practicing and pre-service teachers, college students, teacher educators and those interested in educational reform. Although the book is primarily about the development of thinking in science classrooms, most of it chapters may be of interest to educators from all disciplines.

This state-of-the art research Handbook provides a comprehensive, coherent, current synthesis of the empirical and theoretical research concerning teaching and learning in science and lays down a foundation upon which future research can be built. The contributors, all leading experts in their research areas, represent the international and gender diversity that exists in the science education research community. As a whole, the Handbook of Research on Science Education demonstrates that science education is alive and well and illustrates its vitality. It is an essential resource for the entire science education community, including veteran and emerging researchers, university faculty, graduate students, practitioners in the schools, and science education professionals outside of universities. The National Association for Research in Science Teaching (NARST) endorses the Handbook of Research on Science Education as an important and valuable synthesis of the current knowledge in the field of science education by leading individuals in the field. For more information on NARST, please visit: http://www.narst.org/.

This book addresses the point of intersection between cognition, metacognition, and culture in learning and teaching Science, Technology, Engineering, and Mathematics (STEM). We explore theoretical background and cutting-edge research about how various forms of cognitive and metacognitive instruction may enhance learning and thinking in STEM classrooms from K-12 to university and in different cultures and countries. Over the past several years, STEM education research has witnessed rapid growth, attracting considerable interest among scholars and educators. The book provides an updated collection of studies about cognition, metacognition and culture in the four STEM domains. The field of research, cognition and metacognition in STEM education still suffers from ambiguity in meanings of key concepts that various researchers use. This book is organized according to a unique manner: Each chapter features one of the four STEM domains and one of the three themes—cognition, metacognition, and culture—and defines key concepts. This matrix-type organization opens a new path to knowledge in STEM education and facilitates its understanding. The discussion at the end of the book integrates these definitions for analyzing and mapping the STEM education research. Chapter 4 is available open access under a Creative Commons Attribution 4.0 International License via link.springer.com

Current trends in education suggest that pupils should have more responsibility for their own learning, but how can they if they don't understand the what, the why and the how? This practical guide explores the idea that a metacognitive approach enables pupils to develop skills for lifelong learning. If pupils can identify the what, the why, and the how of their learning, they can begin to formulate strategies for overcoming challenges and for educational improvement. In this book, the authors truly engage with research into the link between metacognition and learning, and the idea that if you can effectively articulate your thoughts and strategies regarding how you learn, you might then be in a better position to take actions in order to improve and to be able to learn best. An appendix of useful resources is also included, which offers a range of activities surrounding the language of learning, reflection and metacognition, as well as practical advice on how to develop metacognition in the early years (4-8), middle years (8-10), and upper years (10-13). Metacognition in the Primary Classroom demonstrates how important it is for children to be well-informed about how to think and develop their thinking skills for effective learning and to have the skills to talk about their learning, and the opportunity to share ideas and strategies with others, which enables all concerned to experience and develop approaches in order to learn better. This book is a crucial read for anyone interested in ensuring that pupils take an active role in their own learning.

Process Oriented Guided Inquiry Learning (POGIL) is a pedagogy that is based on research on how people learn and has been shown to lead to better student outcomes in many contexts and in a variety of...
This volume brings together trends and their prospects to understand the complexity of metacognitive phenomena, with emphasis on the interactions of metacognition with affect. It discusses the three perspectives in understanding these interactions: the possible mechanisms underlying them, the manifestation of interactions of metacognition with affect in self- and co-regulation in social and educational contexts.
contexts, and changes during development in young children and older adults. This volume is a tribute to Professor Emerita Anastasia Efklides, who was among the pioneers to investigate and argue the importance of the interactions between metacognition and affect. It serves as a dedication to her contribution in the widening of the scope of research in metacognition and self-regulated learning.

In contemporary society, science constitutes a significant part of human life in that it impacts on how people experience and understand the world and themselves. The rapid advances in science and technology, newly established societal and cultural norms and values, and changes in the climate and environment, as well as, the depletion of natural resources all greatly impact the lives of children and youths, and hence their ways of learning, viewing the world, experiencing phenomena around them and interacting with others. These changes challenge science educators to rethink the epistemology and pedagogy in science classrooms today as the practice of science education needs to be proactive and relevant to students and prepare them for life in the present and in the future. Featuring contributions from highly experienced and celebrated science educators, as well as research perspectives from Europe, the USA, Asia and Australia, this book addresses theoretical and practical examples in science education that, on the one hand, plays a key role in our understanding of the world, and yet, paradoxically, now acknowledges a growing number of uncertainties of knowledge about the world. The material is in four sections that cover the learning and teaching of science from science literacy to multiple representations; science teacher education; the use of innovations and new technologies in science teaching and learning; and science learning in informal settings including outdoor environmental learning activities. Acknowledging the issues and challenges in science education, this book hopes to generate collaborative discussions among scholars, researchers, and educators to develop critical and creative ways of science teaching to improve and enrich the lives of our children and youths.

This book focuses on developing and updating prospective and practicing chemistry teachers' pedagogical content knowledge. The 11 chapters of the book discuss the most essential theories from general and science education, and in the second part of each of the chapters apply the theory to examples from the chemistry classroom. Key sentences, tasks for self-assessment, and suggestions for further reading are also included. The book is focused on many different issues a teacher of chemistry is concerned with. The chapters provide contemporary discussions of the chemistry curriculum, objectives and assessment, motivation, learning difficulties, linguistic issues, practical work, student active pedagogies, ICT, informal learning, continuous professional development, and teaching chemistry in developing environments. This book, with contributions from many of the world's top experts in chemistry education, is a major publication offering something that has not previously been available. Within this single volume, chemistry teachers, teacher educators, and prospective teachers will find information and advice relating to key issues in teaching (such as the curriculum, assessment and so forth), but contextualised in terms of the specifics of teaching and learning of chemistry, and drawing upon the extensive research in the field. Moreover, the book is written in a scholarly style with extensive citations to the literature, thus providing an excellent starting point for teachers and research students undertaking scholarly studies in chemistry education; whilst, at the same time, offering insight and practical advice to support the planning of effective chemistry teaching. This book should be considered essential reading for those preparing for chemistry teaching, and will be an important addition to the libraries of all concerned with chemical education. Dr Keith S. Taber (University of Cambridge; Editor: Chemistry Education Research and Practice) The highly regarded collection of authors in this book fills a critical void by providing an essential resource for teachers of chemistry to enhance pedagogical content knowledge for teaching modern chemistry. Through clever orchestration of examples and theory, and with carefully framed guiding questions, the book equips teachers to act on the relevance of essential chemistry knowledge to navigate such challenges as context, motivation to learn, thinking, activity, language, assessment, and maintaining professional expertise. If you are a secondary or post-secondary teacher of chemistry, this book will quickly become a favorite well-thumbed resource! Professor Hannah Sevian (University of Massachusetts Boston)

In the science classroom, there are some ideas that are as difficult for young students to grasp as they are for teachers to explain. Forces, electricity, light, and basic astronomy are all examples of conceptual domains that come into this category. How should a teacher teach them? The authors of this monograph reject the traditional separation of subject and pedagogic knowledge. They believe that to develop effective teaching for meaningful learning in science, we must identify how teachers themselves interpret difficult ideas in science and, in particular, what supports their own learning in coming to a professional understanding of how to teach science concepts to young children. To do so, they analyzed trainee and practising teachers' responses to engaging with difficult ideas when learning science in higher education settings. The text demonstrates how professional insight emerges as teachers identify the elements that supported their understanding during their own learning. In this paradigm, professional awareness derives from the practitioner interrogating their own learning and identifying implications for their teaching of science. The book draws on a significant body of critically analysed empirical evidence collated and documented over a five-year period involving large numbers of trainee and practising teachers. It concludes that it is essential to problematize subject knowledge, both for learner and teacher. The book's theoretical perspective draws on the field of cognitive psychology in learning. In particular, the role of metacognition and cognitive conflict in learning are examined and subsequently applied in a range of contexts. The work offers a unique and refreshing approach in addressing the important professional dimension of supporting teacher understanding of pedagogy and critically examines assumptions in contemporary debates about constructivism in science education.

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Trends and Prospects in Metacognition presents a collection of chapters dealing principally with independent areas of empirical Metacognition research. These research foci, such as animal metacognition, neuropsychology of metacognition, implicit learning, metacognitive experiences, metamemory, young children's Metacognition, theory of mind, metacognitive knowledge, decision making, and interventions for the enhancement of metacognition, have all emerged as trends in the field of metacognition. Yet, the resulting research has not converged, precluding an integration of concepts and findings. Presenting a new theoretical framework, Trends and Prospects in Metacognition extends the classical definitions offered by Flavell and Nelson to carry the prospect of more integrated work into the future. By opening the possibility to cross the boundaries posed by traditionally independent research areas, this volume provides a foundation for the integration of research paradigms and concepts and builds on the relationship between metacognition and consciousness, while integrating basic with applied research.

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How Science Works provides student and practising teachers with a comprehensive introduction to one of the most dramatic changes to the secondary science curriculum. Underpinned by the latest research in the field, it explores the meaning and How of Science Works and reviews major developments in pedagogy and practice. With chapters structured around three key themes - why How Science Works, what it is and how to teach it - expert contributors explore issues including the need for curriculum change, arguments for scientific literacy for all, school students' views about science, what we understand about scientific methods, types of scientific enquiry, and, importantly, effective pedagogies and their implications for practice. Aiming to promote discussion and reflection on the ways forward for this new and emerging area of the science curriculum, it considers: teaching controversial issues in science argumentation and questioning for effective teaching enhancing investigative science and developing reasoned scientific judgments the role of ICT in exploring How Science Works teaching science outside the classroom. How Science Works is a source of guidance for all student, new and experienced teachers of secondary science, interested in investigating how the curriculum can provide creativity and engagement for all school students.

This ground-breaking handbook provides a much-needed, contemporary and authoritative reference text on young children's thinking. The different perspectives represented in the thirty-nine chapters contribute to a vibrant picture of young children, their ways of thinking and their efforts at understanding, constructing and navigating the world. The Routledge International Handbook of Young Children's Thinking and Understanding brings together commissioned pieces by a range of hand-picked influential, international authors from a variety of disciplines who share a high public profile for their specific developments in the theories of children's thinking, learning and understanding. The handbook is organised into four complementary parts: 1. How can we think about young children's thinking?: Concepts and contexts 2. Knowing about the brain and knowing about the mind 3. Making sense of the world 4. Documenting and developing children's thinking Supported throughout with relevant research and case studies, this handbook is an international insight into the many ways there are to understand children and childhood paired with the knowledge that young children have a strong, vital, and creative ability to think and to understand, and to create and contend with the world around them.

The Digital Teaching Platform (DTP) brings the power of interactive technology to teaching and learning in classrooms. In this authoritative book, top researchers in the field of learning science and educational technology examine the current state of design and research on DTPs, the principles for evaluating them, and their likely evolution as a dominant medium for educational improvement. The authors examine DTPs in light of contemporary classroom requirements, as well as current initiatives such as the Common Core State Standards, Race to the Top, and the 2010 National Educational Technology Plan.

What do children's interactions on the playground have to do with foreign policy? How does science understanding in middle school relate to environmental disasters in third world countries? The causal patterns that we detect and how we act upon them pervade every aspect of our lives. These skills will only become more important in the future as our world becomes more global and more interconnected. Yet we aren't very skilled at thinking about causality. Research shows that instead we rely on limiting default assumptions that can lead to poor choices in a complex world. What can we do about it? This book offers ways to become aware of these patterns and to reframe our thinking to become more effective learners and citizens of the world. Through examples and accessible explanations, it offers a causal curriculum to enable more effective learning so that we can put the power of better causal understanding to work for ourselves and the next generation for today and tomorrow.
This book presents a study on physics problem solving in real classrooms situations. Problem solving plays a pivotal role in the physics curriculum at all levels. However, physics students' performance in problem solving all too often remains limited to basic routine problems, with evidence of poor performance in solving problems that go beyond equation retrieval and substitution. Adopting an action research methodology, the study bridges the "research-practical divide" by explicitly teaching physics problem-solving strategies through collaborative group problem-solving sessions embedded within the curriculum. Data were collected using external assessments and video recordings of individual and collaborative group problem-solving sessions by 16-18 year-olds. The analysis revealed a positive shift in the students' problem-solving patterns, both at group and individual level. Students demonstrated a deliberate, well-planned deployment of the taught strategies. The marked positive shifts in collaborative competences, cognitive competences, metacognitive processing and increased self-efficacy are positively correlated with attainment in problem solving in physics. However, this shift proved to be due to different mechanisms triggered in the different students.

This book is devoted to the Metacognition arena. It highlights works that show relevant analysis, reviews, theoretical, and methodological proposals, as well as studies, approaches, applications, and tools that shape current state, define trends and inspire future research. As a result of the revision process fourteen manuscripts were accepted and organized into five parts as follows: · Conceptual: contains conceptual works oriented to: (1) review models of strategy instruction and tailor a hybrid strategy; (2) unveil second-order judgments and define a method to assess metacognitive judgments; (3) introduces a conceptual model to describe the metacognitive activity as an autopoietic system. · Framework: offers three works concerned with: (4) stimulate metacognitive skills and self-regulatory functions; (5) evaluate metacognitive skills and self-regulated learning at problem solving; (6) deal with executive management metacognition and strategic knowledge metacognition. · Studies: reports research related to: (7) uncover how metacognitive awareness of listening strategies bias listening proficiency; (8) unveil how metacognitive skills and motivation are achieved in science informal learning; (9) tackle stress at learning by means of coping strategies. · Approaches: focus on the following targets: (10) social metacognition to support collaborative problem solving; (11) metacognitive skills to be stimulated in computer supported collaborative learning; (12) metacognitive knowledge and metacognitive experiences are essential for teaching practices. · Tools: promotes the use of intelligent tutoring systems such as: (13) BioWorld allows learners to practice medical diagnostic by providing virtual patient cases; (14) MetaHistoReasoning provides examples to learners and inquiries about the causes of historical events. This volume will be a source of interest for researchers, practitioners, professors, and postgraduate students aimed at updating their knowledge and finding targets for future work in the metacognition area.

Statistical models attempt to describe and quantify relationships between variables. In the models presented in this chapter, there is a response variable (sometimes called dependent variable) and at least one predictor variable (sometimes called independent or explanatory variable). When investigating a possible cause-and-effect type of relationship, the response variable is the putative effect and the predictors are the hypothesized causes. Typically, there is a main predictor variable of interest; other predictors in the model are called covariates. Unknown covariates or other independent variables not controlled in an experiment or analysis can affect the dependent or predictor variable and mislead the conclusions made from the inquiry (Bock, Velleman, & De Veaux, 2009). A p value (p) measures the statistical significance of the observed relationship; given the model, p is the probability that a relationship is seen by mere chance. The smaller the p value, the more confident we can be that the pattern seen in the data 2 is not random. In the type of models examined here, the R measures the proportion of the variation in the response variable that is explained by the predictors specified in the model; if R is close to 1, then almost all the variation in the response variable has been explained. This measure is also known as the multiple correlation coefficient. Statistical studies can be grouped into two types: experimental and observational.

This esteemed reference work and professional resource, now substantially revised, integrates classic and cutting-edge research on how children and adolescents make meaning from text. The comprehension tasks and challenges facing students at different grade levels are explored, with attention to multiple text types and reading purposes. Preaminent researchers offer a range of perspectives--cognitive, neuroscientific, sociocultural, pedagogical, and technological--on key aspects of comprehension. Effective approaches to assessment, instruction, and intervention are reviewed. The volume also addresses issues in teaching specific populations, including struggling readers and English language learners. New to This Edition *A decade's worth of significant research advances are reflected in 10 entirely new chapters. *Revised throughout to incorporate new studies and timely topics: the expanding role of technology, changing school populations, the Common Core standards, international research, and more. *Chapters on graphic, scientific, and multiple digital texts. *Chapters on fluency, professional learning, and literacy coaching.

This book presents current perspectives on theoretical and empirical issues related to the teaching and learning of geometry at secondary schools. It contains chapters contributing to three main areas. A first set of chapters examines mathematical, epistemological, and curricular perspectives. A second set of chapters presents studies on geometry instruction and teacher knowledge, and a third set of chapters offers studies on geometry thinking and learning. Specific research topics addressed also include teaching practice, learning trajectories, learning difficulties, technological resources, instructional design, assessments, textbook analyses, and teacher education in geometry. Geometry remains an essential and critical topic in school mathematics. As they learn geometry, students develop essential mathematical thinking and visualization skills and learn a language that helps them relate to and interact with the physical world. Geometry has traditionally been included as a subject of study in secondary mathematics curricula, but it has also featured as a resource in out-of-school problem solving, and has been connected to various human activities such as sports, games, and artwork. Furthermore, geometry often plays a role in teacher preparation, undergraduate mathematics, and at the workplace. New technologies, including dynamic geometry software, computer-assisted design software, and geometric positioning systems, have provided more resources for teachers to design environments and tasks in which students can learn and use geometry. In this context, research on the teaching and learning of geometry will continue to be a key element on the research agendas of mathematics educators, as researchers continue to look for ways to enhance student learning and to understand student thinking and teachers' decision making.
The Encyclopedia of Science Education provides a comprehensive international reference work covering the range of methodologies, perspectives, foci, and cultures of this field of inquiry, and to do so via contributions from leading researchers from around the globe. Because of the frequent ways in which scholarship in science education has led to developments in other curriculum areas, the encyclopedia has significance beyond the field of science education. The Encyclopedia of Science Education is aimed at graduate students, researchers, developers in science education and science education research. The topics to be covered encompass all areas of science education and it includes biographical entries on science educators, as well as educators whose work has had an impact on science education as a research field.

This book presents innovations in teaching and learning science, novel approaches to science curriculum, cultural and contextual factors in promoting science education and improving the standard and achievement of students in East Asian countries. The authors in this book discuss education reform and science curriculum changes and promotion of science and STEM education, parental roles and involvement in children's education, teacher preparation and professional development and research in science education in the context of international benchmarking tests to measure the knowledge of mathematics and science such as the Trends in Mathematics and Science Study (TIMSS) and achievement in science, mathematics and reading like Programme for International Student Assessment (PISA). Among the high achieving countries, the performance of the students in East Asian countries such as Singapore, Taiwan, Korea, Japan, Hong Kong and China (Shanghai) are notable. This book investigates the reasons why students from East Asian countries consistently claim the top places in each and every cycle of those study. It brings together prominent science educators and researchers from East Asia to share their experience and findings, reflection and vision on emerging trends, pedagogical innovations and research-informed practices in science education in the region. It provides insights into effective educational strategies and development of science education to international readers.

Discusses the best methods of learning, describing how rereading and rote repetition are counterproductive and how such techniques as self-testing, spaced retrieval, and finding additional layers of information in new material can enhance learning.

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