Measuring Teachers Pedagogical Content Knowledge In Surveys

Education in South America is a critical reference guide to development of education in Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay and Venezuela. The chapters, written by local experts, provide an overview of the education system in each country, focusing particularly on policies and implementation of reforms. Key themes include quality and access, multicultural education and the management of education systems. Including a comparative introduction to the issues facing education in the region as a whole and guides to available online datasets, this book is an essential reference for researchers, scholars, international agencies and policy-makers.

This book explores terminology, frameworks, and research being conducted worldwide on virtual manipulatives. It brings together international authors who provide their perspectives on virtual manipulatives in research and teaching. By defining terminology, explaining conceptual and theoretical frameworks, and reporting research, the authors provide a comprehensive foundation on the study and use of virtual manipulatives for mathematics teaching and learning. This foundation provides a common way for researchers to communicate about virtual manipulatives and build on the major works that have been conducted on this topic. By discussing these big ideas, the book advances knowledge for future research on virtual manipulatives as these dynamic tools move from computer platforms to hand-held, touch-screen, and augmented platforms.

This book constitutes the proceedings of the 11th International Conference on Informatics in Schools: Situation, Evolution and Perspectives, ISSEP 2018, held in St. Petersburg, Russia, in October 2018. The 29 full papers presented in this volume were carefully reviewed and selected from 74 submissions. They were organized in topical sections named: role of programming and algorithmics in informatics for pupils of all ages; national concepts of teaching informatics; teacher education in informatics; contests and competitions in informatics; socio-psychological aspects of teaching informatics; and computer tools in teaching and studying informatics.

This volume highlights the mathematical research presented at the 2019 Association for Women in Mathematics (AWM) Research Symposium held at Rice University, April 6-7, 2019. The symposium showcased research from women across the mathematical sciences working in academia, government, and industry, as well as featured women across the career spectrum: undergraduates, graduate students, postdocs, and professionals. The book is divided into eight parts, opening with a plenary talk and followed by a combination of research paper contributions and survey papers in the different areas of mathematics represented at the symposium: algebraic combinatorics and graph theory algebraic biology commutative algebra analysis, probability, and PDEs topology applied mathematics mathematics education

In this study the researcher designed an instrument appropriate for assessing teachers' PCK in geometry and measurement at the middle school level with respect to the main mathematical focus of the study. This instrument contained 10 items.

Improving learning experiences for all students is the ultimate goal of research in technology use in education. With more availability and better usability of technology in schools, the potential for teachers to use digital tools in schools is greater than ever. However a key factor determining whether new technologies are adopted is the extent to which teachers know how to use them to support students' learning. The special knowledge of how technologies can support students' learning of subject area content is known as technological pedagogical content knowledge (TPACK). This study explored the relationship of accomplished teachers' TPACK confidence to their use of technology with students and to their teaching and learning contexts. In an online survey, 307 National Board Certified teachers provided information about the frequency and breadth of their computer use with students; their use of computers in their personal lives; the school, classroom, and personal resources available to them for learning; and the people in their learning networks supporting their learning to use new technologies for teaching. Although the representativeness of the sample was limited and the measures self-reported, they provided rich opportunities to discover relationships and suggest avenues for supporting teacher learning of new technologies. Analyses showed that these accomplished teachers' confidence in their knowledge of how to use new technologies for teaching was different from their confidence in using technologies more generally. Further, TPACK confidence related to student use of computers in the classroom. No associations were found between TPACK confidence and age, gender, grade levels, subject areas, or student populations. However, confidence in teaching with technology did relate to measures of the teachers' learning resources. More varied learning resources and more productive social learning networks were associated with higher TPACK confidence. Three key types of support provided by learning partners -- learning together, posing challenges, and connecting the teacher to others to learn from -- were significantly more common among high-TPACK teachers. Findings in this study point to ways we might further understand, and subsequently increase, teacher confidence in using new technologies to support student learning. Several questions are raised for future research: Do learning resources lead to confidence in knowledge, or does confidence lead to awareness of existing resources? To what extent can TPACK be measured without first assessing the teacher's PCK? And how might we develop survey measures that reliably capture the complexity of technological pedagogical content knowledge? Understanding TPACK and the conditions under which it develops is an important field of research, as we strive to help teachers learn to use new technologies effectively to support powerful student learning.

This book reviews the Teacher Education and Development Study: Learning to Teach Mathematics, which tested 23,000 primary and secondary level math teachers from 16 countries on content knowledge and asked their opinions on beliefs and opportunities to learn.

The 2nd edition of the Handbook of Technological Pedagogical Content Knowledge (TPACK) for Educators addresses the concept and implementation of technological pedagogical content knowledge—the knowledge and skills that teachers need in order to integrate technology meaningfully into instruction in specific content areas. Driven by the growing influence of TPACK on research and practice in both K-12 and higher education, the 2nd edition updates current thinking about theory, research, and practice. Offering a series of chapters by scholars in different content areas who apply the technological pedagogical content knowledge framework to their individual content areas, the volume is structured around three themes: Current thoughts on TPACK Theory Research on Technological Pedagogical Content Knowledge in Specific Subject Areas Integrating Technological Pedagogical Content Knowledge into Teacher Education and Professional Development The Handbook of Technological Pedagogical Content Knowledge (TPACK) for Educators is simultaneously a mandate and a manifesto on the engagement of technology in classrooms.

Teacher Education and Practice, a peer-refereed journal, is dedicated to the encouragement and the dissemination of research and scholarship related to professional education. The journal is concerned, in the broadest sense, with teacher preparation, practice and policy issues related to the teaching profession, as well as being concerned with learning in the school setting. The journal also serves as a forum for the exchange of diverse ideas and points of view within these purposes. As a forum, the journal offers a public space in which to critically examine current discourse and practice as well as engage in generative dialogue. Alternative forms of inquiry and representation are invited, and authors

from a variety of backgrounds and diverse perspectives are encouraged to contribute. Teacher Education & Practice is published by Rowman & Littlefield.

This book is a critical assessment of the knowledge base on educational effectiveness, covering a period of five decades of research. It formulates a “lean” theory of good schooling, and identifies and explains instances of “ineffectiveness”, such as low effect sizes of malleable conditions, for which expectations are highly strung. The book presents a systemic outlook on educational effectiveness and improvement, as it starts out from an integrated multi-level model that comprises system level, school level and instructional conditions. It offers a classification of school improvement strategies and scenarios for system level educational improvement. Above all, the analysis is very systematic, comprehensive and strongly grounded in theory. The book includes a case study analysis of various strands of improvement-oriented educational policy in the Netherlands as an illustration of some of the arguments used.

Research in mathematics teacher education as a distinctive field of inquiry has grown substantially over the past 10-15 years. Within this field there is emerging interest in how mathematics teacher educators (MTEs) themselves learn and develop. Until recently there were few published studies on this topic, and the processes by which mathematics teacher educators learn, and the forms of knowledge they require for effective practice, had not been systematically investigated. However, researchers in mathematics education are now beginning to investigate the development of MTE expertise and associated issues. This volume draws on the latest research and thinking in this area is therefore timely to stimulate future development and directions. It will survey the emerging field of inquiry in mathematics education, combining the work of established scholars with perspectives of newcomers to the field, with the aim of influencing development of the field, invite cross-cultural comparisons in becoming a mathematics teacher educator by highlighting issues in the development of MTEs in different countries, and examine the roles of both mathematics educators and mathematicians in preparing future teachers of mathematics. The primary audience will be university-based mathematics teacher educators and MTE researchers, and postgraduate research students who are seeking academic careers as MTEs. Additional interest may come from teacher educators in disciplines other than mathematics, and education policy makers responsible for accreditation and quality control of initial teacher education programs.

Pedagogical Content Knowledge (PCK) has been adapted, adopted, and taken up in a diversity of ways in science education since the concept was introduced in the mid-1980s. Now that it is so well embedded within the language of teaching and learning, research and knowledge about the construct needs to be more useable and applicable to the work of science teachers, especially so in these times when standards and other measures are being used to define their knowledge, skills, and abilities. Re-examining Pedagogical Content Knowledge in Science Education is organized around three themes: Re-examining PCK: Issues, ideas and development; Research developments and trajectories; Emerging themes in PCK research. Featuring the most up-to-date work from leading PCK scholars in science education across the globe, this volume maps where PCK has been, where it is going, and how it now informs and enhances knowledge of science teachers’ professional knowledge. It illustrates how the PCK research agenda has developed and can make a difference to teachers’ practice and students’ learning of science.

Regardless of the field or discipline, technology is rapidly advancing, and individuals are faced with the challenge of adapting to these new innovations. To remain up-to-date on the current practices, teachers and administrators alike must constantly stay informed of the latest advances in their fields. Teacher Training and Professional Development: Concepts, Methodologies, Tools, and Applications contains a compendium of the latest academic material on the methods, skills, and techniques that are essential to lifelong learning and professional advancement. Including innovative studies on teaching quality, pre-service teacher preparation, and faculty enrichment, this multi-volume book is an ideal source for academics, professionals, students, practitioners, and researchers.

Physics Teaching and Learning: Challenging the Paradigm, RISE Volume 8, focuses on research contributions challenging the basic assumptions, ways of thinking, and practices commonly accepted in physics education. Teaching physics involves multifaceted, research-based, value added strategies designed to improve academic engagement and depth of learning. In this volume, researchers, teaching and curriculum reformers, and reform implementers discuss a range of important issues. The volume should be considered as a first step in thinking through what physics teaching and physics learning might address in teacher preparation programs, in-service professional development programs, and in classrooms. To facilitate thinking about research-based physics teaching and learning each chapter in the volume was organized around five common elements: 1. A significant review of research in the issue or problem area. 2. Themes addressed are relevant for the teaching and learning of K-16 science 3. Discussion of original research by the author(s) addressing the major theme of the chapter. 4. Bridge gaps between theory and practice and/or research and practice. 5. Concerns and needs are addressed of school/community context stakeholders including students, teachers, parents, administrators, and community members.

This volume represents both recent research in pedagogical content knowledge (PCK) in science, technology, engineering and math (STEM), as well as emerging innovations in how PCK is applied in practice. The notion of “research to practice” is critical to validating how effectively PCK works within the clinic and how it can be used to improve STEM learning. ?As the need for more effective educational approaches in STEM grows, the importance of developing, identifying, and validating effective practices and practitioner competencies are needed. This book covers a wide range of topics in PCK in different school levels (middle school, college teacher training, teacher professional development), and different environments (museums, rural). The contributors believe that vital to successful STEM education practice is recognition that STEM domains require both specialized domain knowledge as well as specialized pedagogical approaches. The authors of this work were chosen because of their extensive fieldwork in PCK research and practice,

making this volume valuable to furthering how PCK is used to enlighten the understanding of learning, as well as providing practical instruction. This text helps STEM practitioners, researchers, and decision-makers further their interest in more effective STEM education practice, and raises new questions about STEM learning.
Teachers' knowledge of mathematics is pivotal to their capacity to provide effective mathematics instruction and to their ability to assess student learning (Ball, Hill, & Bass, 2005; Ma, 1999; Schifter, 1999). The National Council for the Teaching of Mathematics (NCTM, 2000) makes it clear that teachers need knowledge of the whole domain as well as knowledge about the important ideas that are central to their grade level. POWERSOURCE is expected, through professional development and job aids, to influence teachers' pedagogical content knowledge and assessment practices. To gauge such effects the authors have developed teacher measures that focus on three key mathematical principles that are central to POWERSOURCE: the distributive property, solving equations, and rational number equivalence. (Contains 2 figures.).
Teaching Statistics in School Mathematics-Challenges for Teaching and Teacher Education results from the Joint ICMI/IASE Study Teaching Statistics in School Mathematics: Challenges for Teaching and Teacher Education. Oriented to analyse the teaching of statistics in school and to recommend improvements in the training of mathematics teachers to encourage success in preparing statistically literate students, the volume provides a picture of the current situation in both the teaching of school statistics and the pre-service education of mathematics teachers. A primary goal of Teaching Statistics in School Mathematics-Challenges for Teaching and Teacher Education is to describe the essential elements of statistics, teacher’s professional knowledge and their learning experiences. Moreover, a research agenda that invites new research, while building from current knowledge, is developed. Recommendations about strategies and materials, available to train prospective teachers in university and in-service teachers who have not been adequately prepared, are also accessible to the reader.
This book provides an overview of a body of work conducted over the past seven years related to the preparation of secondary mathematics teachers by the Mathematics Teacher Education Partnership (MTE-Partnership), a national consortium of more than 90 universities and 100 school systems. The MTE-Partnership is organized as a Networked Improvement Community (NIC), which combines the disciplined inquiry of improvement science with the power of networking to accelerate improvement by engaging a broad set of participants. The MTE-Partnership is addressing key challenges in secondary mathematics teacher preparation, including: • Supporting the development of content knowledge relevant to teaching secondary mathematics; • Providing effective clinical experiences to teacher candidates; • Recruiting secondary mathematics teacher candidates, ensuring program completion and their subsequent retention in the field as early career teachers; • Supporting overall transformation of secondary mathematics teacher preparation in alignment with these challenges; • Ensuring a focus on equity and social justice in secondary mathematics teacher recruitment, preparation, and induction. This book outlines existing knowledge related to each of these key challenges, as well as the work of Research Action Clusters (RACs) formed to address the challenges. Each RAC includes participants from multiple institutions who work collaboratively to iteratively develop, test, and refine processes and products that can help programs more effectively prepare secondary mathematics teacher candidates. The book describes promising approaches to improving aspects of secondary mathematics teacher preparation developed by the RACs, including specific products that have been developed, which will inform the work of others involved in secondary mathematics teacher preparation. In addition, reflections on the use of the NIC model provides insights for others considering this research design. Particular references to the Standards for Preparing Teachers of Mathematics (Association of Mathematics Teacher Educators, 2017) are included throughout the book.
The purpose of this research is to identify the categories of South Korean elementary teachers’ knowledge for teaching mathematics. Emerging from the data collected and the subsequent analysis are five categories of South Korean elementary teachers’ knowledge for teaching mathematics: Mathematics Curriculum Knowledge, Mathematics Learner Knowledge, Fundamental Mathematics Conceptual Knowledge, Mathematics Pedagogical Content Knowledge, and Mathematics Pedagogical Procedural Knowledge. The first three categories of knowledge play a significant role in mathematics instruction as an integrated form within Mathematics Pedagogical Content Knowledge. This study also demonstrated that Mathematics Pedagogical Procedural Knowledge might play a pivotal role in constructing Mathematics Pedagogical Content Knowledge. These findings are connected to results from relevant studies in terms of the significant role of teachers’ knowledge in mathematics instruction.
There is increasing recognition that teachers will play a key role in preparing students for the challenges of the future. We expect teachers to equip students with the skill set and knowledge required for success in an increasingly global, digital, complex, uncertain and volatile world.
The digital age provides ample opportunities for enhanced learning experiences for students; however, it can also present challenges for educators who must adapt to and implement new technologies in the classroom. The Handbook of Research on Transforming Mathematics Teacher Education in the Digital Age is a critical reference source featuring the latest research on the development of educators’ knowledge for the integration of technologies to improve classroom instruction. Investigating emerging pedagogies for preservice and in-service teachers, this publication is ideal for professionals, researchers, and educational designers interested in the implementation of technology in the mathematics classroom.
This book enhances readers’ understanding of science teachers’ professional knowledge, and illustrates how the Pedagogical Content Knowledge research agenda can make a difference in teachers’ practices and how students learn science. Importantly, it offers an updated international perspective on the evolving nature of Pedagogical Content Knowledge and how it is shaping research and teacher education agendas for science teaching. The first few chapters background and introduce a new model known as the Refined Consensus Model (RCM) of Pedagogical Content Knowledge (PCK) in science education, and clarify and demonstrate its use in research and teacher education and practice. Subsequent chapters show how this new consensus model of PCK in science education is strongly connected with empirical data of varying nature, contains a tailored language to describe the nature of PCK in science education, and can be used as a framework for illuminating past studies and informing the design of future PCK studies in science education. By presenting and discussing the RCM of PCK within a variety of science education contexts, the book makes the model significantly more applicable to teachers’ work.
The Language of Mathematics: How the Teacher’s Knowledge of Mathematics Affects Instruction introduces the reader to a collection of thoughtful works by authors that represent current thinking about mathematics teacher preparation. The book provides the reader with current and relevant knowledge concerning preparation of mathematics teachers. The complexity of

teaching mathematics is undeniable and all too often ignored in the preparation of teachers with substantive mathematical content knowledge and mathematical teaching knowledge. That said, this book has a focus on the substantive knowledge and the relevant pedagogy required for preparing teachings to enter classrooms to teach mathematics in K-12 school settings. Each chapter focuses on the preparation of teachers who will enter classrooms to instruct the next generation of students in mathematics. Chapter One opens the book with a focus on the language and knowledge of mathematics teaching. The authors of Chapters Two-Nine present field-based research that examines the complexities of content and pedagogical knowledge as well as knowledge for teaching. Each chapter offers the reader an examination of mathematics teacher preparation and practice based on formal research that provides the reader with insight into how the research study was conducted as well as providing the findings and conclusions drawn with respect to mathematics teacher preparation and practice. Finally, Chapter 10 presents an epilogue that focuses on the future of mathematics teacher preparation.

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.

Special education is now an established part of public education in the United States—by law and by custom. However, it is still widely misunderstood and continues to be dogged by controversies related to such things as categorization, grouping, assessment, placement, funding, instruction, and a variety of legal issues. The purpose of this 13-part, 57-chapter handbook is to help profile and bring greater clarity to this sprawling and growing field. To ensure consistency across the volume, chapter authors review and integrate existing research, identify strengths and weaknesses, note gaps in the literature, and discuss implications for practice and future research. Key features include: Comprehensive Coverage—Fifty-seven chapters cover all aspects of special education in the United States including cultural and international comparisons. Issues & Trends—In addition to synthesizing empirical findings and providing a critical analysis of the status and direction of current research, chapter authors discuss issues related to practice and reflect on trends in thinking. Categorical Chapters—In order to provide a comprehensive and comparative treatment of the twelve categorical chapters in section IV, chapter authors were asked to follow a consistent outline: Definition, Causal Factors, Identification, Behavioral Characteristics, Assessment, Educational Programming, and Trends and Issues. Expertise—Edited by two of the most accomplished scholars in special education, chapter authors include a carefully chosen mixture of established and rising young stars in the field. This book is an appropriate reference volume for anyone (researchers, scholars, graduate students, practitioners, policy makers, and parents) interested in the state of special education today: its research base, current issues and practices, and future trends. It is also appropriate as a textbook for graduate level courses in special education.

Activity Theory in Education: Research and Practice brings together cutting-edge scholars from a number of continents. Through in-depth case studies the authors highlight how Activity Theory is used in education and discuss the theoretical as well as pragmatic use of Activity Theory frameworks in a range of contemporary learning contexts. The first section of the book focuses on empirical research on using Activity Theory in analysing students' and teachers' experiences of learning and teaching in face-to-face and online learning contexts. The second section contains insights in identifying historical and systemic tensions in educational contexts using Activity Theory. The third section discusses conceptual and contextual aspects of educational contexts through Activity Theory, and Section four discusses the application of Activity Theory in understanding teachers' Pedagogical Content Knowledge and curriculum development. In spite of the widespread and rapidly increasing use of Activity Theory in educational research, few collections of this work are available. Activity Theory in Education: Research and Practice is such a much needed collection of practical experiences, theoretical insights and empirical research findings on the use of Activity Theory in educational settings." – Yrjö Engeström, Centre for Research on Activity, Development and Learning (CRADLE), The University of Helsinki.

The Mathematics Enthusiast (TME) is an eclectic internationally circulated peer reviewed journal which focuses on mathematics content, mathematics education research, innovation, interdisciplinary issues and pedagogy. The journal exists as an independent entity. It is published on a print-on-demand basis by Information Age Publishing and the electronic version is hosted by the Department of Mathematical Sciences- University of Montana. The journal is not affiliated to nor subsidized by any professional organizations but supports PMENA [Psychology of Mathematics Education- North America] through special issues on various research topics. Indexing Information: Australian Education Index; EBSCO Products (Academic Search Complete); EDNA; Directory of Open Access Journals (DOAJ); Psyc-INFO (the APA Index); MathDI/MathEDUC (FiZ Karlsruhe); Journals in Higher Education (JIHE); SCOPUS; Ulrich's Periodicals Directory; Emerging Sources Citation Index (Thompson Reuters)

This book diagnoses Cambodian teaching quality and presents policy options for reform.

Abstract: "In an era of educational reform, investigating teachers' pedagogical content knowledge has implications for many involved in education, from policy makers and curriculum designers to those in teacher education. This thesis proposed a model, designed by the researcher, used to examine Shulman's (1986) theory of pedagogical content knowledge. In particular, it addressed primary teachers' pedagogical content knowledge required for teaching measurement. By examining teachers' mathematics pedagogical content knowledge a greater understanding of teachers' professional knowledge was gained enabling improvement of teacher quality, by being able to identify more clearly individual teacher's needs for professional development. This study addressed four specific research questions. How evident is the teacher's depth of mathematical knowledge of measurement within their teaching? How do teachers show that they understand and address the needs of students when teaching? How to teachers demonstrate their general pedagogical knowledge when teaching? How is a teacher's knowledge and practice impacted by other factors when teaching and what are these major factors? A qualitative research model was used in which four teachers of Years Three and Four participated, providing four individual case studies. Each teacher was interviewed at the commencement of the study, was observed and recorded throughout their teaching of a sequence of measurement lessons, interviewed prior to and following each lesson, and finally responded to a reflective questionnaire two weeks after the sequence of lessons had concluded. Due to the extensive nature of the data, a series of vignettes was written, based upon MATHEMATICAL PEDAGOGICAL CONTENT KNOWLEDGE viii identified teaching

episodes, significant to addressing the research questions. These vignettes contributed to the cross case analysis (Yin, 2010), along with the other data. The study found that the teachers' knowledge varied considerably in each of the areas of knowledge of teaching, knowledge of students and knowledge of mathematics. Consequently, the teachers were rated differently in relation to their pedagogical content knowledge, ranging from very weak to strong. These differences were examined in terms of the model, providing evidence that the model effectively explained variations in teachers' pedagogical content knowledge. Factors such as self-efficacy, teacher beliefs and the culture of the school were also shown to influence each teacher's pedagogical content knowledge. The model was shown to be dynamic and it clearly identified how and why pedagogical content knowledge varied from one teacher to another. This study has shown that the model used to represent pedagogical content knowledge demonstrated theoretical, methodological and diagnostic value. This study concludes with a discussion of implications for policy and practice at system level and for teacher education courses for preservice teachers. The findings of this study provide further understanding of teacher pedagogical content knowledge, which is an essential step towards improving teacher quality and teaching practice. The evidence suggests that this model could be used for further research into pedagogical content knowledge beyond the teaching of measurement."

The new emphasis in the Singapore mathematics education is on Big Ideas (Charles, 2005). This book contains more than 15 chapters from various experts on mathematics education that describe various aspects of Big Ideas from theory to practice. It contains chapters that discuss the historical development of mathematical concepts, specific mathematical concepts in relation to Big Ideas in mathematics, the spirit of Big Ideas in mathematics and its enactment in the mathematics classroom.This book presents a wide spectrum of issues related to Big Ideas in mathematics education. On the one end, we have topics that are mathematics content related, those that discuss the underlying principles of Big Ideas, and others that deepen the readers' knowledge in this area, and on the other hand there are practice oriented papers in preparing practitioners to have a clearer picture of classroom enactment related to an emphasis on Big Ideas.

Research on teachers' professional knowledge hints at teachers' pedagogical content knowledge being an important criterion for instructional quality and student achievement. This research project investigates the relation between teachers' pedagogical content knowledge, teachers' actions, and students' content knowledge in physics comparing Finland, Germany, and Switzerland.

This ambitious text is the first of its kind to summarize the theory, research, and practice related to pedagogical content knowledge. The audience is provided with a functional understanding of the basic tenets of the construct as well as its applications to research on science teacher education and the development of science teacher education programs.

This edited volume brings forth intriguing, novel and innovative research in the field of science education. The chapters in the book deal with a wide variety of topics and research approaches, conducted in various contexts and settings, all adding a strong contribution to knowledge on science teaching and learning. The book is comprised of selected high-quality studies that were presented at the 11th European Science Education Research Association (ESERA) Conference, held in Helsinki, Finland from 31 August to 4 September, 2015. The ESERA science education research community consists of professionals with diverse disciplinary backgrounds from natural sciences to social sciences. This diversity provides a rich understanding of cognitive and affective aspects of science teaching and learning in this volume. The studies in this book will invoke discussion and ignite further interest in finding new ways of doing and researching science education for the future and looking fo r international partners for both science education and science education research. The twenty-five chapters showcase current orientations of research in science education and are of interest to science teachers, teacher educators and science education researchers around the world with a commitment to evidence-based and forward-looking science teaching and learning.

This book discusses competence, teacher competence, and professional error competence of teachers, and emphasizes the need for a training programme that supports the latter. The book starts out by presenting results from previous studies that underline the necessity to train professional error competence of teachers, especially in the field of accounting. The studies analysed include research in the field of accounting, and on the efficacy of teacher training. Next, considerations on training programmes are presented. From these analyses, a training programme was designed to support professional error competence in accounting. This training programme aims for increased knowledge about students' errors (content knowledge) and offers strategies to handle these errors (pedagogical content knowledge). Both are central facets of professional error competence. The book describes the development, characteristics, implementation, and evaluation of this programme. It details the test platform that was developed and used for the assessment of professional error competence, and critically discusses the results from the evaluation of the training programme from various perspectives. The current discussion on teacher training and expertise is influenced by empirical results obtained in international large-scale studies such as PISA and TIMSS. The findings of the studies underpin the discussion on teaching quality and teachers' professional competences. The key issue is that teacher competence has an impact on teaching quality and this, in turn, influences students' achievements. International comparative studies reveal that teachers often lack central competence facets, and therefore it is assumed that standard teacher training programmes may fail to successfully prepare student teachers for their tasks. Therefore, customized training programmes are currently being discussed. Their focus is mostly on pedagogical content knowledge and classroom practices, because these competence facets are essential for teaching quality.

Knowledge, Beliefs, and Identity in Mathematics Teaching and Teaching Development examines teacher knowledge, beliefs, identity, practice and relationships among them. These important aspects of mathematics teacher education continue to be the focus of extensive research and policy debate globally.

The contribution of this book is to synthesize important common themes and highlight the unique features, findings, and lessons learned from three systematic, ongoing research and professional learning projects for supporting English learners in science. Each project, based in a different region of the U.S. and focused on different age ranges and target populations, actively grapples with the linguistic implications of the three-dimensional learning required by the Framework for K-12 Science Education and the Next Generation Science Standards. Each chapter provides research-based recommendations for improving the teaching of science to English learners. Offering insights into teacher professional learning as well as strategies for measuring and monitoring how well English learners are learning science and language, this book tells a compelling and inclusive story of the challenges and the opportunities of teaching science to English learners.

Mathematics and Science education have both grown in fertile directions in different geographic regions. Yet, the mainstream discourse in international handbooks does not lend voice to developments in cognition, curriculum, teacher development, assessment, policy and implementation of mathematics and science in many countries. Paradoxically, in spite of advances in information technology and the "flat earth" syndrome, old distinctions and biases between different groups of researcher's persist. In addition limited accessibility to conferences and journals also contribute to this problem. The International Sourcebooks in Mathematics and Science Education focus on under-represented regions of the world and provides a platform for researchers to showcase their research and development in areas within mathematics and science education. The First Sourcebook on Asian Research in Mathematics Education: China, Korea, Singapore, Japan, Malaysia and India provides the first synthesized treatment of mathematics education that has both developed and is now prominently emerging in the Asian and South Asian world. The book is organized in sections coordinated by leaders in mathematics education in these countries and editorial teams for each country affiliated with them. The purpose of unique sourcebook is to both consolidate and survey the established body of research in these countries with findings that have influenced ongoing research agendas and informed practices in Europe, North America (and other countries) in addition to serving as a platform to showcase existing research that has shaped

teacher education, curricula and policy in these Asian countries. The book will serve as a standard reference for mathematics education researchers, policy makers, practitioners and students both in and outside Asia, and complement the Nordic and NCTM perspectives.