

P R O F E S S I O N A L L E A R N I N G

Understanding and Developing Science Teachers' Pedagogical Content Knowledge

2nd Edition

John Loughran, Amanda Berry and Pamela Mulhall

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Understanding And Developing Science Teachers Pedagogical Content Knowledge 2nd Edition

Saima Salehjee



Understanding And Developing Science Teachers Pedagogical Content Knowledge 2nd Edition:

Understanding and Developing Science Teachers' Pedagogical Content Knowledge John Loughran, Amanda Berry, Pamela Mulhall, 2012-07-31 There has been a growing interest in the notion of a scholarship of teaching. Such scholarship is displayed through a teacher's grasp of and response to the relationships between knowledge of content teaching and learning in ways that attest to practice as being complex and interwoven. Yet attempting to capture teachers' professional knowledge is difficult because the critical links between practice and knowledge for many teachers is tacit. Pedagogical Content Knowledge (PCK) offers one way of capturing, articulating and portraying an aspect of the scholarship of teaching and in this case the scholarship of science teaching. The research underpinning the approach developed by Loughran, Berry and Mulhall offers access to the development of the professional knowledge of science teaching in a form that offers new ways of sharing and disseminating this knowledge. Through this Resource Folio approach comprising CoRe and PaP eRs, a recognition of the value of the specialist knowledge and skills of science teaching is not only highlighted but also enhanced. The CoRe and PaP eRs methodology offers an exciting new way of capturing and portraying science teachers' pedagogical content knowledge so that it might be better understood and valued within the profession. This book is a concrete example of the nature of scholarship in science teaching that is meaningful, useful and immediately applicable in the work of all science teachers preservice, in service and science teacher educators. It is an excellent resource for science teachers as well as a guiding text for teacher education. Understanding teachers' professional knowledge is critical to our efforts to promote quality classroom practice. While PCK offers such a lens, the construct is abstract. In this book, the authors have found an interesting and engaging way of making science teachers' PCK concrete, useable and meaningful for researchers and teachers alike. It offers a new and exciting way of understanding the importance of PCK in shaping and improving science teaching and learning. Professor Julie Gess Newsome, Dean of the Graduate School of Education, Willamette University. This book contributes to establishing CoRes and PaP eRs as immensely valuable tools to illuminate and describe PCK. The text provides concrete examples of CoRes and PaP eRs completed in real-life teaching situations that make stimulating reading. The authors show practitioners and researchers alike how this approach can develop high-quality science teaching. Dr Vanessa Kind, Director, Science Learning Centre, North East School of Education, Durham University.

Understanding and Developing Science Teachers' Pedagogical Content Knowledge J. John Loughran, Amanda Berry, Pamela Mulhall, 2006-01-01 There has been a growing interest in the notion of a scholarship of teaching. Such scholarship is displayed through a teacher's grasp of and response to the relationships between knowledge of content teaching and learning in ways that attest to practice as being complex and interwoven. Yet attempting to capture teachers' professional knowledge is difficult because the critical links between practice and knowledge for many teachers is tacit. Pedagogical Content Knowledge (PCK) offers one way of capturing, articulating and portraying an aspect of the scholarship of

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Re-examining Pedagogical Content Knowledge in Science Education Amanda Berry, Patricia Friedrichsen, John Loughran, 2015-03-24 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

Handbook of Research on Science Education, Volume II Norman G. Lederman, Sandra K. Abell, 2014-07-11 Building on the foundation set in Volume I a landmark synthesis of research in the field Volume II is a comprehensive state of the art new volume highlighting new and emerging research perspectives The contributors all experts in their research areas represent the international and gender diversity in the science education research community The volume is organized around six themes theory and methods of science education research science learning culture gender and society and science learning science teaching curriculum and assessment in science science teacher education Each chapter presents an integrative review of the research on the topic it addresses pulling together the existing research working to understand the historical trends and patterns in that body of scholarship describing how the issue is conceptualized within the literature how methods and theories have shaped the outcomes of the research and where the strengths weaknesses and gaps are in the literature Providing guidance to science education faculty and graduate students and leading to new insights and directions for future research the *Handbook of Research on Science Education Volume II* is an essential resource for the entire science education community

Exploring Mathematics and Science Teachers' Knowledge Hamsa Venkat, Marissa Rollnick, John Loughran, Mike Askew, 2014-05-09 Globally mathematics and science education faces three crucial challenges an increasing need for mathematics and science graduates a declining enrolment of school graduates into university studies in these disciplines and the varying quality of school teaching in these areas Alongside these challenges internationally more and more non specialists are teaching mathematics and science at both primary and secondary levels and research evidence has revealed how gaps and limitations in teachers content understandings can lead to classroom practices that present barriers to students learning This book addresses these issues by investigating how teachers content knowledge interacts with their pedagogies across diverse contexts and perspectives This knowledge practice nexus is examined across mathematics and science teaching traversing schooling phases and countries with an emphasis on contexts of disadvantage These features push the boundaries of research into teachers content knowledge The book s combination of mathematics and science enriches each discipline for the reader and contributes to our understandings of student attainment by examining the nature of specialised content knowledge needed for competent teaching within and across the two domains Exploring Mathematics and Science Teachers Knowledge will be key reading for researchers doctoral students and postgraduates with a focus on Mathematics Science and teacher knowledge research

Tep Vol 26-N2 Teacher Education and Practice, 2013-11-25 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

Mentoring Science Teachers in the Secondary School Saima Salehjee, 2020-12-14 This practical guide helps mentors of new science teachers in both developing their own mentoring skills and providing the essential guidance their trainees need as they navigate the rollercoaster of the first years in the classroom Offering tried and tested strategies based on the best research it covers the knowledge skills and understanding every mentor needs and offers practical tools such as lesson plans and feedback guides observation sheets and examples of dialogue with trainees Together with analytical tools for self evaluation this book is a vital source of support and inspiration for all those involved in developing the next generation of outstanding science teachers Key topics explained include Roles and responsibilities of mentors Developing a mentor mentee relationship Guiding beginning science teachers through the lesson planning teaching and self evaluation processes Observations and pre and post lesson discussions and regular mentoring meetings Supporting beginning teachers to enhance scientific knowledge

and effective pedagogical practices Building confidence among beginning teachers to cope with pupils contingent questions and assess scientific knowledge and skills Supporting beginning teachers planning and teaching to enhance scientific literacy and inquiry among pupils Developing autonomous science teachers with an attitude to promote the learning of science for all the learners Filled with tried and tested strategies based on the latest research Mentoring Science Teachers in the Secondary School is a vital guide for mentors of science teachers both trainee and newly qualified with ready to use strategies that support and inspire both mentors and beginning teachers alike

Understanding Science Teachers' Professional Knowledge Growth Michel Grangeat, 2015-12-09 Science education has to be improved in order to become more responsive to the needs of society confronted with a rapidly changing world Bringing science teaching up to a higher level is a key factor in this endeavour The authors of this book think about teachers as part of the immediate and large communities and systems in which they function They consider the development of teachers professional knowledge as a continuous process that depends on the communities they are committed to and participate in the discipline they are teaching the social context in which they perform the instruments made available in their environment and their day to day classroom experience From this perspective each teacher learns in an individual way but cannot learn without relying on their colleagues and other partners Such professional knowledge is partly tacit and explicit and thus possessed by teachers experts and researchers Coordinating activity theory and models of pedagogical content knowledge PCK the book provides a better understanding of the growth of science teacher professional knowledge The chapters are organised around shared perspectives and themes and based on research findings The emerging model can inform pre service teacher educators researchers and students The book results from exchanges and symposia during international conferences ECER ESERA and from a two day seminar held at Universit Grenoble Alpes in March 2015

Designing and Teaching the Elementary Science Methods Course Sandra K. Abell, Ken Appleton, Deborah L. Hanuscin, 2010-02-25 This guide for elementary science teacher educators outlines the theory principles and strategies they need to know in order to plan and carry out instruction for future elementary science teachers and provides classroom examples anchored to those principles The book is grounded in the theoretical framework of pedagogical content knowledge PCK

International Handbook of Mathematics Teacher Education: Volume 1, 2019-12-02 This second edition of the International Handbook of Mathematics Teacher Education builds on and extends the topics ideas in the first edition while maintaining the themes for each of the volumes Collectively the authors looked back beyond and within the last 10 years to establish the state of the art and continuing and new trends in mathematics teacher and mathematics teacher educator education and looked forward regarding possible avenues for teachers teacher educators researchers and policy makers to consider to enhance and or further investigate mathematics teacher and teacher educator learning and practice in particular The volume editors provide introductions to each volume that highlight the subthemes used to group related chapters which offer meaningful lenses to see important connections

within and across chapters Readers can also use these subthemes to make connections across the four volumes which although presented separately include topics that have relevance across them since they are all situated in the common focus regarding mathematics teachers Volume 1 Knowledge Beliefs and Identity in Mathematics Teaching and Teaching Development edited by Despina Potari and Olive Chapman 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 Thus as the first volume in the series it appropriately addresses central topics issues that provide an excellent beginning to engage in the field of mathematics education through the handbook Contributors are Jill Adler Mike Askew Maria Bartolini Bussi Anne Bennison Kim Beswick Olive Chapman Charalambos Charalambus Helen Chick Marta Civil Sandra Crespo Sean Delaney Silvia Funghi Merrilyn Goos Roberta Hunter Barbara Jaworski Kim Koh Esther S Levenson Yeping Li Niamh O Meara JoengSuk Pang Randolph Phillipp Despina Potari Craig Pournara Stephen Quirke Alessandro Ramploud Tim Rowland John Zig Siegfried Naqing Song Konstantinos Stouraitis Eva Thanheiser Collen Vale Hamsa Venkat and Huirong Zhang

Repositioning Pedagogical Content Knowledge in Teachers' Knowledge for Teaching Science Anne Hume, Rebecca Cooper, Andreas Borowski, 2019-01-28 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

Conference Proceedings. New Perspectives in Science Education Pixel, 2017 [Current Trends and Best Practices of Pedagogical Content Knowledge \(PCK\)](#) Taskin Bedizel, Nazli Ruya, 2025-02-06 In the world of education teachers face a critical challenge the effective dissemination of knowledge to students The intricacies of teaching go beyond mere content delivery educators must possess a nuanced understanding of how to teach specific content to foster meaningful learning experiences This challenge is encapsulated in the concept of Pedagogical Content Knowledge PCK a form of tacit knowledge that bridges the gap between subject matter expertise and effective instructional strategies As education paradigms shift and technology reshapes the learning environment there is a growing need for a comprehensive guide to navigate the terrain of PCK Enter the Current Trends and

Best Practices of Pedagogical Content Knowledge PCK a guide for educators and researchers grappling with the complexities of effective teaching This meticulously curated handbook offers a solution by compiling diverse research articles that dissect the nature historical foundations and future trajectories of PCK It not only acknowledges the importance of this tacit knowledge but also presents practical insights and methodologies for its development From assessing challenges to leveraging technology and exploring cross disciplinary applications this handbook becomes an indispensable resource for those dedicated to enhancing teaching practices advancing teacher education and ultimately improving student learning outcomes through the cultivation of Pedagogical Content Knowledge

Classroom-based Interventions Across Subject Areas Gabriel Stylianides,Ann Childs,2018-11-01 Classroom based Interventions Across Subject Areas explores cutting edge educational research that has real potential to support the improvement of classroom practice Written by expert researchers and practitioners it provides empirically tested and theory based approaches that practitioners can use to improve learning in classroom settings This edited volume provides examples of classroom based interventions in English mathematics science languages history and geography Taking as its basis research which has been conducted in actual classrooms with close collaboration between researchers and practitioners this text will help researchers and practitioners understand how and why interventions can be successful or not The text further considers the broad theoretical and practical issues that derive from intervention studies including the nature of collaboration between researchers and teachers and ways of adapting effective classroom based interventions for use in different contexts Offering insight into the methodology behind successful classroom based interventions this text will be essential reading for students of education trainee teachers and all those concerned with how educational research can impact on teaching and learning

Designing Learning with Multimodality in English Medium of Education (EME) Classrooms Across Asia Fei Victor Lim,Jack Pun,2025-06-12 This book provides evidence based and pedagogically focused analyses of a variety of multimodal resources to scaffold learning in contexts of English Medium Education EME in Asia The contributing authors are active researchers in the field of EME and multimodality across the primary secondary and tertiary levels from Hong Kong Indonesia Japan Singapore South Korea Taiwan and Thailand They explore both the latest theoretical conceptions on the design of EME by harnessing the affordances of multimodality as well as practical applications of multimodal pedagogies for the teaching and learning of specific subjects particularly STEM subjects They provide examples of EME lessons with annotated notes to showcase good practice

A Diversity of Pathways Through Science Education Yann Shiou Ong,Timothy Ter Ming Tan,Yew-Jin Lee,2024-06-18 This book presents the work of academics who contributed their work at the International Science Education Conference ISEC 2021 in alignment with the conference theme 20 20 Vision for Science Education Research Collectively the chapters aim to evoke intellectual dialogues on current and future trends in science education It features chapters that are grouped thematically into three sections Questions and Questioning in Science STEM education Developing Science Teaching and Assessment and

History Philosophy and Sociology of Science Engineering and Informal Learning Through the various sections the book presents empirical studies in science and engineering classrooms or laboratories puts forward a framework for problem based learning provides an account of a prominent scientist s efforts in promoting practical science through analysis of historical documents and uncovers trends in informal science learning space research through a review of literature Each section is introduced by a commentary with further insights and thought provoking questions on ideas raised in the chapters The book also includes a Notes to Our Future Colleagues section in each chapter which presents readers with a collective vision for the state of science education research in the year 2050

Designing Professional Development for Teachers of Science and Mathematics Susan Loucks-Horsley, Katherine E. Stiles, Susan Mundry, Nancy Love, Peter W.

Hewson, 2009-11-24 This third edition represents the gold standard of resources for those working in the field of professional development My staff and I highly recommend this book as a primary resource for designing and continuously improving professional development programs for teachers of science and mathematics Unlike other resources this unique and important book provides current research an updated strategic planning framework and access to a portfolio of best practices for informing your work Sally Goetz Shuler Executive Director National Science Resources Center In the 21st century when STEM education has become vital for our students and our nation and the importance of quality professional development has increased at least tenfold this seminal work should be required reading for every education leader It is both practical and scholarly in guiding a school toward a culture of continuous learning and improvement Harold Pratt President Science Curriculum Inc Former President National Science Teachers Association The classic guide for designing robust science and mathematics professional development programs This expanded edition of one of the most widely cited resources in the field of professional learning for mathematics and science educators demonstrates how to design professional development for teachers that is directly linked to improving student learning Presenting an updated professional development PD planning framework the third edition of the bestseller reflects current research on PD design underscores how beliefs and local factors can influence the PD design illustrates a wide range of PD strategies and emphasizes the importance of Continuous program monitoring Combining strategies to address diverse needs Building cultures that sustain learning An inspiring blend of theory and practical wisdom Designing Professional Development for Teachers of Science and Mathematics remains a highly regarded reference for improving professional practice and student achievement

Second International Handbook of Science Education Barry Fraser, Kenneth Tobin, Campbell J. McRobbie, 2011-12-14 The International Handbook of Science Education is a two volume edition pertaining to the most significant issues in science education It is a follow up to the first Handbook published in 1998 which is seen as the most authoritative resource ever produced in science education The chapters in this edition are reviews of research in science education and retain the strong international flavor of the project It covers the diverse theories and methods that have been a foundation for science

education and continue to characterize this field Each section contains a lead chapter that provides an overview and synthesis of the field and related chapters that provide a narrower focus on research and current thinking on the key issues in that field Leading researchers from around the world have participated as authors and consultants to produce a resource that is comprehensive detailed and up to date The chapters provide the most recent and advanced thinking in science education making the Handbook again the most authoritative resource in science education

From Teacher Thinking to Teachers and Teaching Cheryl J. Craig, Paulien C. Meijer, Jan Broeckmans, 2013-07-04 This volume covers advances that have occurred in the thirty year existence of the International Study Association on Teachers and Teaching ISATT the organization that helped transition the study of teacher thinking to the study of teachers and teaching in all of its complexities

Teaching Chemistry Jan Apotheker, 2019-05-06 Teaching Chemistry can be used in courses focusing on training for secondary school teachers in chemistry The author who has been actively involved in the development of a new chemistry curriculum in The Netherlands and is currently chair of the Committee on Chemistry Education of the International Union of Pure and Applied Chemistry offers an overview of the existing learning models and gives practical recommendations how to implement innovating strategies and methods of teaching chemistry at different levels It starts at the beginner level with students that have had no experience in secondary schools as a teacher After a solid background in the theory of learning practical guidance is provided helping teachers develop skills and practices focused on the learning process within their classrooms In the final chapter information is given about the way teachers can professionalize further in their teaching career Addresses innovative teaching methods and strategies Includes a section of practical examples and exercises in the end of each chapter Written by one of the top experts in chemistry education Jan Apotheker taught chemistry for 25 years at the Praedinius Gymnasium Groningen In 1998 he became a lecturer in chemistry education at the University of Groningen retired in 2016 He is currently chair of the Committee on Chemistry Education of the IUPAC

Understanding And Developing Science Teachers Pedagogical Content Knowledge 2nd Edition Book Review: Unveiling the Magic of Language

In an electronic era where connections and knowledge reign supreme, the enchanting power of language has be more apparent than ever. Its ability to stir emotions, provoke thought, and instigate transformation is actually remarkable. This extraordinary book, aptly titled "**Understanding And Developing Science Teachers Pedagogical Content Knowledge 2nd Edition**," published by a very acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound effect on our existence. Throughout this critique, we shall delve to the book is central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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