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Transformational Change Efforts: Student Engagement in Mathematics through an Institutional Network for Active Learning - Wendy M. Smith 2021-05-05
The purpose of this handbook is to help launch institutional transformations in mathematics departments to improve student success. We report findings from the Student Engagement in Mathematics through an Institutional Network for Active Learning (SEMINAL) study. SEMINAL's purpose is to help change agents, those looking to (or currently attempting to) enact change within mathematics departments and beyond—trying to reform the instruction of their lower division mathematics courses in order to promote high achievement for all students. SEMINAL specifically studies the change mechanisms that allow postsecondary institutions to incorporate and sustain active learning in Precalculus to Calculus 2 learning environments. Out of the approximately 2.5 million students enrolled in collegiate mathematics courses each year, over 90% are enrolled in Precalculus to Calculus 2 courses. Forty-four percent of mathematics departments think active learning mathematics strategies are important for Precalculus to Calculus 2 courses, but only 15 percnt state that they are very successful at implementing them. Therefore, insights into the following research question will help with institutional transformations: What conditions, strategies, interventions and actions at the departmental and classroom levels contribute to the initiation, implementation, and institutional sustainability of active learning in the undergraduate calculus sequence (Precalculus to Calculus 2) across varied institutions?
10 Performance-Based Projects for the Math Classroom - Todd Stanley 2021-09-03
Each book in the 10 Performance-Based Projects series provides 10 ready-made projects designed to help students achieve higher levels of thinking and develop 21st-century skills. Projects are aligned to the Common Core State Standards, allowing students to explore and be creative as well as gain enduring understanding. Each project represents a type of performance assessment, including portfolios, oral presentations, research papers, and exhibitions. Included for each project is a suggested calendar to allow teacher scheduling, mini-lessons that allow students to build capacity and gain understanding, as well as multiple rubrics to objectively assess student performance. The lessons are presented in an easy-to-follow format, enabling teachers to implement projects immediately. Grades 3-5
Doing Math with Python - Amit Saha 2015-08-01
Doing Math with Python shows you how to use Python to delve into high school–level math topics like statistics, geometry, probability, and calculus. You'll start with simple projects, like a factoring program and a quadratic-equation solver, and then create more complex projects once you've gotten the hang of things. Along the way, you'll discover new ways to explore math and gain valuable programming skills that you'll use throughout your study of math and computer science. Learn how to: –Describe your data with statistics, and visualize it with line graphs, bar charts, and scatter plots –Explore set theory and probability with programs for coin flips, dicing, and other games of chance –Solve algebra problems using Python's symbolic math functions –Draw geometric shapes and explore fractals like the Barnsley fern, the Sierpinski triangle, and the Mandelbrot set –Write programs to find derivatives and integrate functions Creative coding challenges and applied examples help you see how you can put your new math and coding skills into practice. You'll write an inequality solver, plot gravity's effect on how far a bullet will travel, shuffle a deck of cards, estimate the area of a circle by throwing 100,000 "darts" at a board, explore the relationship between the Fibonacci sequence and the golden ratio, and more. Whether you're interested in math but have yet to dip into programming or you're a teacher looking to bring programming into the classroom, you'll find that Python makes programming easy and practical. Let Python handle the grunt work while you focus on the math. Uses Python 3
Quality Education as a Constitutional Right - Theresa Perry 2010-10-13
In 2005, famed civil rights leader and education activist Robert Moses invited one hundred prominent African American and Latino intellectuals and activists to meet to discuss a proposal for a campaign to guarantee a quality education for all children as a constitutional right—a movement that would "transform current approaches to educational inequity, all of which have failed miserably to yield results for our children." The response was passionate, and the meeting launched a movement. This book—emerging directly from that effort—reports on what has happened since and calls for a new scale of organizing, legal initiatives, and public definitions of what a quality education is. Essays include · Robert Moses's historically rooted call for citizens, especially young people, to make the demand for quality education · Ernesto Cortés's view from decades of work organizing Latino communities in Texas · Charles Payne's interview with students from the Baltimore Algebra Project, who organized to make historic demands on their district · Legal scholar Imani Perry's nuanced analysis of the prospects of making a case for quality education as a right guaranteed by the Constitution · Perspectives from scholars Lisa Delpit and Joan T. Wynne, and by teachers Alicia Caroll and Kim Parker, who provide examples of what quality education is, describing its goal, and how to guide practice in the meantime
Rethinking Mathematics - Eric Gutstein 2005
A collection of more than thirty articles shows teachers how to weave social justice principles throughout the math curriculum, and how to integrate social justice math into other curricular areas as well.
Everyday Mathematics - 1999

Amazing Math Projects - Laszlo C. Bardos 2010
Outlines projects that introduce math concepts from prime numbers to paraboloids, suggesting such hands-on activities as constructing a geodesic dome, solving the world's hardest two-piece puzzle, and identifying the hidden patterns in snowflakes.
What Counts in Teaching Mathematics - Sandy Schuck 2011-02-04
In this book, internationally recognised scholars and practitioners synthesise current practice and research developments in the area of mathematics teacher education and mathematics education. The book's two sections examine the role and significance of collaborations and critical friends in the self-study of mathematics teaching and teacher education; and the emerging conflicts, dilemmas and incongruities arising from the study of mathematics education practices. The book considers the insights gained from self-analysis regarding the practitioner themselves, as well as their pedagogical content, students and approaches. The contributions highlight the complexity, characteristics and features of mathematics education. The chapters reveal nuances in teaching and learning that are of particular relevance in mathematics education. In addition, the book contains ideas and suggestions on how to enhance the teaching of mathematical content to pre-service teachers. Accordingly, the book appeals to a wide audience of educators—including education academics, teachers, student teachers and researchers. As teacher educators involved in mathematics education, reflection on practice and engagement in practitioner research is becoming increasingly important in our efforts to enhance our teaching. Teachers and student teachers also gain from the insights arising from such reflection. The knowledge and experience

encapsulated in this book provides much for the mathematics education community to build on.

Project-Based Learning in the Math Classroom - Telannia Norfar 2022-03-15

Project-Based Learning in the Math Classroom: Grades 3–5 explains how to keep inquiry at the heart of mathematics teaching in the upper elementary grades. Helping teachers integrate other subjects into the math classroom, this book outlines in-depth tasks, projects and routines to support Project-Based Learning (PBL). Featuring helpful tips for creating PBL units, alongside models and strategies that can be implemented immediately, Project-Based Learning in the Math Classroom: Grades 3–5 understands that teaching in a project-based environment means using great teaching practices. The authors impart strategies that assist teachers in planning standards-based lessons, encouraging wonder and curiosity, providing a safe environment where mistakes can occur, and giving students opportunities for revision and reflection.

Hands-On Math Projects With Real-Life Applications - Judith A. Muschla 2006-07-18

Hands-On Math Projects with Real-Life Applications, Second Edition offers an exciting collection of 60 hands-on projects to help students in grades 6--12 apply math concepts and skills to solving everyday, real-life problems! The book is filled with classroom-tested projects that emphasize: cooperative learning, group sharing, verbalizing concepts and ideas, efficient researching, and writing clearly in mathematics and across other subject areas. Each project achieves the goal of helping to build skills in problem solving, critical thinking, and decision making, and supports an environment in which positive group dynamics flourish. Each of the projects follows the same proven format and includes instructions for the teacher, a Student Guide, and one or more reproducible datasheets and worksheets. They all include the elements needed for a successful individual or group learning experience. The projects are easily implemented and can stand alone, and they can be used with students of various grade levels and abilities. This thoroughly revised edition of the bestseller includes some new projects, as well as fresh information about technology-based and e-learning strategies and enhancements; No Child Left Behind standards; innovative teaching suggestions with activities, exercises, and standards-based objectives; reading and literacy connections; and guidelines and objectives for group and team-building projects. Hands-On Math Projects with Real-Life Applications is printed in a lay-flat format, for easy photocopying and to help you quickly find appropriate projects to meet the diverse needs of your students, and it includes a special Skills Index that identifies the skills emphasized in each project. This book will save you time and help you instill in your students a genuine appreciation for the world of mathematics. "The projects in this book will enable teachers to broaden their instructional program and provide their students with activities that require the application of math skills to solve real-life problems. This book will help students to realize the relevance and scope of mathematics in their lives." --Melissa Taylor, middle school mathematics teacher, Point Pleasant Borough, New Jersey

Sir Cumference and the Great Knight of Angleland - Cindy Neuschwander 2010-07-30

To earn his knighthood, Radius uses a circular medallion to find and rescue a missing king.

Math Fact Fluency - Jennifer Bay-Williams 2019-01-14

Mastering the basic facts for addition, subtraction, multiplication, and division is an essential goal for all students. Most educators also agree that success at higher levels of math hinges on this fundamental skill. But what's the best way to get there? Are flash cards, drills, and timed tests the answer? If so, then why do students go into the upper elementary grades (and beyond) still counting on their fingers or experiencing math anxiety? What does research say about teaching basic math facts so they will stick? In Math Fact Fluency, experts Jennifer Bay-Williams and Gina Kling provide the answers to these questions—and so much more. This book offers everything a teacher needs to teach, assess, and communicate with parents about basic math fact instruction, including The five fundamentals of fact fluency, which provide a research-based framework for effective instruction in the basic facts. Strategies students can use to find facts that are not yet committed to memory. More than 40 easy-to-make, easy-to-use games that provide engaging fact practice. More than 20 assessment tools that provide useful data on fact fluency and mastery. Suggestions and strategies for collaborating with families to help their children master the basic math facts. Math Fact Fluency is an indispensable guide for any educator who needs to teach basic facts. This approach to facts instruction, grounded in years of research, will transform students' learning of basic facts and help them become more confident, adept, and successful at math.

Symbolic Logic and the Binomial Expansion - Richard Forringer 2011-11

While Symbolic Logic and the Binomial Expansion are subjects that are often mentioned in High School and College math courses, the two projects contained in this book have been carefully developed to help the student achieve a more in-depth understanding of these concepts. The projects are designed to be done independently or they can be incorporated into the curriculum of any math course from second semester algebra and beyond. Students who complete these projects will gain a stronger appreciation of what it means to think logically and they will see how two seemingly unrelated areas of study connect in ways that strengthen both. Areas of focus in these projects include: Truth Tables Compound Truth Tables Negations Conditionals Converse, Inverse, and Contrapositive Biconditionals Tautologies Symbolic logic (also known as Mathematical Logic) is foundational to many fields of study such as computer science and engineering. Those who have an understanding of symbolic logic and the binomial expansion will be better prepared for further courses of study in mathematics, science, and engineering. About the author: Dick Forringer received his Bachelors Degree from Kent State University, majoring in mathematics and he earned his Masters in Education from Fordham University. He retired after 42 years of being a teacher and administrator at Durham Academy, in Durham, North Carolina. He is a recipient of the F. Robertson Hershey Distinguished Faculty award and the Brumley Excellence in Teaching award. Dick has also had three feature articles published in Mathematics Teacher. This is his second published book.

Algebra - 1993

Algebraic Topology - Allen Hatcher 2002

In most mathematics departments at major universities one of the three or four basic first-year graduate courses is in the subject of algebraic topology. This introductory textbook in algebraic topology is suitable for use in a course or for self-study, featuring broad coverage of the subject and a readable exposition, with many examples and exercises. The four main chapters present the basic material of the subject: fundamental group and covering spaces, homology and cohomology, higher homotopy groups, and homotopy theory generally. The author emphasizes the geometric aspects of the subject, which helps students gain intuition. A unique feature of the book is the inclusion of many optional topics which are not usually part of a first course due to time constraints, and for which elementary expositions are sometimes hard to find. Among these are: Bockstein and transfer homomorphisms, direct and inverse limits, H-spaces and Hopf algebras, the Brown representability theorem, the James reduced product, the Dold-Thom theorem, and a full exposition of Steenrod squares and powers. Researchers will also welcome this aspect of the book.

Advanced Common Core Math Explorations - Jerry Burkhart 2021-09-03

Students become mathematical adventurers in these challenging and engaging activities designed to deepen and extend their understanding of concepts from the Common Core State Standards in Mathematics. The investigations in this book stretch students' mathematical imaginations to their limits as they investigate the numeration systems of creatures from another planet, create and solve stories and problems with extreme numbers, use place value to design their own new divisibility strategies, and play with a strange kind of number line specially designed to multiply numbers without a calculator. Each activity comes with detailed support for classroom implementation including learning goals, discussion guides, detailed solutions, and suggestions for extending the investigation. There is also a free supplemental e-book offering strategies for motivation, assessment, parent communication, and suggestions for using the materials in different learning environments. Grades 5-8

The Math Teacher's Problem-a-Day, Grades 4-8 - Judith A. Muschla 2008-04-11

From bestselling authors Judith and Gary Muschla, The Math Teacher's Problem-a-Day is a hands-on resource containing 180 handy worksheets, one for each day of the school year, to help students in grades 4-8 acquire the skills needed to master mathematics. These reproducible worksheets are perfect for "sponge activities"—five-minute challenges to start or end a class period—that can also be used as supplemental lessons, homework, or extra credit. With problems based on the Standards and Focal Points of the National Council of Teachers of Mathematics, the book is designed to give students valuable practice

in math skills, using specific activities to enhance critical thinking and boost test scores. The topics covered focus on the core math concepts and skills required for middle school students, including: Numbers and Operations Algebra Geometry Measurement Data Analysis Part of the 5-Minute Fundamentals series, The Math Teacher's Problem-a-Day is an important resource that will help today's students understand more concepts, make connections between branches of mathematics, and apply math skills to a variety of real-life problems.

Partial Differential Equations - Walter A. Strauss 2007-12-21

Partial Differential Equations presents a balanced and comprehensive introduction to the concepts and techniques required to solve problems containing unknown functions of multiple variables. While focusing on the three most classical partial differential equations (PDEs)—the wave, heat, and Laplace equations—this detailed text also presents a broad practical perspective that merges mathematical concepts with real-world application in diverse areas including molecular structure, photon and electron interactions, radiation of electromagnetic waves, vibrations of a solid, and many more. Rigorous pedagogical tools aid in student comprehension; advanced topics are introduced frequently, with minimal technical jargon, and a wealth of exercises reinforce vital skills and invite additional self-study. Topics are presented in a logical progression, with major concepts such as wave propagation, heat and diffusion, electrostatics, and quantum mechanics placed in contexts familiar to students of various fields in science and engineering. By understanding the properties and applications of PDEs, students will be equipped to better analyze and interpret central processes of the natural world.

Project Origami - Thomas Hull 2017-06-29

Project Origami: Activities for Exploring Mathematics, Second Edition presents a flexible, discovery-based approach to learning origami-math topics. It helps readers see how origami intersects a variety of mathematical topics, from the more obvious realm of geometry to the fields of algebra, number theory, and combinatorics. With over 100 new pages, this updated and expanded edition now includes 30 activities and offers better solutions and teaching tips for all activities. The book contains detailed plans for 30 hands-on, scalable origami activities. Each activity lists courses in which the activity might fit, includes handouts for classroom use, and provides notes for instructors on solutions, how the handouts can be used, and other pedagogical suggestions. The handouts are also available on the book�s CRC Press web page. Reflecting feedback from teachers and students who have used the book, this classroom-tested text provides an easy and entertaining way for teachers to incorporate origami into a range of college and advanced high school math courses. Visit the author�s website for more information.

Clothesline Math: The Master Number Sense Maker - Chris Shore 2019-12-10

This must-have resource provides the theoretical groundwork for teaching number sense. Authored by Chris Shore, this e-book empowers teachers with the pedagogy, lessons, and detailed instructions to help them implement Clothesline Math in K-12 classrooms. Detailed, useful tips for facilitating the ensuing mathematical discourse are also included. At the elementary level, the hands-on lessons cover important math topics including whole numbers, place value, fractions, order of operations, algebraic reasoning, variables, and more. Implement Clothesline Math at the secondary level and provide students with hands-on learning and activities that teach advanced math topics including geometry, algebra, statistics, trigonometry, and pre-calculus. Aligned to state and national standards, this helpful resource will get students excited about learning math as they engage in meaningful discourse.

Key Ideas in Teaching Mathematics - Anne Watson 2013-02-21

Big ideas in the mathematics curriculum for older school students, especially those that are hard to learn and hard to teach, are covered in this book. It will be a first port of call for research about teaching big ideas for students from 9-19 and also has implications for a wider range of students. These are the ideas that really matter, that students get stuck on, and that can be obstacles to future learning. It shows how students learn, why they sometimes get things wrong, and the strengths and pitfalls of various teaching approaches. Contemporary high-profile topics like modelling are included. The authors are experienced teachers, researchers and mathematics educators, and many teachers and researchers have been involved in the thinking behind this book, funded by the Nuffield Foundation. An associated website, hosted by the Nuffield Foundation, summarises the key messages in the book and connects them to examples of classroom tasks that address important learning issues about particular mathematical ideas.

Radical Equations - Robert Moses 2002-02-01

The remarkable story of the Algebra Project, a community-based effort to develop math-science literacy in disadvantaged schools—as told by the program’s founder “Bob Moses was a hero of mine. His quiet confidence helped shape the civil rights movement, and he inspired generations of young people looking to make a difference”—Barack Obama At a time when popular solutions to the educational plight of poor children of color are imposed from the outside—national standards, high-stakes tests, charismatic individual saviors—the acclaimed Algebra Project and its founder, Robert Moses, offer a vision of school reform based in the power of communities. Begun in 1982, the Algebra Project is transforming math education in twenty-five cities. Founded on the belief that math-science literacy is a prerequisite for full citizenship in society, the Project works with entire communities—parents, teachers, and especially students—to create a culture of literacy around algebra, a crucial stepping-stone to college math and opportunity. Telling the story of this remarkable program, Robert Moses draws on lessons from the 1960s Southern voter registration he famously helped organize: “Everyone said sharecroppers didn't want to vote. It wasn't until we got them demanding to vote that we got attention. Today, when kids are falling wholesale through the cracks, people say they don't want to learn. We have to get the kids themselves to demand what everyone says they don't want.” We see the Algebra Project organizing community by community. Older kids serve as coaches for younger students and build a self-sustained tradition of leadership. Teachers use innovative techniques. And we see the remarkable success stories of schools like the predominately poor Hart School in Bessemer, Alabama, which outscored the city's middle-class flagship school in just three years. Radical Equations provides a model for anyone looking for a community-based solution to the problems of our disadvantaged schools.

Place Value - David A. Adler 2016-02-15

You had better not monkey around when it comes to place value. The monkeys in this book can tell you why! As they bake the biggest banana cupcake ever, they need to get the amounts in the recipe correct. There’s a big difference between 216 eggs and 621 eggs. Place value is the key to keeping the numbers straight. Using humorous art, easy-to-follow charts and clear explanations, this book presents the basic facts about place value while inserting some amusing monkey business.

Handbook of Research on Mathematics Teaching and Learning - Douglas Grouws 2006-11-01

Sponsored by the National Council of Teachers of Mathematics and written by leading experts in the field of mathematics education, the Handbook is specifically designed to make important, vital scholarship accessible to mathematics education professors, graduate students, educational researchers, staff development directors, curriculum supervisors, and teachers. The Handbook provides a framework for understanding the evolution of the mathematics education research field against the backdrop of well-established conceptual, historical, theoretical, and methodological perspectives. It is an indispensable working tool for everyone interested in pursuing research in mathematics education as the references for each of the Handbook's twenty-nine chapters are complete resources for both current and past work in that particular area.

Robert Parris Moses - Laura Visser-Maessen 2016-02-24

One of the most influential leaders in the civil rights movement, Robert Parris Moses was essential in making Mississippi a central battleground state in the fight for voting rights. As a leader of the Student Nonviolent Coordinating Committee (SNCC), Moses presented himself as a mere facilitator of grassroots activism rather than a charismatic figure like Martin Luther King Jr. His self-effacing demeanor and his success, especially in steering the events that led to the volatile 1964 Freedom Summer and the formation of the Mississippi Freedom Democratic Party, paradoxically gave him a reputation of nearly heroic proportions. Examining the dilemmas of a leader who worked to cultivate local leadership, historian Laura Visser-Maessen explores the intellectual underpinnings of Moses's strategy, its achievements, and its struggles. This new biography recasts Moses as an effective, hands-on organizer, safeguarding his ideals while leading from behind the scenes. By returning Moses to his rightful place among the foremost leaders of the movement, Visser-Maessen testifies to Moses's revolutionary approach to grassroots leadership and the power of the individual in generating social change.

Math Art and Drawing Games for Kids - Karyn Tripp 2019-11-19
In Math Art and Drawing Games for Kids, you'll find an amazing collection of more than 40 hands-on art activities that make learning about math fun! Create fine art-inspired projects using math, including M. C. Escher's tessellations, Wassily Kandinski's abstractions, and Alexander Calder's mobiles. Make pixel art using graph paper, grids, and dot grids. Explore projects that teach symmetry with mandala drawings, stained glass rose window art, and more. Use equations, counting, addition, and multiplication to create Fibonacci and golden rectangle art. Play with geometric shapes like spirals, hexagrams, and tetrahedrons. Learn about patterns and motifs used by cultures from all over the world, including Native American porcupine quill art, African Kente prints, and labyrinths from ancient Crete. Cook up some delicious math by making cookie tangrams, waffle fractions, and bread art. Take a creative path to mastering math with Math Art and Drawing Games for Kids!

Theory and Practice: An Interface or A Great Divide? The Mathematics Education for the Future Project – Proceedings of the 15th International Conference - Alan Rogerson
This volume contains the papers presented at the International Conference on Theory and Practice: An Interface or A Great Divide? and held from August 4-9, 2019 at Maynooth University, Kildare, Ireland. The Conference was organized by The Mathematics Education for the Future Project – an international educational project founded in 1986 and dedicated to innovation in mathematics, statistics, science and computer education world-wide. Oouder, Fouze Abu; Amit, Miriam: Incorporating Ethnomathematical Research in Classroom Practice – The Case of Geometrical Shapes in Bedouin Traditional Embroidery. pp 1 – 4 Ethnomathematics asserts that in addition to the formal mathematics taught in schools, there are other forms of mathematics, which have been taught in different societies and cultures around the world. Research and educational experience has shown that combining ethnomathematics with the formal mathematics curriculum in the classroom can improve students' academic achievement, since it strengthens their self-image and reinforces their motivation for studying mathematics. We adopted this approach with Bedouin students who are defined as 'underachievers' in national mathematics tests. In this paper, we offer an ethnomathematical analysis of Bedouin embroidery samples taken from traditional dresses made by Bedouin women. We then describe how ethnomathematical elements were incorporated in the teaching of mathematics for Bedouin students, and how doing so contributed to their learning. https://doi.org/10.37626/GA9783959871129.0.01 Adams, Nadine; Hayes, Clinton: Providing Synchronous Mathematics Instruction to Distance Students- Workshop. pp 5 – 8 In theory technology breaks down boundaries and allows us to more easily connect to our students. But in practice despite all of the technology available mathematics instruction is still best given in a "talk and chalk" format. The use of instructional videos, where the student is able to watch handwritten instruction, has become standard. These are great in that they provide asynchronous instruction and allow the student to learn at a time that suits them. What these videos lack is the interactive component that makes face-toface teaching preferable. To overcome this online lectures are conducted using a combination of Zoom, PDF Annotator and a Tablet PC. Students are provided with an experience much closer to that of face-to-face. https://doi.org/10.37626/GA9783959871129.0.02 Adenegan, Kehinde Emmanuel: Managing Pupils with Dysgraphia in Early Child Numeracy. pp 9 – 13 Dysgraphia is a specific learning difficulty which is a brain-based disorder that impacts on writing skills whereby affected individuals have difficulty with forming letters, writing figures, spacing words and even organizing text into complete sentences. Early child numeracy is a competence built in the young child at an early childhood stage in the mathematical skills needed to cope with everyday life and an understanding of information presented mathematically. To this end, this paper presents dysgraphia, its symptoms in pupils, offers measures on how to manage dysgraphia pupils by teachers and parents and highlights strong recommendations to assist such pupils in performing and competing favourably in Mathematics and other subjects with other pupils in the classroom. Keywords: Dysgraphia, Early Child Numeracy (ECN), Mathematics, Pupils, Numerophobia. https://doi.org/10.37626/GA9783959871129.0.03 Anhalt, Cynthia O.; Cortez, Ricardo: Mathematical Modeling Thinking: Laying the Foundation for Mathematical Modeling Competency. pp 14 – 19 Mathematical modeling competency requires frequent practice and sufficient time to derive experience solving open-ended contextual problems. Specific ways of thinking necessary in modeling are identified by contrasting Pólya's general problem-solving framework, which may be familiar worldwide. These ways of thinking are developed through mathematical activities that promote dispositions for eventual success in modeling. We posit that mathematical modeling thinking (MMT) is necessary for building modeling competency. This paper describes MMT and illustrates how it can be developed through a well-known problem of universal human cultural greeting exchange. While connecting to world cultures, we examine ways to promote MMT practices such as making useful simplifications, looking for patterns, utilizing multiple representations, mathematizing the situation, and reflecting on the solution. We conclude with practical ways to effect MMT as the foundation for developing mathematical modeling competency. https://doi.org/10.37626/GA9783959871129.0.04 Ashleigh, Glenda Jean: Individual Differences in Cognition and Affect in Multiplicative Knowledge in Basic Mathematics Problems. pp 20 – 25 This paper discusses the roles that individual differences in cognitive and affective variables play in the formation of increasingly complex multiplicative knowledge structures in basic mathematics problems. The effectiveness of learner strategies and teaching strategies to optimise the development of authentic multiplicative knowledge will vary according to these individual differences. https://doi.org/10.37626/GA9783959871129.0.05 Banach, Katarzyna: Ok Notebook as an Untypical Form of Student´s Notebook – Own Experience. pp 26 – 28 In recent years, the methods of work at the Polish school have been evaluated. From the Prussian school model, we are slowly moving to the model of a modern school meeting contemporary challenges. At the present time, much attention is devoted to the search for new working methods and teaching tools. We draw on the experience of other countries. We test our own solutions. This paper deals with the use of formative assessment in association with the untypical formula of a student's notebook. https://doi.org/10.37626/GA9783959871129.0.06 Bateiha, Summer; Mir, Sadia: Engaging with Mathematics through Three Types of Storytelling. pp 29 – 33 Throughout history, storytelling has been used as a way to appeal to people's imagination and emotions. When stories are told in the mathematics classroom, the subject comes to life. Students begin to understand the purpose of learning the content, and mathematics becomes something greater than a plethora of irrelevant facts and formulas that are meant to be memorized, applied, and repeated. This workshop focuses on the use of storytelling as a way to engage students in a nontraditional and pertinent form of learning mathematics. In this session, participants will listen to stories used with predominantly Arab students in an American university in Qatar and partake in doing mathematical tasks related to the stories presented. Although the stories in this workshop were applied in an Arab context, the ideas can be edited for use in any cultural context. https://doi.org/10.37626/GA9783959871129.0.07 Bedwell, Mike: Freedom of Speech. pp 34 – 35 This paper rues the fact that submissions to some academic journals are treated increasingly badly by the publishers, with little succour offered by the editor. The writer gives an example where changes in terminology, spelling and punctuation were introduced after the paper had been accepted by the peer appraisers. This paper also argues for rigid ruling on the graphical presentation of quantitative data, such as the dimensionless labelling of the axes in Cartesian graphs, and the default rule for ordering the nominal variables on a bar-chart. https://doi.org/10.37626/GA9783959871129.0.08 Bentley, Brianna: College Studens´ Views of Fraction Arithmetic. pp 36 – 41 College students view mathematics, specifically fraction arithmetic, as a series of tricks that can lead them to the correct answer. This view of mathematics is a direct reflection of their lack of conceptual understanding of fraction arithmetic and their reliance on procedural understanding. College students have an imprecise remembrance of fraction arithmetic and instead rely on tricks they vaguely remember and cannot explain. This reliance on procedural processes that they do not fully understand causes them to make mistakes in their arithmetic. If we do not require students to think critically about the mathematical processes they are completing when first taught a subject and require this critical thought as students progress through mathematics courses, mathematics loses meaning and our students will not have the ability to think critically or conceptually about mathematics. https://doi.org/10.37626/GA9783959871129.0.09 Betts, Paul; et al: Foundational Experiences as a Design Principle for Mathematics Curriculum for Children. pp 42 – 47 Students must make sense of the mathematics they are learning, if they are to understand it. When students are encountering a mathematics topic primarily through that topic's mathematical forms—its symbols, terminology, definitions, operations, and algorithms—the richness, potency, and completeness of their understanding will depend on their prior,

pre-formal experiences with that topic. Foundational experiences activities enable students to construct images, patterns, and ideas—in a word, memories—that will enable them to see the sensibility of the topic's mathematical forms when they learn them. We invite participants to explore some examples of instructional activities designed to provide foundational experiences for multiplication. What are the qualities that we should invest in foundational experience activities? How can such activities be positioned within curriculum design, with the goal of increasing the quality of students' understandings of mathematics topics, in pursuit of success for all participants in school math? https://doi.org/10.37626/GA9783959871129.0.10 Billings, Esther; Kasmer, Lisa: Learning via Teaching: Examples of Mediated Field Experiences in Early Coursework of Pre-Service Teachers. pp 48 – 53 Twenty years ago, Ball and Cohen (1999) described a vision for practicebased professional education in which teachers' learning is situated within practice. We have purposefully designed practice-based educational experiences early in teacher preparation coursework around McDonald et al.'s (2013) learning cycle to include mediated field experiences. Such experiences are structured to explicitly connect coursework and fieldwork and are organized around core practices; preservice teachers (PSTs) deepen their learning of mathematics and ways to teach mathematics by doing the work of teachers within authentic K-12 classroom settings. In this paper we describe examples of mediated field experiences structured on McDonald et al.'s (2013) learning cycle that occur early in PSTs' coursework, prior to student teaching. https://doi.org/10.37626/GA9783959871129.0.11 Brahier, Daniel J.: Research into Practice: 29 Years of Classroom Teaching. pp 54 – 59 The preparation and professional development of mathematics teachers requires instructors who are not only proficient in their content and pedagogy but can bring successful teaching experiences to the classroom. In this paper, the author shares his experience of 29 years of simultaneously teaching in a K-12 secondary school, while also serving as a university professor who teaches mathematics methods courses. Examples of classroom experiences that enhanced university methods courses are described, as are some of the benefits of teaching in both settings to connect research and practice in mathematics teaching.
https://doi.org/10.37626/GA9783959871129.0.12 Browning, Sandra: Elementary Preservice Teachers and Questioning Strategies in Mathematics. pp 60 – 65 Research has demonstrated an interest in the relationship between teachers' questioning strategies and children's ability to reason and learn (Baroody & Ginsburg, 1990; Buschman, 2001; Fennema, Franke, Carpenter & Carey, 1993). Helping preservice teachers develop effective questioning strategies is an important component of a teacher education program. This session describes an exploration designed to determine if EC-6 preservice teachers can (a) recognize effective questioning strategies when observing inservice teachers and (b) use Hess's Cognitive Rigor Matrix to analyze the level and effectiveness of their own questioning strategies during field experiences. https://doi.org/10.37626/GA9783959871129.0.13 Burrill, Gail: Statistical Literacy and Quantitative Reasoning. pp 66 – 71 Given a world awash with data, students of today will be consumers of statistical information whatever their future. What can we do to make them critical consumers as articulated by researchers such as Gal and Steen and as suggested in the National Council of Teachers of Mathematics Catalyzing Change, able to process information, ask the right questions and make informed decisions? This paper explores what it means to be statistically literate able to reason with quantitative information in today's world and why it is important from both a personal and professional perspective. Examples from several fields illustrate features of essential core concepts that should be components of the curriculum for all students if we are to have statistically literate citizens capable of thinking and reasoning in quantitative situations. The discussion will also address some of the challenges we face in making this recommendation a reality. https://doi.org/10.37626/GA9783959871129.0.14 Cametti, Cristina; et al: Advantages, Challenges and Opportunities in Teaching Statistics in Doctoral Training to a Heterogeneous Group: the Case of FLAMES Summer School. pp 72 – 77 FLAMES is an inter-university doctoral training network in which all Flemish universities of Belgium collaborate. It aims to support young researchers, in need of methodological and statistical insights and skills, by offering them high quality training at basic, intermediate and advanced levels. One of our most successful activities is a yearly two-week summer school which features a range of modules on research design, statistical methodology and data analysis. Each module connects theory with hands-on exercises, focusing on various disciplines and using different software packages. In this paper, we discuss the FLAMES approach in teaching statistics to a heterogeneous group of young researchers from various disciplines with a different background in statistics and methodology. FLAMES' 'measuring is knowing' principle is used to evaluate the content, applicability and educational aspects of the current modules and to receive suggestions for future topics.
https://doi.org/10.37626/GA9783959871129.0.15 Castro Miguez, Luis Alexander; et al: Diagrammatic Reasoning from Reflections on Peircean Semiotics. pp 78 – 83 The document illustrates some elements of reflection on Peirce's semiotics focused on reasoning through diagrams. The solution of a Euclidean geometry problem is taken as a reference in which mathematical diagrams are recognized as epistemological tools in the learning and teaching of geometry. This is how an interpreter, who systematically observes and experiments with a geometric diagram, generates different interpretants by means of abductive, inductive and deductive reasoning. https://doi.org/10.37626/GA9783959871129.0.16 Chapman, Olive; Babb, Paulino Preciado: Prospective Secondary Mathematics Teachers´ Development of Knowledge of Modelling for Teaching. pp 84 – 89 Given the growing attention on modelling in school mathematics curriculum, prospective teachers are likely to need special help to develop a rich sense of mathematical modelling [MM] and effective classroom practices to support students' development of MM competencies. This paper is based on a study involving the use of inquiry-based activities to engage prospective secondary mathematics teachers [PTs] in developing such knowledge of MM for teaching. Participants were students in a mathematics education course. Data sources included course work and field notes. We report findings related to the inquirybased activities and the learning they afforded in the participants' understanding of specific components of problem-solving [PS] and MM knowledge for teaching and the relationship between them. https://doi.org/10.37626/GA9783959871129.0.17 Chin, Kin Eng; Jiew, Fui Fong: Misconceptions or Preconceptions in Making Sense of Decimals. pp 90 – 95 This paper aims to explore the root causes of students' misconceptions in decimals. A set of decimal tasks and follow-up interviews were used to gather the relevant data. Eight Year Six primary school students participated in this study on a voluntary basis. In this paper, data collected from two students were reported because they showed qualitatively distinct responses and could cover the spectrum of responses of this group of participants. Findings revealed that students' misconceptions maybe regarded as preconceptions that were developed from work experiences in other contexts such as integers. This shows that the learning experiences from other contexts may impede future learning of students in new contexts.
https://doi.org/10.37626/GA9783959871129.0.18 Civil, Marta; Hunter, Roberta: Supporting Mathematics Teachers to Build Deep Understandings of the Home Contexts of their Students. pp 96 – 99 Teachers face many challenges in meeting the cultural diversity they encounter in current mathematics classrooms. To avoid marginalisation of specific groups of students we advocate for a strength-based approach in which teachers are supported to build deep understandings of the lived home context of their students. We discuss findings from our research projects with immigrant students (Pāsifika) in New Zealand and with Mexican American students in the United States. While our contexts are quite different, our approaches have much in common, in particular through their focus on teachers learning from and about their students' communities to then build on this learning in their mathematics teaching. Bridging theory and practice, we share specific strategies that we have used to support teachers as learners of their students' home contexts (e.g., home visits; parents' classroom visits; school meetings led by parents).
https://doi.org/10.37626/GA9783959871129.0.19 Clemmer, Katharine; et al: Collaborative Solution Discovery: A Problem Solving Process. pp 100 – 103 Loyola Marymount University (LMU) has developed a new approach to problem solving, Collaborative Solution Discovery (CSD), to help practitioners in a school system leverage their individual passions in a way that grows students' positive math identity through mathematical thinking, problem solving, and self-regulation. By focusing on how students and teachers interact with each other in real-time in an ideal classroom, practitioners take ownership of a process to guide their students in growing their positive math identity and thus taking ownership of their own math learning. Practitioners measure progress along the way through metrics that are created, defined, used, and continually refined by themselves to attain their ideal math learning environment. The entire CSD process results in a system that owns ist improvement efforts—improvement efforts that are flexible, adaptable, and sustainable. https://doi.org/10.37626/GA9783959871129.0.20 Coggins, Porter; et al: The Mathematical Culture of Ojibwe Students – An Ethnographic Study. pp 104 – 109 Human beings have an

innate capacity to communicate, count, detect patterns, locate, and create. With these capacities we invent, design, play, and explain. Regardless of academic background, we also have the innate capacity to use mathematics in meaningful ways. However, in spite of this innate capacity, there is a large disconnect between innate function and success in academic mathematics. Our research is based on interviews of 14 Ojibwe-identifying tribal college students. The instrument was constructed based on Bishop's (1988) set of six universals or activities people have always done. We present the development of the instrument, interview process, and initial findings. Findings include common ethnomathematical threads found among the interviewed students. Our goal is to use this research to improve ourpreK-12 professional education teacher program and positively impact Ojibwe student learning.
https://doi.org/10.37626/GA9783959871129.0.21 Collins, Ken: Using CAS to Improve Student Understanding of Calculus Concepts. pp 110 – 114 This session will explore two areas of application of CAS: one focusing on how teachers can improve student learning using CAS, the other focusing on how students can use CAS directly to help them improve their understanding of calculus concepts. We will illustrate the first area by sharing some examples of calculus teaching lessons that use CAS to help students understand or apply a particular concept. We will illustrate the second area by sharing some examples of student explorations that utilize CAS. These allow students to explore some relationships and applications we use in calculus that would be difficult to do otherwise. For example, the Mean Value Theorem (MVT) is one of the most important theorems in calculus. Many first year calculus students have difficulties really understanding or applying the MVT. Using CAS, a student can explore how to apply the MVT to a differentiable function and develop a better understanding of the MVT and its graphical interpretation. This session will focus on first year calculus topics. https://doi.org/10.37626/GA9783959871129.0.22 Curry, Marjorie: Culturally Responsive Math. pp 115 – 117 Using the Ready for Rigor framework, Zaretta Hammond's book Culturally Responsive Teaching and the Brain: Promoting Authentic Engagement and Rigor Among Culturally and Linguistically Diverse Students gives educators a neuroscience-based approach to closing the achievement gap. The Ready for Rigor framework consists of four strands: awareness, learning partnerships, information processing, and community building. Acknowledging that all four strands are paramount to culturally responsive teaching but restricting focus to information processing, this session will give participants examples of and strategies for making their mathematics lessons more culturally responsive. More specifically, participants will learn to game-ify it, story-ify it, and make it social.
https://doi.org/10.37626/GA9783959871129.0.23 Czarnocha, Bronislaw: Constructivist Teaching Experiment: Constructivist Research and Constructivist Teaching. pp 118 – 123 The aim of the discussion is twofold: first, we formulate and present examples of the creative bisociativity inherent in teaching-research TR/NYCity model (Section 1). Second, we bring the creative model of teaching-research as the precise solution to the difficulties experienced by Common Curriculum Standards in Mathematics (CCSM). Section 2 analyzes the reason for extraordinary difficulties in successful introduction of the curriculum into practice, which manifest themselves among others, by the necessity of scripted lessons telling teachers exactly what to do in all different moments of the lesson time. The root reason for the contemporary difficulties is the absence of teachers involvement in the design process It is in contradiction with the irreducible presence of teaching within the central constructivist instrument of research- constructivist teaching experiment of Cobb and Steffe (1983). https://doi.org/10.37626/GA9783959871129.0.24 Das, Mili: Curriculum for Mathematics Education – An Approach to Discuss Relation Between Theory and Practice. pp 124 – 129 A new curriculum has been introduced in Teachers' Training course as the course is shifted from one year to two-year course in West Bengal, a state of India. In this curriculum in each course-paper theory and practicum are given equal importance so is in mathematics education also. In this new approach most of the educational experiences in mathematics education, gathered by the trainees are set and organized by combining theory and practicum. So, instead of only theory in this paper relationship is discussed on intertwined function of theory and practicum with practice.
https://doi.org/10.37626/GA9783959871129.0.25 De Lange, Jan: Curious Minds: Serious Play. pp 130 – 135 We describe the background, theory, implementation and results so far of the Curious Minds Project, carried out by seven Dutch and Belgian Universities. The present article focuses on the Utrecht University's involvement and results. Issues addressed are: hypothesis, role of manipulatives (toys), designing student activities from pre-primary to primary, creativity and curiosity, the role of adults and the challenges for professional development. Keywords: Early Childhood, Curiosity, Scientific Reasoning, Practice.
https://doi.org/10.37626/GA9783959871129.0.26 Demirbec, Maifer Remzie: Puerto Rico Gas Prices Fall – „The Math of Cheap Oil". pp 136 – 138 This project is an application of "Rate of change" and "Equation of the line" in business and finance field, as part of College Algebra and Trigonometry syllabus. The goal of this project is to develop students' skills to understand and interpret graphs, tables, Math concepts as absolute value and percent change by showing them how Math is connected with real life issues. Also, is to engage students with the topic and through that how to use their Math knowledge of reading tables, complete tables, calculate the absolute and percent change, construct and interpret graphs.
https://doi.org/10.37626/GA9783959871129.0.27 Dick, Thomas P.; Pilgrim, Mary E.: Learning (and Learning Teaching) by Doing Problems. pp 139 – 144 Active learning is often a challenge to find in mathematics classrooms at the post-secondary level. Still, teachers are expected to be experts in studentcentered approaches despite not having experiences with such approaches as students. The aim of this workshop is to introduce participants to a totally problem-based instructional experience, with the opportunity to actively engage in mathematics as students. During the workshop, participants will engage in discourse and reflection – reflection on both mathematics as well as the impact such a problem-based instructional experience could have on their practice. https://doi.org/10.37626/GA9783959871129.0.28 Dorrington, Pam: Family Maths: Experiential Learning. pp 145 – 149 The international Family Maths programme adopts an inquiry teaching and learning approach and it encourages learners, often from diverse backgrounds, to participate fully in the learning process. The programme also aims to develop the vocabulary necessary for meaningful communication in mathematics, develop problem solving skills and increase confidence and enjoyment of mathematics. The programme has proven to be a powerful catalyst in this regard and holds important lessons for both curriculum development and developing positive attitudes towards mathematics teaching and learning. This experiential learning, interactive work-session focuses on primary school mathematics curricula (for pupils approximately 9 – 13 years of age) and aims at giving participating conference delegates an opportunity to engage with and experience some of the hands-on problem solving activities used in the Family Maths programme. Discussion will be encouraged around the relevance of these activities for the teaching and learning of mathematics. Our conference organisers encourage presenters to consider the relationship between research and classroom teaching, and how, and if, these relate to each other in practice. Can the Family Maths philosophy and practice be a catalyst in narrowing the divide between the theory and practice of effective mathematics teaching and learning?
https://doi.org/10.37626/GA9783959871129.0.29 Ferrarello, Daniela; et al: Serious Games in Teaching/learning Mathematics: the Experience of FunGo. pp 150 – 155 In this paper we present a general overview of serious games and their educational potential. We focus in particular on serious games for the teaching/learning of mathematics, highlighting how the method of horizontal teaching is effective in enabling students to achieve the learning objectives set by the teacher. FunGo, a serious game designed by the authors (researchers in mathematics education) in synergy with a group of graphic designers and computer scientists, is part of this line of ideas. We will show how FunGo has a multiple usability: it has, in fact, a double didactic use and has been used in public events of dissemination of mathematics, reporting in both cases positive results. https://doi.org/10.37626/GA9783959871129.0.30 Fine, Benjamin; et al: The Impact of Mathematics and Mathematicians. pp 156 – 160 The 1600's ushered in our modern world, but not in the way most people learn in school. There was a revolution; started by Kepler, continued by Galileo, Descartes and Fermat and culminating in Newton and Leibniz. This revolution allowed for the development of modern mathematics which in turn led to modern science and engineering to advance. Hence, the technological revolution occurred which has shaped our present-day existence much more than anything else. In this article we examine these developments during the amazing seventeenth century. We keep an eye on the fact that for whatever reason human beings for the most part seem not to do hard engineering until the hard science is developed and not to do the hard science until the correct mathematics has been discovered. https://doi.org/10.37626/GA9783959871129.0.31 Fox, Courtney: Clean Water for Women and Children. pp 161 – 163 This workshop gives participants an outline of a full unit in Trigonometry that covers right triangle trigonometry, the law of sines, and the law of cosines. Attendees will participate in

abbreviated student tasks. In the unit students are introduced to the world water crisis and how it affects women and children the most and why this is. Using their knowledge of trigonometry and the Desmos (or other graphing) calculator to “solve” a water crisis in a town and bring clean sanitation to a remote island. This unit helps students develop critical thinking and problem-solving skills, numerical literacy, and global awareness. Students make connections to the “real world” using mathematics and become world citizens. https://doi.org/10.37626/GA9783959871129.0.32 Galluzzo, Ben; Kavanagh, Katie: Getting Started Getting Students Modeling: Designing and Facilitating Open-ended Math Modeling Experiences. pp 164 – 167 “Modeling” is a term that has several meanings in general, but particularly in mathematics. Here math modeling refers to the process of creating a mathematical representation of a real-world scenario to make a prediction or provide insight. There is a distinction between using a formula that arises from an application (for example, distance equals rate times time) and the actual creation of a mathematical relationship itself that can be useful in an applied setting. In this two part workshop, we demonstrate how to develop authentic math modeling challenge problems that are accessible and relevant to students. In the second part of the workshop we talk about how to facilitate math modeling so that students have an opportunity to be creative and innovative in their modeling process while having ownership over their solution. https://doi.org/10.37626/GA9783959871129.0.33 Gazit, Avikam: Mathe Teachers´ Attitudes toward integrating Humor in Math Lessons. pp 168 – 172 The purpose of this study was to examine the attitudes mathematics teachers toward integrating humor in math lessons. Mathematics and humor are not seen as consistent with each other. Mathematics is seen as a subject is difficult to understand and its subject matter is isolated without any humanistic elements. Integrating humor in math lessons may create a pleasant atmosphere and reduce math anxiety. Humor can increase motivation as well as promoting creative thinking. A sample of 25 math teachers, most of them from elementary schools, answered a questionnaire. An important conclusion to be drawn from the findings is the positive attitudes of the teachers regarding the integration of humor in math lessons. It recommended strengthen math teacher to integrate humor in their lessons. https://doi.org/10.37626/GA9783959871129.0.34 Gill, Eoin: Maths Week Ireland: Promoting a Positive Attitude to Mathematics in Ireland. pp 173 – 176 Maths Week Ireland is an annual festival established in 2006 by people in the STEM community as an all-island event including the Republic of Ireland and Northern Ireland. Particular effort is made to highlight maths for life, for careers and as part of our culture. While the core principle is “Maths for All” the main engagement is with schools. In 2018 teachers reported 354,000 primary and second level pupils participating through in-school activities, online activities and events at partner centres. Maths Week creates an opportunity to disseminate new ideas in maths education. It also creates a space whereby teachers can try out new ideas and invent and create new activities with their pupils. This paper describes the organisation and activities of Maths Week and discusses the impact of the initiative with particular reference to evaluation with teachers. https://doi.org/10.37626/GA9783959871129.0.35 Goodell, Joanne E.: Learning to Teach Mathematics Through Project-Based Instruction. pp 177 – 182 Project-based instruction (PBI) is gaining prominence in the USA as an instructional innovation that promotes deep and connected understanding in mathematics. In this paper, I describe a program developed at the University of Texas at Austin known as UTeach that is being replicated in 45 universities across the USA. Concepts of inquiry teaching, problem-based and projectbased instruction are developed across the program. In this paper I argue that the structure, timing and location of student teaching impacts whether or not pre-service teachers are able to implement PBI during student teaching, which in turn impacts satisfaction with the student teaching experience and ultimately the intention to enter and continue in the teaching profession. https://doi.org/10.37626/GA9783959871129.0.36 Gordon, John; et al: A Problem-Solving Approach to the Introduction to Ordinary Differential Equations for Undergraduate Students at an American Two-year College. pp 183 – 188 Undergraduate students in STEM (Science, Technology, Engineering, and Mathematics) at City University of New York (CUNY)-Queensborough Community College (QCC) working toward a baccalaureate degree at one of CUNY’s senior colleges are required to take an introductory course in ordinary differential equations (ODE). Faculty in the Mathematics Department at QCC are experimenting with a problem-solving approach to this course in which students engage in learning course material through the development of mathematical models of real-world problems. The results seem promising and we outline them in this paper. Key-Words: First-order, linear system, integrating factor, homogeneous equation, research-based. https://doi.org/10.37626/GA9783959871129.0.37 Grzegorczyk, Ivona: Magic Tricks and Activities Supporting Abstract Thinking in Mathematics. pp 189 – 192 This workshop will involve you in mathematics based magic tricks activities promoting pattern recognition and algebraic modeling in various contexts. The interactive, hands-on activities are designed for introductory algebra courses, but they can be modified to generate more complexity and advanced mathematical thinking. https://doi.org/10.37626/GA9783959871129.0.38 Gurevich, Irina: Do Future Mathematics Teachers Need the Course „Integration of Digital Technologies in Teaching Mathematics“, and if so, what exactly can it help them with? pp 193 – 198 In the current research we analysed our teaching experience in the course “Integration of digital technologies in teaching mathematics”. The students were mathematics student teachers. The main goal of the course was to demonstrate the potential of digital technologies in teaching mathematics and to provide the students with basic skills in the intellectual use of these technologies. During the course the students, after getting acquainted with various mathematical software packages, build and present their own teaching units. We were interested to analyse the students’ attitudes towards the course. A multiple-choice questioner was formulated, and the collected data were analysed. We observed that most of the students found the course being helpful for their future teaching. The obtained results indicated that the described course provided them a didactic model to emulate. https://doi.org/10.37626/GA9783959871129.0.39 Hansen, Heidi B.; Magiera, Marta T.: Working Together: A Cross-cultural Study Addressing Mathematics Anxiety in K-8 Pre-service Teachers. pp 199 – 204 This study will present data from research on K-8 pre-service teachers’ math anxiety across three universities: one public, one private and one non-U.S. The article discusses background rationale, literature, tools used and results of this study. The results of the study indicated that similar math anxiety levels exist in students in all three types of academic institutions. The paper also incorporates discussion of the importance of including the topic in pre-service teacher training, and possible interventions for alleviating math anxiety. https://doi.org/10.37626/GA9783959871129.0.40 Hansen-Smith, Bradford: Why the Circle cannot be Squared. pp 205 – 210 Squaring the circle using compass and straight edge in such a way that both have the same area is not possible. The question is, why not? Math logic assumes there must be an area equal to both. Presumably there is a need to make these very different 2-D shapes equal, possibly to find a geometric proof to an inverse mathematical concept about differences. To “square the circle” gives preference to the square, four straight lines and four 90° angles, over a single line of the circle without angles. Maybe the emphasis more correctly is about the relationship of difference. Logically the truncation process suggests the circle is origin to the square, meaning there can be no polygon equal to the circle. Folding the circle gives a unique perspective about the relationship of circle to square, revealing 90° to be an angle of change, of directional movement between two points before any construction of a fixed angle or measuring of lines and areas. https://doi.org/10.37626/GA9783959871129.0.41 Herrelko, Janet M.: Change the Paradigm of Solitary Lesson Planning to Collaborative Planning that Unites Research and Practice. pp 211 – 216 Teachers are planning mathematics lessons using a basic protocol created in the 17th century. The results of the Programme for International Student Assessment provide evidence that this is not a successful approach to teaching students mathematical concepts today. Research in cognitive sciences has established how people attend to, sort, and store new content. Educational research provides case studies of successful pedagogical methods that help students learn. It is time for mathematics educators to unite these resources to create integrated lessons that focus on problem solving with experiential learning. This is a proposal to have teachers integrate educational and cognitive research creating lessons that improve access and equity to help students learn mathematics. https://doi.org/10.37626/GA9783959871129.0.42 Horwitz, Kenneth: Utilizing Analytics to show Representations used in Comparing and Ordering Unit Fractions. pp 217 – 222 Video Analytics bring together the world of educational research and classroom teaching with technology and the internet. Through use of more than 4500 hours of video data, an open source analytic creation tool, this study creates a video analytic that supports a research paper. In addition to supporting research, analytics can be a reflective tool for teachers, as well as support professional development as all levels. This report illustrates the video analytic, Using Meredith’s models to reason about comparing and ordering unit fractions, (Horwitz, 2015, available at

http://dx.doi.org/doi:10.7282/T33J3FQG), as well as the methods used in the creation of the analytic used to support research in student use of representations to make sense of fractions.
https://doi.org/10.37626/GA9783959871129.0.43 Huang, Hsin-Mei E.; et al: Investigating Junior High School Students´ Length Estimation Ability and Strategies. pp 223 – 228 This study investigated junior high school students' length estimation ability with respect to everyday objects with lengths between 1 millimetre and 1 meter. Students' strategies used for estimating the length of the longer side of a basketball court in school were analysed. A total of 240 Grade 7-9 students from cities in northern Taiwan completed a paper-and-pencil test assessing length estimation abilities. Results showed a significant gender effect on length estimation, but neither effects of grade level nor any interaction between grade level and gender on length estimation. About 40% of the students used effective strategies for estimating length measures, including visualizing, utilizing body parts, applying previous experiences, using a mental ruler, and making use of objects nearby. Still, about 60% of the students used ineffective strategies such as guessing. Implications for research and education practices are discussed.
https://doi.org/10.37626/GA9783959871129.0.44 Humarán Martínez, Yuitza T.: Using Manipulatives to Develop the Understanding of the Concept of the Fraction of Preservice Elementary Teachers: The Meaning of Measure. pp 229 – 234 Manipulatives are a tool when that well-implemented can contribute to the development of mathematical concepts and processes, and is a popular strategy in elementary school. However, educators usually don't use this technique efficiently for several reasons. For example, they had never used manipulatives before starting to work at school. In this quasi-experimental research, the understanding of preservice elementary school teachers of the concept of the fraction, specifically, the meaning of measure, was studied. Statistically significant evidence was gathered to conclude that the understanding of the meaning of measure improves after the implementation of the lesson with tangible manipulatives. https://doi.org/10.37626/GA9783959871129.0.45 Hydorn, Debra L.: Tools for Modern Mathematics: A Course to Introduce Experimental Mathematics. pp 235 – 239 The accessibility of computational methods and resources has made it easier to include undergraduates in mathematical research projects. However, based on the traditional form of mathematics education, many students aren't confident in developing their own research questions or conjectures. Originally created to introduce students to programming tools (R, Mathematica and MATLAB), this course has evolved into an introduction to experimental mathematics. Students first learn the fundamentals of programming along with algorithmic structures and methods of simulation. Then, following the approach used by the Summer Undergraduate Research Institute in Experimental Mathematics at Michigan State University, students participate in (1) an experimental phase, where they use algorithms and simulations to produce output, (2) a conjecture phase, where they review their output to identify potential relationships and patterns, and (3) a 2nd experimental phase where additional output is produce to determine if any of their conjectures are still viable. The focus of the course is on developing students' ability to pose research questions and their ability to use computational tools to address those questions. https://doi.org/10.37626/GA9783959871129.0.46 Iji, Clement O.; Andortan, Joseph A.: Brandishing Ethno-Mathematics Approach as an Interface for Improving Upper Basic Education (UBE) Students´ Interest and Achievement in Number and Numeration. pp 240 – 244 The study considered how ethno-Mathematics approach could be brandished to serve as an interface to improving UBE students' interest and achievement in number and numeration (NN). The study was carried out in Obudu, a rural community in Cross River State of Nigeria. It adopted a quasi-experimental of pre-test post-test control groups design with intact classes used. Population of study comprised all the 6,226 upper basic education students from the 23 government controlled basic education schools in the study area. Two instruments were used for data collection. The study found among other things that when ethnomathematics was properly brandished, the UBE students improved in their interest and achievement in the NN concepts taught during the period of this study. It was also found that the initial noted gap between the male and female UBE students' interest and achievement in NN was drastically reduced. Key words: Brandishing, Ethnomathematics, Interface, Number and Numeration, Upper Basic Education, Interest and Achievement https://doi.org/10.37626/GA9783959871129.0.47 Innabi, Hanan; et al: Patterns of Variation in the Work of „Mathematics in the City Project": A Suggested Research Question. pp 245 – 250 The framework of this paper is based on the variation theory (VT), which explains the necessary conditions for learning. According to this theory, students have to experience patterns of variation for learning to take place. This paper highlights the patterns of variation that can be found in the work of the "Mathematics in the City" (MitC) project. Some examples are presented, and a research question is proposed related to using VT as a tool to analyze students' learning in the MitC classrooms.
https://doi.org/10.37626/GA9783959871129.0.48 Jackson, Colin: Going Against the Grain: Critical Thinking in and Beyond Mathematics. pp 251 – 256 In the UK, it is almost universal that secondary mathematics is taught in classes organised on the basis of differential 'ability': all-attainment teaching is rare. This paper is based on data collected from in-depth interviews with a small number of teachers whose beliefs and practices defy this norm. A number of themes emerged in their teaching, but in this paper I explore, very briefly, how the teachers enacted their belief in the importance of developing their students' critical thinking skills as well as their mathematics. https://doi.org/10.37626/GA9783959871129.0.49 Jiew, Fui Fong; Chin, Kin Eng: The Embodiment of Mathematical Meanings with Special Reference to Multiplication: Issues and Challenges. pp 257 – 262 This paper aims to illustrate how two primary school teachers (Doreen and Edwin – pseudonyms) make sense of mathematics in particular the multiplication of fractions and decimals. The meaning of a particular mathematical expression and symbol could be conveyed through language however a mathematical procedure that is performed for a purpose may be difficult to make sense sometimes. Data were collected through semistructured interviews. Findings revealed that Doreen recognised the meaning of multiplication as the notion "of" in the contexts of fractions. Both of them rote learned the mathematical procedures in the multiplication of fractions and decimals and they could not make sense of them. One of the main reasons for this was because they were not aware of the changes of mathematical meanings across different contexts. https://doi.org/10.37626/GA9783959871129.0.50 Johnston, Peter; et al: Supporting Transition for Mathematics and Science Students under an Assumed Knowledge Approach. pp 263 – 268 In Australia there is concern over the poor mathematical skills of students entering University STEM degrees (King & Cattlin, 2015). Challenged by the introduction of an assumed knowledge approach for mathematics dependent university degrees, we noted diagnostic testing approaches (Ní Fhloinn et al., 2014) and sought to adapt the successful GetSet2 quiz that previously had been applied only to pre-requisite mathematics university entry (Burton et al., 2013). We introduced the on-line self-assessment Get Ready Maths/Science quizzes for commencing science and mathematics students. This allowed students to receive timely personalised feedback on their level of knowledge and skills compared with the expected assumed/pre-requisite knowledge for university entry. This paper reviews the design, development and initial implementation of transition quizzes under the challenges of an assumed knowledge framework, instead of a pre-requisite framework.
https://doi.org/10.37626/GA9783959871129.0.51 Johnston-Wilder, Sue; Lee, Clare: How can we Address Mathematics Anxiety more Efficiently as a Community? pp 269 – 274 Mathematics anxiety has been discussed for over 60 years. The majority of those suffering belong to an identifiable subgroup, often identified as 'female', or learners with a 'feeling' rather than a 'thinking' preference, or empathisers. These learners prefer to understand the value, meaning, purpose and narrative of the mathematical tools they are required to learn. Ten years ago, we planted a seed for a change in practices that engender anxiety to those that build a positive stance. This seed has grown into a group of teacher and research practitioners working to overcome mathematics anxiety and build mathematical resilience. The paper discusses what is known, by these researchers and teachers, and how to develop innovative communication in order to work internationally toward elimination of the acquired, disabling condition of mathematics anxiety.
https://doi.org/10.37626/GA9783959871129.0.52 Kaino, Luckson Muganyizi: Enhancing Mathematical Modeling Activities in Classroom Instruction. pp 275 – 280 The ability of students in mathematical modeling was enhanced through activities that involved systems of linear equations with two variables. Students involved were in form four, at the final year of the ordinary secondary school level where they were expected to have mastered the knowledge on systems of linear equations with two variables. Students' knowledge on ill-conditioned linear systems was explored as well as their knowledge on practical problems in linear equations. Then after, mathematics subject teachers guided students to identify practical problems in linear equations of two variables. Students were put into groups to think of problems in real life and come up with solutions. The solutions were related to the real situations in the environment and each group

had to make a presentation in the class. Problems in transportation, manufacturing, production and diet were identified by students and the results presented for discussion. It came out clearly that students acquired knowledge on solving real life problems at the end of the activities. Before these activities, students had theoretical knowledge on solving problems with two unknowns without relating these to real life problems. While knowledge on independent and inconsistent systems was known to students, enthusiasm was noted among students at the end of the activities when they got involved in real aspects of solutions obtained. It was concluded that with more time availed in the school curricula, students can acquire useful knowledge on mathematical modeling to achieve problem-thinking skills that involve real life situations. https://doi.org/10.37626/GA9783959871129.0.53 Kania, Sylwia: Solving Mathematical Problems in the Context of Some Obstacles between Teachers and Students. pp 281 – 286 Great mathematical discoveries are mostly based on huge knowledge of their explorers and long, solid work leading slowly to the finding. There are also well known cases of the “accidental” discoveries that happened quickly, intense and their founders did not even realize the range of the discovery, because they were working on something else at the time. Nevertheless, each finding requires energy, devotion and concentration of its discoverer. Solving mathematical problems demands quite the same things, thus teachers may find some opportunities to create curious, open-minded young discoverers. It is not an easy job to do though, because there is a great risk of killing pupils’ enthusiasm by teacher’s skepticism, there is a large chance to nip pupils’ energy in the bud by routine operations and there is a huge possibility to discourage pupils’ endeavors by giving them wrong-chosen problems to solve.
https://doi.org/10.37626/GA9783959871129.0.54 Kennedy, Tierney: Exploring the Nature of Teacher Questioning withing Challenging Tasks for Inducing Conceptual Change. pp 287 – 292 Recent research has considered how to support teachers using challenging tasks in mathematicswith students who struggle. Teacher questioning in response to correct or incorrect answers has been identified as an important element for maintaining the cognitive load. This paper examines the nature of teacher questioning within challenging tasksin which struggling students were noted to change their own conceptionsand proposes a minor change to includea questioning phasewithin the Launch-Explore-Summarise structure by Lappan et al. (2006). It presents evidence from a two-year study in which the combination of conceptual change questioning with challenging tasks led to substantial gains for low-performing students across six primary schools on standardised tests compared with Education Department expectations (d = 0.7).
https://doi.org/10.37626/GA9783959871129.0.55 Klymchuk, Sergiy; Wilson, David: Integrating Pen-enabled Tablet PCs in Teaching Engineering Mathematics. pp 293 – 298 The paper analyses the attitudes and experiences of two university lecturers involved in integrating pen-enabled Tablet PCs (penTPCs) in teaching engineering mathematics. The first lecturer has an engineering background and teaches an advanced engineering mathematics course (year four). The second lecturer has a mathematics background and teaches a second year engineering mathematics course. Two rounds of interviews with the lecturers on using penTPCs were conducted in 2015 and 2019. Analysis of these interviews suggests that, for the lecturer in mathematical disciplines, a key factor in their initial adoption of penTPC technology may be their perception of the usefulness of the technology in enhancing delivery within the context of existing pedagogical approaches in a classroom/lecture setting. https://doi.org/10.37626/GA9783959871129.0.56 Krevisky, Steve: Using Sports Data in Statistics and Math Classes: An Overview and Update. pp 299 – 300 Sports data can be a very good way to motivate students, in both statistics and math classes. Background to this usage will be discussed, along with some new ideas on how to employ this in the classroom.
https://doi.org/10.37626/GA9783959871129.0.57 Kusaka, Satoshi: Analysis of the Characteristics of Mozambican Primary Mathematics Textbooks compared with Japanese Textbooks focusing on Tasks and Problems related to the Real World. pp 301 – 305 This study aims to clarify the pertinent characteristics of Mozambican primary mathematics textbooks from a sociocultural perspective (in comparison to Japanese ones) by focusing on how they treat ‘real-world’ mathematics. The following four perspectives are discussed: (1) Proportion of the tasks related to the real world via the introduction of new learning content (2) Proportion of problem solving exercises related to the real world (3) Categorization of the situation of the tasks and problems related to the real world (4) Appearance of socially open-ended problems and their content. As a result, we found that there are few problems which are related directly to the real world in the Mozambican primary mathematics textbooks. The content of the problems related to the real world are about the tax system and salaries, which means students are given opportunities to view and think mathematically about their social system right from the primary school age.
https://doi.org/10.37626/GA9783959871129.0.58 Laskasky, Katie; et al: Innovative Problem Solving: What happens when Math Education, Business, and Engineering Perspectives Interact. pp 306 – 311 For years, practitioners and researchers have attempted to solve the same math education problem. Though the approach varies, they use outdated processes and see few results. Thus, there is an overall need to use new strategies. This paper explores how one K-12 school district uses an innovative, collaborative, problem solving process to understand its math learning problem. Stakeholders engage diverse viewpoints, use researchbased recommendations to define success in how students learn mathematics, develop context-sensitive solution options, and evaluate those options’ adaptability. This innovative problem solving process’ foundation emerges from research and best practice recommendations found at the intersection of multiple disciplines: math education, business, systems engineering, and implementation science. The current observation and interview data indicate that stakeholders feel a sense of ownership, embrace variability in problem solving, and understand how to collect data about students’ math learning.
https://doi.org/10.37626/GA9783959871129.0.59 Lemieux, Collette; Roettger, Eric: Students´ Reasoning During a Calculus Two-Stage Exam. pp 312 – 317 For a two-stage exam, students first write their exam individually and then repeat it in a small group. This study analyzed the discussions that students had during the group stage of a two-stage exam in a first-year calculus course in order to investigate students’ reasoning and how they arrived at their answers. Data, consisting of 14 transcripts of audio-recordings of the students’ discussions, were analyzed qualitatively, guided by Lithner’s (2007) conceptual framework on mathematical reasoning. The results suggest that, though students primarily used imitative reasoning or rote learning to answer many questions, they also demonstrated creative reasoning by using a novel & plausible approach and grounding their reasoning in mathematics. Further, though the imitative reasoning relied primarily on remembering a theorem or term in calculus, creative reasoning was demonstrated in multiple ways. https://doi.org/10.37626/GA9783959871129.0.60 Corredor, Olga León; et al: Integrating Technology and Didactic Resources for Enhancing Learning Processes. An Exploratory Study. pp 318 – 323 Some limitations that affect the learning of mathematics are related to two dysfunctional issues: lack of acknowledgment of students‘ differences in the didactic designs and of the students’ awareness about their learning skills. Accessible and affective didactic designs aim to overcome such dysfunctional issues. In this direction, the document presents three contributions: first, the exploration of technological relationships that foster cognitive convergence between the student and tools; second, a revision of hypotheses that give support to accessible and affective didactic designs; and third, the documentation of the learning trajectories that some diverse Colombian populations made while they were playing the game called The Jumper. The methodologies used in the research were Design Science Research and Teaching Experiments.
https://doi.org/10.37626/GA9783959871129.0.61 Liang, Su: Enquiry-Based Learning in College Mathematics Education: Theory and Practice. pp 324 – 329 The practice of Inquiry-Based Learning (IBL) has a very long history. In the western world, the ancient Greek philosopher, Socrates (469 – 399 B.C.) had utilized IBL to engage his interlocutors in dialogue for discovering basic truth and principles. In the Eastern world, the ancient Chinese philosopher and educator Confucius (551 -479 B.C.) had also raised the idea of IBL approach for teaching and learning. Confucius had said: “I hear, I forget; I see, I remember; I do, I understand”. Active learning is the essence of IBL way of teaching. The IBL discussed in the paper is guided IBL. In the research literature, many research showed evidence that guided IBL produced better learning outcomes comparing to pure lecture approach. In recent years, promoting IBL in the field of education becomes a trend, because researchers believe that the features of IBL can fulfill the 21st century education through cultivating students’ critical and creative thinking, nurturing inquiry mind of problem-solving, and preparing life-long learners, for our society. However, in reality, the traditional way of teaching – lecture is still dominated at school teaching. Why has IBL been promoted in the educational research but most teachers still never employ it in their teaching practice yet? In this paper, I will discuss the challenging we are facing and propose some ideas for IBL implementation.
https://doi.org/10.37626/GA9783959871129.0.62 Lipovec, Alenka; Ferme, Jasmina: Some Factors

Influencing Effectiveness of Mathematics Homework. pp 330 – 335 Empirical research, which examines the relationship between mathematical achievement of elementary school students and mathematics homework assignments, gives inconsistent results. We present the results of the crosscultural study (N = 1061) with 12-15 years old students from Slovenia, Croatia and Slovakia. The results show that homework frequency, teacher responses, and the support of parents are not related to students' mathematics achievements; but parental control and the time spent doing homework are negatively related to those achievements. https://doi.org/10.37626/GA9783959871129.0.63 Lousis, Michael: Recommendations for Instructional Designers and Textbook Writers Concerning the Correction of Significant and Pesistent Errors in Arithmetic and Algebra. pp 336 – 342 An error analysis of the 200 English and 150 Greek learners' tests in arithmetic and algebra was accomplished. Those tests stemmed from the Kassel Project. Following this error analysis, specific recommendations are presented in each domain of arithmetic and algebra that should be taken into account by instructional designers and textbook writers. These recommendations were founded on terms of psychology and cognitive science as applied to information-processing. The study has shown the educational media (textbooks etc.), as being responsible for the emergence and persistence of these errors in the learners' minds too, since instruction is mostly based on the use of those media. Key words: error analysis, Kassel Project, textbooks, educational media, recommendations. https://doi.org/10.37626/GA9783959871129.0.64 Marchand, Patricia: Interface between Theoretical Guidelines and Classroom Practices to Create Activities that Enhance the Development of Spatial Reasoning in Elementary School. pp 343 – 346 The spatial reasoning has been identified by many researchers as being linked to positive mathematical performance and, therefore, is a determining factor in mathematics and scientific success at elementary, secondary and upper levels (Davis & The spatial reasoning study group, 2015). Also, spatial reasoning has been proven to be a type of reasoning that is malleable and can be develop, implying that teachers are empowered in this development (Moss, Bruce, Caswell, Flynn & Hawes, 2016; Wai, Lubinski & Benbow, 2009; Marchand, 2009a; Berthelot & Salin, 1992). The goal of this workshop is to expose theoretical guidelines to analyse and to create classroom activities focusing on developing spatial reasoning in elementary school. The interface between these theoretical guidelines and classrooms activities allows us to unfold new ideas to deal with spatial reasoning at the elementary level. https://doi.org/10.37626/GA9783959871129.0.65 Markun, Urska; Kos, Jasna: Research Work in a Secondary School Classroom: How Well are Teachers Equipped for it? pp 347 – 352 A university degree is not enough in itself to equip a mathematics teacher for successful secondary school-teaching in the longer term. Without continuous training and career-long learning, a teacher will not be able to provide adequate support for students in activities such as extended essays or explorations, both of which are compulsory components of the IB programme. In this paper, we present some examples of such work by IB students at our school. In addition, some Slovenian secondary school students regularly participate in a national research competition for which they must submit project-based work in various fields. The present article describes how university departments co-operated with our secondary school in the course of such research. Examples of research carried out by a number of 16-year-old students at our school are also presented here. https://doi.org/10.37626/GA9783959871129.0.66 Mart, Malgorzata: The Impact of Teacher Self-Efficacy on the Level of Implementation of Graphing Technology in Teaching Factoring Quadratic Functions in Introductory Algebra. pp 353 – 357 The purpose of the study was to determine whether there is a relationship between self-efficacy of global and local algebra teachers and their level of incorporating technology in teaching factoring quadratic functions to introductory algebra students. The participants (54 mathematics educators form 15 countries and five continents) replied to the UVGIA survey instrument. Quantitative analysis of data brought the conclusion that there is a strong positive relationship between the level of self-efficacy of teachers and their level of implementations of technology regardless of country of origin. https://doi.org/10.37626/GA9783959871129.0.67 Mason, Ralph; et al: Foundational Experiences as a Curriculum Design Principle for Secondary Mathematics. pp 358 – 363 Students must make sense of the mathematics they are learning, if they are to understand it. When students are encountering a mathematics topic primarily through that topic's mathematical forms—its symbols, terminology, definitions, operations, and algorithms—the richness, potency, and completeness of their understanding will depend on their prior, pre-formal experiences with that topic. Foundational experiences activities enable students to construct images, patterns, and ideas—in a word, memories—that will enable them to see the sensibility of the topic's mathematical forms when they learn them. We invite participants to explore some examples of instructional activities designed to provide foundational experiences for the mathematics of powers, from power laws through geometric sequences to exponential functions. With these examples, participants will consider these questions: How can foundational experiences contribute to students' understandings of the math behind the topic's formal content? What are the qualities that we should invest when designing foundational experience activities? https://doi.org/10.37626/GA9783959871129.0.68 May, Bernie (Dov): Engage Students More Hopscotch Mathe has Students Jumping for Joy. pp 364 – 367 The goal was to create a system to teach children deep thinking skills, as well as problem solving skills which they could later use in tomorrow's innovation economy. The by-product is they learn the Times Table. We cover more in less time…under 5 hours, we go up to 20×20, and introduce the children to complex algebraic equations, too. Guess what? They love it – and ask for more! The times table represents the problem to be solved. Each intersection represents a smaller aspect of the problem. They learn various techniques. No dumb sing-song melodies. They build on what they know. We do not go linearly through the table. We jump around…and cover whatever we can. When we are through I show them that if they only knew 7×4 = 28, they have the problem solving skills where they can solve the whole table. The idea behind Kinestetic Math is to get into their world, and reach them at their level. Children like to run, jump, colour and move around – so do we. We use our fingers, our knuckles, and our legs to learn the Times Table. This paper covers a small section of the program, Magic Squares and Hopscotch Math, as an introduction to a different kind of thinking and how innovative thinking can be applied to teaching. I introduce the program with a 10×10 grid representing the times table. Every time we solve one of the blocks on the table, they get to color the block however they want. https://doi.org/10.37626/GA9783959871129.0.69 Menz, Petra; Mulberry, Nicola: Open Source Differential and Integral Calculus Material Development to Support Student Accessibility and Learning. pp 368 – 373 Educational resources in mathematics are an important aspect of the teaching and learning landscape. Moreover, resources have come a long way from the spoken word with such inventions as paper and the computer to the point where there is now an infrastructure around open educational resources (OER) that has matured into viable alternatives to traditional resources. The newfound prevalence of these materials provides opportunities to customize OER to the specific needs of students and institutions. We designed open source material for the social science strand of differential and integral calculus by adopting an open source textbook and adapting it for our needs. Along with the course notes, we developed lecture notes, student notes based on the Cornell note-taking system, and assignments with solutions. Students are appreciative of free material, but moreover, the cohesiveness and interconnectivity among the various course materials provides for a smoother learning journey through our courses. This paper presents our philosophy, an overview of our open source material, and the operation of both courses. https://doi.org/10.37626/GA9783959871129.0.70 Michelsen, Claus: The MACAS Symposiums 2005 – 2019. Mathematics Education in an Interdisciplinary Context. pp 374 – 379 The symposium series Mathematics and its Connections to the Arts and Sciences (MACAS) has been held since 2005. The vision which the MACASinitiative is based upon is to develop a humanistic approach to education that combines various disciplines in a single curriculum. According to this vision the aim is to educate students by enabling them to pursue diverse fields of research, while at the same time exploring the aesthetic and scientific connections between the arts and science. In view of the challenges of the 21st century, a modern approach to education with a focus on multi- and interdisciplinarity is more important than ever. Five MACAS symposiums have been held since 2005, and the proceedings of the symposiums provide an insight into ideas, experiences, conceptual frameworks, and theories to connect mathematics education to the arts and sciences. Based on the symposiums proceedings we provide an overview of five main themes addressed at the MACAS symposiums (i) mathematics and science (ii) mathematics and art (iii) mathematics and technology, (iv) mathematics and literature, and (v) educational perspectives on interdisciplinarity. The overview highlights the need for joint empirical investigations that operationalize, model and study the rich ideas presented in at the symposiums. https://doi.org/10.37626/GA9783959871129.0.71 Miheso-O´Connor, Marguerite K.: Teaching Mathematics through Historic Environment. A Time-Travel Grounded Pedagogy. pp 380 – 385 Mathematics has been used by generations to make important decisions for a long period of

time. History is littered with problem solving events which are results of mathematization of tasks based on available tools in any given generation. While History of mathematics focuses on what each culture contributed to present day conventional mathematics as taught in schools as a subject, Mathematics in a Historic environment focuses on identifying mathematical thinking that exists in all historical events. Historical events when enacted through the Time Travel approach learners get the opportunity to relive past events in the present context. Teaching mathematics in historic environment uses the time travel events that are practised by bridging ages international, to provide a reflective meaningful conceptualization of mathematics is a living subject. The strategy illuminates the centrality of mathematical thinking in all historical events. This paper shares findings from a study carried out on the effectiveness of this approach for teaching mathematics and provides an opportunity to discuss the approach as a viable pedagogic strategy that can be replicated across the curriculum
https://doi.org/10.37626/GA9783959871129.0.72 Missen, Jenny: Researching and Implementing in the Mathematics Classroom Australian Curriculum General Capabilities. pp 386 – 391 The Australian Curriculum (AC) provides teachers with a great amount of detail in each curriculum area. In addition to teaching these curricula, the AC requires incorporation of Cross-Curriculum Priorities and General Capabilities. This paper documents the work done on an action research project considering ways in which the General Capabilities (GCs) of the Australian Curriculum could be incorporated into teaching Mathematics and the difficulties I faced as a teacher researching during the teaching term.
https://doi.org/10.37626/GA9783959871129.0.73 Morge, Shelby: Addressing Teachers´ Culturally Responsive Teaching Beliefs through Course Activities. pp 392 – 397 Making data-based decisions about course content is a difficult process for teacher educators. This difficulty is amplified when considering complex issues focused on diversity. In order to understand and address pre- and in-service teachers' culturally responsive teaching beliefs, the Culturally Responsive Teaching Outcome Expectancy Scale (Siwatu, 2007) was administered during graduate and undergraduate courses in mathematics education at two southeastern US universities. From the survey results instructors identified items with high and low means (on a 100 point scale). The lowest items provided a basis for constructing future course activities. In this paper we share the expectancy scale results and course activities that were implemented. We also discuss opportunities for improving the culturally relevant practices and activities in our courses in order to ensure the transferto classroom practice. https://doi.org/10.37626/GA9783959871129.0.74 Morska, Janina: From the Purpose oft he Lesson to Success. pp 398 – 400 This paper deals with efficiency in teaching. The purpose of the lesson and the criterion of success are complex elements in the didactic process. Between these elements are theory and practice, various forms of work, feedback and student self – evaluation. I would like to share my professional experience as an apprenticeship teacher, as well as a deputy head teacher (vice-director) observing the work of other teachers in formative assessment.
https://doi.org/10.37626/GA9783959871129.0.75 Moscardini, Lio; et al: Collaborating Across the Pond: Cognitively Guided Instruction Project. pp 401 – 405 This paper describes a primary-school (ages 5-11) project implemented in Scotland, based on the United States research from Cognitively Guided Instruction (CGI), and as envisioned by Dr. Lio Moscardini. Three schools, two public and one private, participated in this two-year long initial study that focused on helping teachers to understand the developmental stages pupils naturally progress through in order to understand the mathematics for their class level as defined by the Scottish government. This project provides evidence that a rise in attainment can occur by focusing on teachers' knowledge, pedagogy, and pedagogical content knowledge in relation to mathematics rather than by focusing on attainment itself. Additionally, this project addresses the teaching and learning of a diverse group of students, i.e. inclusion, low socio-economics. https://doi.org/10.37626/GA9783959871129.0.76 Movshovitz-Hadar, Nitsa; et al: Bridging between School Mathematics and Contemporary Mathematics: Turning a Dream into Reality. pp 406 – 411 In many countries, school mathematics curriculum does not go beyond the 18th century mathematics. Any solution for bridging this gap must consider students' limited background, as well as teachers' time constrains. Our 'bridge' consists of periodically interweaving Mathematics-News Snapshots (MNSs), i.e., short descriptive presentations of recent mathematical results, throughout the teaching of the ordinary math curriculum during the three years of senior high school. More than 20 MNSs are already available (see https://MNS.co.il). Our two-part workshop is aimed at sharing our solution. This will include a discussion of its underlying principles, a reverse engineering analysis of sample MNSs vis-à-vie the MNS authoring guidelines, an overview of three teacher preparation models, and results of our implementation follow-up studies. Finally, in the spirit of the conference, we'll invite attendees to adopt our solution, and possibly also to participate in developing more MNSs, thus turning our dream of bridging the gap into reality. https://doi.org/10.37626/GA9783959871129.0.77 Narayanan, Ajayagosh: Peer Tutoring: Developing and Sustaining Effective Teaching Practices with Mathematics Teachers in Lesotho. pp 412 – 417 This paper shows how a group of educators initiated in-service workshops for primary and secondary mathematics teachers since 2012 in collaboration with the Ministry of Education and Training (MoET) in Lesotho. The prime focus of these workshops was to develop teachers' capacity building in mathematics through peer-support. The paper also narrates how a chain of these workshops evolved to a capacity building program with innovative approaches in classrooms. These workshops explored ideas on numbers, shapes (through the use of origami) and problem solving for effective teaching/learning of mathematics. The concept of peer tutoring/learning had emerged from these workshops as an idea that suits Lesotho education system. A capacity building program was thus recommended for the sustainability of these activities. https://doi.org/10.37626/GA9783959871129.0.78 Navarro Robles, María Estela: Variation Theory used to make a Personalized Diagnostic in the Level of Knowledge of Fundamental Concepts about Rational Numbers and their Operations in Undergraduate Students. pp 418 – 421 This lecture explains how through Marton Variation Theory was designed and evaluated a test about rational numbers to identify for each student the specific knowledge and skills about the theme to solve problems and to make operations and thus which concepts theyneed to learn or what skills they need to develop. The variation theory was used in the sense of one problem, multiple changes. The test was answered by 115 students of 7 groups of a private university, who are enrolled in a leveling course. From the answers of the students it was characterized the lived object of learning and this was the start point to classify the conceptual or operational needs of each student. With the detailed results it was possible to design a personalized route of learning. Key words: Rational numbers, variation theory, undergraduate student, personalized course https://doi.org/10.37626/GA9783959871129.0.79 Niess, Margaret L.: Online Strategies Enhancing Mathematics Teacher Knowledge for the Digital Age: Discourse and Critical Reflection. pp 422 – 427 This study designed online graduate courses to enrich inservice mathematics teachers' Technological Pedagogical Content Knowledge (TPACK). The effort identified key experiences to engage teachers in discourse and critical reflections for relearning, rethinking, and redefining teaching and learning as they know and learned it, transforming their TPACK with respect to teaching with digital technologies. The experiences modeled inquiry tasks merging content, technology and pedagogy as described in TPACK, connecting teachers with experiences as students learning about and with technologies. Critical reflections on the experiences as learners and as teachers combined with the online community of learners' discourse, transforming their teacher knowledge. The collection of strategies involving discourse and critical reflection did enhance the participants' TPACK, providing recommendations for designing online inservice teacher education courses. https://doi.org/10.37626/GA9783959871129.0.80 O´Dell, Jenna R.; Frauenholtz, Todd R.: An Unsolved Graph Theory Problem: Comparing Solutions of Grades 4, 6, & 8. pp 428 – 433 This study investigated how students in Grades 4, 6, and 8 reasoned through a non-routine, unsolved problem. The study took place at a K-8 school in the Midwestern United States. Each grade participated in two or three task-based sessions lasting between 45 and 60 minutes with the researchers. During the sessions, students engaged in the Graceful Tree Conjecture where they examined graceful labelling for Star, Path, and Caterpillar Graphs. We examined differences in students' generalized solutions across the grades and how they were able to provide justifications and state generalizations of a graceful labelling for the graphs in the Path Class. Descriptions of students' generalized solutions are included for each grade level.
https://doi.org/10.37626/GA9783959871129.0.81 O´Meara, Niamh; Faulkner, Fiona: Professional Development for Out-of-field Post-primary Teachers of Mathematics: A pre and post Analysis of the Impact of Mathematics Specific Pedagogical Training. pp 434 – 439 The Professional Diploma in Mathematics for Teaching is a 2-year part-time programme dedicated to out of field teachers of mathematics in second level education in Ireland. The programme was introduced in Ireland after a report highlighted that 48% of second level teachers of mathematics in Ireland were not qualified to teach mathematics (Ní Ríordáin &

Hannigan 2011). The programme has been running since 2012 and is currently upskilling its 6th cohort of out-of-field teachers. As part of the programme, teachers are required to undertake mathematics content modules as well as mathematics specific pedagogy modules. One such mathematics specific pedagogy module requires students to undertake five 3-hour workshops which examine mathematics content contained on the second level curriculum and offers suggestions on how to teach it for conceptual understanding. Teachers in Cohort 5 of the programme completed a questionnaire prior to completing the 5 workshops to outline how confident they felt teaching particular aspects of the second level mathematics curriculum. They were also asked to best describe the teaching approaches that they favoured at that point in time. Upon completion of the 5 workshops, this same cohort of teachers completed a similar questionnaire investigating their level of confidence in teaching the curriculum and any changes in their teaching practices that occurred as a result of participation in this module.
https://doi.org/10.37626/GA9783959871129.0.82 Pagge, Jenny: Effective Use of ICT and Storytelling to Teach Statistics in the Preschool Classroom. pp 440 – 444 New school curricula and modern teachers are trying to get the child engaged and interested in statistics through accessibility and enjoyment. This has been backed up by much research into the correlation of a child's engagement and their academic achievement (Gunuc, & Kuzu, 2014). Using storytelling as a teaching method, teachers can provide a meaningful context for statistics which can change this prejudice from a young age (Casey et al., 2004, Walters et al 2018) and is shown to have many educational benefits for children (Sherwood, 2018). In the last years ICT tools, games and storytelling have been used to achieve this engagement (Lekka et al, 2017, Walters 2018). ICT provides children with the opportunity to enhance their communication skills, creativity, high-order thinking and practical technological skills which are needed in a modern society (Corel, 2019). This paper includes a brief overview of research that looks at the use of ICT applications, and use of storytelling to teach descriptive statistics in the preschool classroom.
https://doi.org/10.37626/GA9783959871129.0.83 Paolucci, Catherine: Supporting Pre-service Mathematics Teacher Development through Transformative Community Engagement. pp 445 – 449 Opportunities for field-based transformative learning are a critical part of mathematics teacher education, yet several factors limit the extent to which teacher preparation programs can offer them. This paper discusses the value of transformative learning for pre-service mathematics teachers and presents an example of an international community engagement program that was specifically designed to support transformative learning for pre-service teachers in both the United States and South Africa. It highlights evidence of key aspects of transformative learning in the reflections of both the pre-service teachers and the students in the program and discusses the implications of this for future research and program development.
https://doi.org/10.37626/GA9783959871129.0.84 Pearn, Catherine; et al: Developing and Assessing Algebraic Reasoning in the Middle Years. pp 450 – 455 New school curricula and modern teachers are trying to get the child engaged and interested in statistics through accessibility and enjoyment. This has been backed up by much research into the correlation of a child's engagement and their academic achievement (Gunuc, & Kuzu, 2014). Using storytelling as a teaching method, teachers can provide a meaningful context for statistics which can change this prejudice from a young age (Casey et al., 2004, Walters et al 2018) and is shown to have many educational benefits for children (Sherwood, 2018). In the last years ICT tools, games and storytelling have been used to achieve this engagement (Lekka et al, 2017, Walters 2018). ICT provides children with the opportunity to enhance their communication skills, creativity, high-order thinking and practical technological skills which are needed in a modern society (Corel, 2019). This paper includes a brief overview of research that looks at the use of ICT applications, and use of storytelling to teach descriptive statistics in the preschool classroom.
https://doi.org/10.37626/GA9783959871129.0.85 Pearson, Esther: „STEPS" to a Brighter Future. pp 456 – 461 The „Science, Technology, Engineering, Precollege Studies" (STEPS) program was developed in 1988 by Dr. Esther Pearson. The STEPS program has served thousands of youth over the past two decades to provide academic support and mentoring to minorities and women students. The STEPS program focuses on demonstrating a connected learning approach to STEM academics. Students participate in mentoring through the STEM pipeline of course choices, extra-curricular activities, and exposure to STEM practitioners. Students learn to overcome the challenges that prevent successful matriculation into STEM fields. Minority and women students in elementary through college in the Boston and greater Boston areas learn how to navigate from a desire for a STEM career to achieving one.
https://doi.org/10.37626/GA9783959871129.0.86 Pilgrim, Mary E.; Dick, Thomas P.: Actively Engaging in Calculus to Support all Students. pp 462 – 466 Research findings support the use of active engagement in the mathematics classroom. Active learning not only has the potential to positively impact student learning, it also helps to address equity issues in the mathematics classroom. However, with limited experiences in student-centered instruction and little to no pedagogical training, mathematics faculty are often underprepared to meet the needs to today's STEM majors. In addition, content-specific professional development is typically not readily available to faculty on their campuses. With a focus on calculus, this workshop aims to fill this professional development gap by providing participants with the opportunity to engage in student-centered activities as well as reflect and discuss the implications for their own mathematics classrooms. https://doi.org/10.37626/GA9783959871129.0.87 Pomuczné Nagy, Ildikó-Anna: How and wherer can a Mathematics Teacher Utilize his 33 Years of Teaching Experience? A Math Teacher about Teaching Mathematics-Excerpt from 33 Years of Teaching Experience. pp 467 – 472 This paper shows how a mathematics teacher can utilize his teaching experience. I have been working as a mathematics and physics teacher in Hungary for 33 years. I have taught at various levels of the education system: at elementary school, high school, teacher training college, and in teacher training too, but at most time of my job I taught at high school. I am currently working on the series of a new mathematics textbook for 10 to 14-year-old students. It is based on the traditions of the Hungarian mathematics education, but using the opportunities offered by the 21st century, it also includes modern sample tasks that fit into the curriculum, for example Geogebra files, written by me. I would like to share how I use my teaching experience in textbook writing and how I focus primarily on the didactic aspects of teaching mathematics. I pursue my PhD research in the topic of problem-solving thinking, so I study the mathematical thinking of my students studying in different school types. In my lecture, I analyse different tasks by focusing on mathematical methodological aspects. For example I will tell that I believe it is advantageous to introduce mathematical definitions with examples which are astonishing for students in order to draw attention to maths as much as possible. I will give examples of how I build my experience into the textbook in order to make the system of mathematical concepts optimal for pupils. I would like it if give you an insight into a segment the current Hungarian mathematics education, the current teaching of problem-solving thinking and the different ways of students' thinking. https://doi.org/10.37626/GA9783959871129.0.88 Povey, Hilary: Moral and Political Dilemmas in Working with the Concept of Citizenship within Mathematics Teaching in Schools: a Personal Perspective. pp 473 – 478 This paper springs out of my engagement with a curriculum development project framed in response to a European Union call for action on global citizenship. But citizenship is a complex and elusive concept – slippery, dangerous and contested. Inevitably, tensions arise as we seek to find a way of acting in the world and trying to find, however limited and partial, an answer to the question: „what is to be done?". In this paper, I identify and offer a personal response to some of moral and political dilemmas we have identified during the design and implementation of the project. https://doi.org/10.37626/GA9783959871129.0.89 Prendergast, Mark; et al: Incentivising the Study of Higher Level Mathematics. pp 479 – 484 In Ireland, mathematics has been assigned a special status within the postprimary school curriculum with the introduction of a Bonus Points initiative (BPI) in 2012. Students are now awarded an extra 25 points in their upper post-primary school state examination results if they achieve a passing grade at Higher Level (HL) mathematics. The culmination of points that student achieve in six different subjects acts as a gatekeeper to tertiary level education. Mathematics is the only subject in which there are extra points awarded. The initiative was introduced to encourage more students to study the subject at an advanced level. Anecdotally there have been many mixed reviews about the success of the BPI. While the numbers taking HL mathematics have steadily increased, there have been concerns expressed that many students who are not mathematically capable of performing up to the standard required are now opting for the HL paper and that the difficulty of this examination and the marking schemes have been adjusted accordingly. This paper investigates the advantages and disadvantages associated with the BPI from the perspective of mathematics teachers (n=266).
https://doi.org/10.37626/GA9783959871129.0.90 Raja, Shagufta; et al: Using GIS to Develop Spatial

Reasoning and Analysis of Data. pp 485 – 490 The Geographic Information System (GIS) is a spatial analysis tool that allows users to capture, store, analyze, and visualize data related to real-world problems. GIS is used daily in multiple STEM fields to solve complex problems. Educators find GIS useful for students to be able to interpret data in a spatial context. Students develop quantitative and spatial analysis reasoning using GIS to understand and develop solutions for many current scientific concerns. This paper presents two cases highlighting middle grade students' use of GIS. The cases illustrate how GIS promotes students' development of spatial reasoning as they think about patterns and relationships made evident through data visualization. The cases demonstrate how students engage in finding relative and absolute mapped features, geographic patterns, and changes over time as they make decisions using geographic inquiry, spatial thinking and problem solving. https://doi.org/10.37626/GA9783959871129.0.91 Ramsay, John R.: Mentored Teams of Undergraduates in Real World Consulting. pp 491 – 496 One of the difficulties in mathematics education is providing a good answer to the "What can I do with mathematics?" question. Applied examples and projects within existing mathematics courses can help answer this but often aren't close enough to real world applications and they can consume considerable course time. We have addressed this difficulty with a summer program that employs students to solve actual applied problems. The College of Wooster Applied Methods & Research Experience is a summer program that puts teams of students to work as consultants in the local community. Student teams are usually composed of three students with a mathematics or computer science faculty member acting as mentor. Clients of the program come from business, industry, government agencies, and service organizations. The program also includes a significant professional development component in order to increase the educational benefit to the participants. https://doi.org/10.37626/GA9783959871129.0.92 Rugelj, Marina: Counting with 10 Fingers as a Man, with 8 fingers as a Hen or with 2 Switches as a Computer. pp 497 – 502 In the high school curriculum of mathematics in Slovenia one of the goals is "Students can convert from decimal to binary number". In most high schools, an algorithm for conversion is presented, which the students learn by heart like a cooking recipe, without proper understanding. A different method will be presented, where pupils play, explore and find certain conclusions on their own. This helps students to understand and learn the new concept much more efficiently, comparing to when they only listen to the instruction. Hence, the knowledge gained this way is hopefully more solid and lasting.
https://doi.org/10.37626/GA9783959871129.0.93 Sack, Jacqueline; Quander, Judith: Secondary Math Teacher Candidates´ Perspectives on a Co-Taught Blended Content & Methods Geometry Course. pp 503 – 508 Two faculty, from the mathematics and education departments in an urban university, co-teach a blended methods and content geometry course for preservice secondary teachers who are also math majors. The course is entirely inquiry-based, a departure from traditional instructor-centered maths courses, and utilizes design-based trajectories developed by one of the authors over 12 years. We conducted two individual clinical interviews and one focus-group interview with 6 volunteer students, to ascertain their perspectives on how they best learn mathematics; to gauge how they perceived the inquiry-based experiences from this course; and, their reflections on inquiry-based instruction in mathematics as they move forward in their goals to become teachers. We used narrative inquiry as a research method to study the experiences of these students individually and collectively.
https://doi.org/10.37626/GA9783959871129.0.94 Sáenz-Ludlow, Adalira; Jiménez, Alexandra Jiménez: Linkages between a Teacher´s Preparation and the Potential for Students´ Learning. pp 509 – 514 From the Peircean perspective of diagrammatic reasoning, the paper presents a teacher's analysis of a task with a square array of dots. She conceptualizes different partitions of the array and transforms it into different tasks of sequences of squares to facilitate her inductive thinking and the emergence of different generalizations pertaining square numbers. https://doi.org/10.37626/GA9783959871129.0.95 Santhanam, S. R.: Welcome 2019 – A Workshop on Framing Non-Routine Problems in Mathematics for all Levels. pp 515 – 516 The main aspect of mathematics is problem solving. A non-routine problem is any complex problem that requires some degree of creativity to solve. There are no standardised methods to solve a non-routine problem, if there is one then it becomes a routine problem. What about framing a non-routine problem? It is all the more difficult. In this workshop the author attempts to make the audience to understand non-routine problems and their solutions and further to frame problems of this nature.
https://doi.org/10.37626/GA9783959871129.0.96 Shamash, Josephine: From Equations to Structures: Linking Abstract Algebra and High-School Algebra for Secondary School Teachers. pp 517 – 522 The high-school curriculum in algebra deals mainly with the solution of different types of equations. Modern algebra has a completely different viewpoint and is concerned with algebraic structures and operations. The course Algebra: From Equations to Structures is part of an M.Sc. programme for Israeli secondary school mathematics teachers. It provides an introduction to algebraic structures and modern abstract algebra, and links abstract algebra to the high-school curriculum in algebra. It follows the historical attempts of mathematicians to solve polynomial equations of higher degrees, attempts which resulted in the development of group theory and field theory by Galois and Abel. This approach leads naturally to examining topics and fundamental theorems in both group theory and field theory. Along the historical "journey", many other major results in algebra in the past 150 years are introduced, and current research in algebra is highlighted. We examine the relevance of the course to the teachers' work.
https://doi.org/10.37626/GA9783959871129.0.97 Showers, Dennis: Real-world Maths: Preparing Teachers to use Real-life Contexts for Teaching Maths. pp 523 – 525 Common Core Mathematics in the US promotes eight Standards for Mathematical Practice to guide instructional reform. Standard 2 includes the practice of "decontextualizing" or abstracting a given situation and representing it symbolically to solve real-world problems. Preparing teachers to employ this practice in classrooms requires knowledge and skill to apply technology to bring the real world into the classroom and the ability to discuss personal experiences in a mathematical way. Professional development with New York teacher candidates and in-service teachers in Nicaragua, China, and the US indicates the need for further dissemination with a research program to evaluate its efficacy. https://doi.org/10.37626/GA9783959871129.0.98 Shriki, Atara; Lavy, Ilana: Shedding New Light on Common Algorithms: What can we Learn from Vedic Mathematics? pp 526 – 528 In Sanskrit, the ancient Hinduism language, 'Vedas' means 'knowledge'. The Vedas are a corpus of more than 1,000,000 ancient philosophical writings divided into Sutras, some of which deal with mathematics. These mathematics Sutras, termed 'Vedic Mathematics', concern various fields of mathematics. The Vedic methods are coherent, logical and simple, and students enjoy practicing them. Besides 'spicing up' the regular mathematics lessons by integrating some of the Vedic algorithms, engaging students in proving them supports the development of their insights regarding the rationale underlying the formal rules and algorithms included in the curriculum. In this workshop, we present some of the basic Vedic arithmetic and algebraic algorithms, involve the participants in proving the them and discuss the advantages and disadvantages of integrating Vedic mathematics into classes at different age groups and study levels.
https://doi.org/10.37626/GA9783959871129.0.99 Sibbald, Timothy: The Confluence of Numeracy with Interdisciplinary Mathematics. pp 529 – 534 Interdisciplinary mathematics, such as STEM, but not limited to it, has received considerable attention in recent years. Its role in mathematics is the provision of practical circumstances that support learning mathematical concepts. The validation of concepts through the adoption to interdisciplinary purposes has a broad base of examples. Furthermore, among the concepts bridging mathematics and another discipline is a group of concepts that transcend a variety of other disciplines and, within that scope, numeracy emerges. Since this is not a traditional definition of numeracy it is reconciled with other definitions of numeracy and the implications of that reconciliation with interdisciplinary instructional approaches is examined. https://doi.org/10.37626/GA9783959871129.0.100 Siemon, Dianne: Connecting Research and Practice – The Case of Multiplicative Thinking. pp 535 – 540 There is very little of any substance that can be achieved in school mathematics, and beyond without the capacity to recognise, represent and reason about relationships between quantities, that is, to think multiplicatively. However, research has consistently found that while most students in the middle years of schooling (i.e., Years 5 to 9) are able to solve simple multiplication and division problems involving small whole numbers, they rely on additive strategies to solve more complex problems involving larger numbers, fractions, decimals, and/or proportion. This paper describes how this situation can be addressed through the use of evidence-based formative assessment tools and teaching advice specifically designed to support the development of multiplicative thinking. https://doi.org/10.37626/GA9783959871129.0.101 Smith, Raymond; et al: Insights Gained from Implementing Teaching Toolkits: A Case of Activating Prior Knowledge. pp 541 – 546 In designing teaching toolkits for teachers the effectiveness of such a resource

depends on mutual enactment and engagement by the designer, the teacher and the learners. It is a recursive process and illuminates the tensions between the intended outcomes envisaged by the designer and the realised outcomes in the classroom. In the qualitative research tradition, the exploratory investigation captured in this paper employed a descriptive phenomenological approach. With this orientation, and along the theoretical trajectory led by Todres (2005:107), this study sought to collect detailed descriptive accounts of personal experience. Data were gathered by collecting samples of learners' work, teacher interviews and classroom observations. This paper draws attention to the practical disjuncture between assessing and activating prior knowledge. Insights acquired may contribute both to the design approach and to teaching practice. https://doi.org/10.37626/GA9783959871129.0.102 Spooner, Kerri: Authentic Mathematical Modelling Behaviours for Secondary School Students. pp 547 – 551 Mathematical modelling is part of many curricula around the world. Some of these curriculum statements are vague and general. There is a need for statements to be more specific with supporting examples for implementation of curriculums. There is also a need for further development of activities focused on authentic mathematical modelling behaviour. To address this problem, an ethnographic study in New Zealand was carried out to identify the behaviours of a real world mathematical modelling team. These behaviours were then explored to determine what they could look like for a sixteen-year-old student. This paper will present the modelling behaviours of the real world modelling team and the potential authentic mathematical modelling behaviours of a secondary school student.
https://doi.org/10.37626/GA9783959871129.0.103 Stephens, Max: Developing Algorithmic Thinking in Mathematics in the Primary and Junior Secondary Years. pp 552 – 557 The fourth industrial revolution is already changing what we mean by mathematical reasoning in its different forms, such as algebraic, spatial and geometric, and statistical. Algorithmic thinking is one particular form of mathematical reasoning, emphasizing decomposition (breaking a complex problem down into component sub-problems and sub-tasks), pattern recognition, generalization and abstraction. With a growing global emphasis on using algorithmic thinking in coding and computing programs in schools, it is necessary to examine how algorithmic thinking should be included more explicitly in the teaching and learning of mathematics.
https://doi.org/10.37626/GA9783959871129.0.104 Takahashi, Tadashi: Proving in Mathematics Education – On the Proof using ATP. pp 558 – 563 The aim of the mathematics education is the acquisition of "knowledge/skill of the mathematics" and "the mathematical thinking". Proving is a chain of the logic in mathematics and is "mathematical thinking" itself. So, proving is the domain that is important from a point of view that can evaluate the acquisition of enough "mathematical thinking". There is a variety of sense of values in the present situation of the proof using the ATP (Automated theorem proving). We should establish a clear vision as mathematics education in this situation. That is, in mathematics education, we should build sense of values for proof using the ATP newly. To that end, we fix contents of the mathematics, and it is necessary to prove them by using ATP. We would like to assume the aim the theorems of Euclid's Elements. Because the contents are the basics of the mathematical thinking. The proving is an important aim in the mathematics education, it is necessary to clarify new value by using the ATP as mathematics education. https://doi.org/10.37626/GA9783959871129.0.105 Tannor, David: Effective Mathematics Instruction: Two-Year College Mathematics Instructors´ Knowledge and Self-Efficacy. pp 564 – 569 In this article are findings from a 2017 mixed methods study on two-year college mathematics instructors' knowledge and self-efficacy on effective pedagogy. https://doi.org/10.37626/GA9783959871129.0.106 Temple, Barbara Ann; et al: Designing a Transdisciplinary Approach to Elementary Math Literacy Learning through Science & the Arts. pp 570 – 574 Engaging with subject matter in isolation stymies creativity, promotes rote learning, and limits development of divergent thinking skills. Conversely, a transdisciplinary approach to math develops critical and creative thinking skills, strengthens problem solving capacity, and promotes metacognition. In this pilot study, the design-based research process began with sharing initial intervention ideas for elementary Math lessons with participants at an international elementary Math conference. Utilizing participant feedback as part of the iterative process, three specific interventions for second-grade Math concepts were designed with intentional infusion of Science and the Arts. The ultimate goal for this research is the design of an effective elementary Math curriculum offering authentic, real-world learning through a transdisciplinary approach. https://doi.org/10.37626/GA9783959871129.0.107 Thomas, Jeffrey: Learning through Self-Assessment towards Understanding the New B.Ed. Curriculum in South Africa: Experiences from the new B.Ed. Programme at Sol Plaatje University. pp 575 – 580 The mismatch between instruction and learning could pose a serious barrier to effective teaching and learning. Effective teaching should be a dynamic alignment and realignment of teaching and learning styles to optimise achievement. When teaching and learning styles do not complement each other students may become anxious, frustrated and disengaged which may have negative effects on their performance. The focus of the study is to gather evidence on how students perceive their own learning in order to adapt the teaching approach which will accommodate the students' preferred way of learning. The main findings in this study showed that students prefer to work independently and that elements of metacognition are present during their efforts to learn. This study therefore suggests that self-assessment activities should become an integral part of the teaching and learning process. Thus, students are afforded the opportunity to advance personal learning through the development of metacognition as self-monitoring and corrective actions. Key words: Self-assessment, metacognition, self-regulated learning
https://doi.org/10.37626/GA9783959871129.0.108 Toro-Clarke, José A.: A Participative and Individualized Laboratory: A Strategy for Increasing Student Success in College-Level Mathe Courses. pp 581 – 586 This research was carried out within a qualitative research paradigm. The objective was to observe, analyze and enrich pedagogical practice through the use of pedagogical learning strategies. The learning strategy was a participative and individualized laboratory carried out during a research project in a non-Traditional Laboratory (LnT, abbreviated in Spanish form). The primary aim of this research was to observe if the LnT assists the students and in this way maximizes success and knowledge in the Introductory Math course (MATE3001) on the University of Puerto Rico campus. The LnT contributed to: (1) students improved their study habits; (2) the students had greater participation in the solution of math problems, their practice and discussion; (3) they accepted that the research professor supervise their work as it was carried out and understood that the presence was for their benefit. https://doi.org/10.37626/GA9783959871129.0.109 Vacaretu, Ariana-Stanca: Developing High-School Students´ Competences through Math Research Workshops – the M&L Project. pp 587 – 592 Mathematics is or it should be about problem solving and math thinking. However, what mathematics students learn in schools is more about procedures for solving different types of math exercises and problems. In many cases, students learn by heart algorithms and words (math concepts) and use them for solving different math tasks. School math is very far from what mathematicians do and, in many cases, doesn't motivate students for learning math. This paper presents the way we organized the assessment of the students' skills developed through math research workshops and some of the assessment results. Even though we didn't assess all the competences the students develop through the math research workshop, the findings show that the students certainly develop their problem-solving skills. https://doi.org/10.37626/GA9783959871129.0.110 Walsh Jr., Thomas: Exploring Computer Science with MicroworldsEX to Learn Geometry and Logo Programming Code. pp 593 – 598 Future employment of computer-programming jobs will be best for applicants with experience in different languages and coding tools (Bureau of Labor Statistics, 2018). Empirical and meta-analysis research studies support of teaching Logo programming in developing student cognitive problem-solving skills has been documented. Using guided instruction with teacher-mediated scaffolding Exploring Computer Science with MicroworldsEX (Walsh, 2013-2017) has been found as an effective method in preparing students using the Logo code programming language to create geometric graphic, animation, and gaming projects. More research is needed to study teacher scaffolding and mediation skills to support learning Logo coding and transfer to other domains including other programming environments.
https://doi.org/10.37626/GA9783959871129.0.111 Walsh Jr., Thomas: The Survey Toolkit Curriculum Methodology for Researching Information, Survey Questioning, and Analyzing Data with TinkerPlots. pp 599 – 604 In an era where social media traffics fake news websites that publishes misinformation it is imperative to provide students' experiences in The Survey Toolkit and TinkerPlots curriculum teaching sound research principles and information gathering techniques. The field-tested program was found effective in guiding students choosing research questions, writing a research report using a paragraph cluster information strategy, developing unbiased survey questions using reliable sampling, analyzing survey data with TinkerPlots, and sharing results. The paper will present support for teaching the

curriculum, development based on research direction, implementation considerations, and use of the curriculum with elementary to middle school students. https://doi.org/10.37626/GA9783959871129.0.112 Warren, Lynae; Wohlhuter, Kay: Merging Theory and Practice in Statistics in Communities of Mathematical Inquiry. pp 605 – 606 This workshop will engage participants in statistical problem solving with reallife data, using technology. Participants will work in a Community of Inquiry, (CoI, Garrison, 2016) with other participants to formulate questions that will be answered in their community. The participants will engage in problem solving using 2018 data about world populations, to determine how best to answer their questions and how their answers may become part of a larger exploration. The facilitators will share examples from their work with developmental mathematics students and mathematics teacher candidates regarding how they use the CoI model to merge theory and practice in the areas of: teaching & learning, educational technology, curriculum development, teachers' preparation and development, and issues of equity. Participants will need access to a computer or tablet with web access and spreadsheet software. https://doi.org/10.37626/GA9783959871129.0.113 Watson, Steven: Bridging Theory and Practice: a Posthuman Perspective on Mathematics Teacher Education. pp 607 – 612 This paper considers posthumanism in the context of mathematics teacher professional learning. Posthumanism presents a challenge to Enlightenment rationality and the privileged position and potential capability of the human mind. Posthuman perspectives present knowledge and knowing as an embodied and experiential process. Learning, then, is not simply about the acquisition of knowledge and skills, it is an embodied experience in which the learner acts within an environment and comes to make sense of this experience through a reflective process. As well as presenting a theoretical account of mathematics professional learning and the implications of the posthuman to this field, I illustrate this with my own research in mathematics teachers' preservice education and the professional development of practising teachers.
https://doi.org/10.37626/GA9783959871129.0.114 Webb, Lyn; et al: Enabling Grade 3 Teachers to Transform an Intended Curriculum into an Enacted Curriculum in Mathematics Classrooms. pp 613 – 617 The introduction of a new mathematics curriculum is usually heralded by the production of a plethora of learner workbooks and teacher aids. In South Africa this study researches the effect of curriculum change on Grade 3 mathematics teachers in an endeavour to understand what elements enable the transition from an intended curriculum to an enacted curriculum. The theoretical framing for this paper is Fullan's (2006) change theory that focuses on new materials, new practices and new beliefs. The research identifies that current South African curriculum documents and workbooks focus on mathematical content almost exclusively, and give minimal guidance concerning pedagogical content knowledge and teacher agency. A tri-level system is suggested to narrow the gap between policy and praxis.
https://doi.org/10.37626/GA9783959871129.0.115 Webb, Paul: Towards Unifying Logic for the Pedagoy of Mathematics in South Africa. pp 618 – 622 South Africa's performance in mathematics at school level is not impressive, even when measured against countries with fewer resources. As a country, it is one of the lowest performers in the world with a wide range of achievement between schools, with historically white schools achieving results much closer to the international average compared to historically-black African schools. The South African National Planning Commission has identified mathematics education as a key area of concern, particularly amongst poor children. In response, the Mapungubwe Institute for Strategic Reflection (MISTRA) initiated a research project to explore the possibility of a 'unifying pedagogy' that could help improve mathematics teaching across the range of schools in the country. This paper presents a summary of the 'cumulative resonances' of 'sagacious' members of the mathematics education community in South Africa and abroad. The data generated by these 'sagacious' sources' in academia and governmental and non-governmental organisations were analysed thematically in order to explore the possibility of framing a unifying pedagogy of mathematics for South African conditions.
https://doi.org/10.37626/GA9783959871129.0.116 Wickliff, Gregory A.; et al: Communicating Mathematics and Science: Teaching and Tutoring Writing in a Summer Program for High School Students. pp 623 – 628 Supplemental instruction and tutoring in writing, genre, and document design and illustration, can improve the quality of formal mathematics and science papers and presentations composed by rising high school junior and senior students in a four-week summer program. This paper discusses the program history and goals, its structure, the methods of instruction and tutoring, and the professional and student writing samples delivered through the University of North Carolina at Charlotte's Summer Ventures in Science and Mathematics program. The program is a no-cost, state-funded program for academically talented students who aspire to careers in science, technology, engineering, and mathematics. Participants reside on the university campus for four weeks and conduct research around topics of their own interest individually or in collaboration with like-minded peers. Participants engage in research under the supervision of university faculty. https://doi.org/10.37626/GA9783959871129.0.117 Willson, Ian: Formative Assessment and Middle-School Classroom Tasks with the Wolfram Language. pp 629 – 630 Middle-school classroom tasks with the Wolfram Language can play a very significant role in the growth and development of mathematical competence. This can occur at the intersection of challenging Mathematical tasks, coding skills, exploration, discovery, collaboration and formative assessment. This workshop will reference all of these elements as they informed and underpinned classroom activities conducted at several different secondary schools in Melbourne Australia. https://doi.org/10.37626/GA9783959871129.0.118 Woodcock, Stephen: Not all Equals are Equal: Decoupling Thinking Processes and Results in Mathematical Assessments. pp 631 – 636 One of the greatest challenges in mathematics education is in fostering an understanding of what mathematicians would recognise as "mathematical thought." We seek to encourage students to develop the transferable skills of abstraction, problem generalization and scalability as opposed to simply answering the specific question posed. This difference is perhaps best illustrated by the famous – but likely apocryphal – tale of Gauss's school days and his approach to summing all positive integers up to and including 100, rather than just summing each sequentially. Especially with the rise of technology-enabled marking and results-focussed tutoring services, the onus is on the educator to develop new types of question which encourage and reward the development of mathematical processes and deprioritise results alone. Some initial work in this area is presented here. https://doi.org/10.37626/GA9783959871129.0.119 Zell, Simon: Weekly 10-minute-tasks to Promote Students Solving Equations in a Content-oriented Manner. pp 637 – 642 When solving equations in school, students often rely on routines and do not consider alternative ways of solving. Even basic equations which could be solved quite fast using common sense are regularly solved in a complicated way. To overcome this reliance on routine, a study with 17 classes of grade 10 students was carried out. Weekly 10-minute-tasks, which contained appropriate subtasks to enhance content-oriented solving, were solved by students over the course of one school year. These tasks were designed with the purpose of reducing the dominance of routines and the aim of using insight in the solving of equations.
https://doi.org/10.37626/GA9783959871129.0.120 Zollman, Alan: Collective Participation: A Story of Business, Community, Schools, and University Partnering in STEM Education. pp 643 – 648 The quality of the public school teacher has the greatest in-school impact on nurturing cognitive abilities, developing content knowledge, and increasing motivation of students (Ferguson & Ladd 1996; Haycock 1998; Rivkin, Hanushek, & Kain 2005; Rice 2003; Sanders & Rivers, 1996; Zollman, Tahernezhadi, & Billman, 2012). We also know from educational research (Johnson & Sondergeld, 2015) that traditional professional development formats do not result in improvement of teacher practices nor substantial gain in student achievement. This paper reports on a shift in the traditional professional development project – one to enhance the quality of the public school teacher in STEM education projects through a synergy of business, community, and school districts partners with education and science university faculty.
https://doi.org/10.37626/GA9783959871129.0.121 Zonnefeld, Ryan G.; Zonnefeld, Valorie L.: Innovative Pathways in STEM Teacher Preparation: Bridging the Gap between University Expectations & Secondary School Needs. pp 649 – 651 Innovative teacher preparation programs for STEM education are essential for meeting the goal of ensuring that secondary school students receive instruction from a certified teacher. This exploratory workshop examines the role that interdisciplinary STEM and mathematics programs can have to increase the number of certified teachers prepared to teach STEM classes from an interdisciplinary approach. https://doi.org/10.37626/GA9783959871129.0.122

The Math(s) Fix - Conrad Wolfram 2020

Why are we all taught maths for years of our lives? Does it really empower everyone? Or fail most and disenfranchise many? Is it crucial for the AI age or an obsolete rite of passage? The Math(s) Fix: An Education Blueprint for the AI Age is a groundbreaking book that exposes why maths education is in crisis worldwide and how the only fix is a fundamentally new mainstream subject. It argues that today's maths

education is not working to elevate society with modern computation, data science and AI. Instead, students are subjugated to compete with what computers do best, and lose. This is the only book to explain why being "bad at maths" may be as much the subject's fault as the learner's: how a stuck educational ecosystem has students, parents, teachers, schools, employers and policymakers running in the wrong direction to catch up with real-world requirements. But it goes further too"¬,¬"for the first time setting out a completely alternative vision for a core computational school subject to fix the problem and seed more general reformation of education for the AI age.

Math Through the Ages - William P. Berlinghoff 2004-09-09

An informal and accessible overview of the history of mathematics.

How People Learn - National Research Council 2000-08-11

First released in the Spring of 1999, How People Learn has been expanded to show how the theories and insights from the original book can translate into actions and practice, now making a real connection between classroom activities and learning behavior. This edition includes far-reaching suggestions for research that could increase the impact that classroom teaching has on actual learning. Like the original edition, this book offers exciting new research about the mind and the brain that provides answers to a number of compelling questions. When do infants begin to learn? How do experts learn and how is this different from non-experts? What can teachers and schools do-with curricula, classroom settings, and teaching methods--to help children learn most effectively? New evidence from many branches of science has significantly added to our understanding of what it means to know, from the neural processes that occur during learning to the influence of culture on what people see and absorb. How People Learn examines these findings and their implications for what we teach, how we teach it, and how we assess what our children learn. The book uses exemplary teaching to illustrate how approaches based on what we now know result in in-depth learning. This new knowledge calls into question concepts and practices firmly entrenched in our current education system. Topics include: How learning actually changes the physical structure of the brain. How existing knowledge affects what people notice and how they learn. What the thought processes of experts tell us about how to teach. The amazing learning potential of infants. The relationship of classroom learning and everyday settings of community and workplace. Learning needs and opportunities for teachers. A realistic look at the role of technology in education.

Mindset Mathematics - Jo Boaler 2017-08-28

Engage students in mathematics using growth mindset techniques The most challenging parts of teaching mathematics are engaging students and helping them understand the connections between mathematics concepts. In this volume, you'll find a collection of low floor, high ceiling tasks that will help you do just that, by looking at the big ideas at the first-grade level through visualization, play, and investigation. During their work with tens of thousands of teachers, authors Jo Boaler, Jen Munson, and Cathy Williams heard the same message—that they want to incorporate more brain science into their math instruction, but they need guidance in the techniques that work best to get across the concepts they needed to teach. So the authors designed Mindset Mathematics around the principle of active student engagement, with tasks that reflect the latest brain science on learning. Open, creative, and visual math tasks have been shown to improve student test scores, and more importantly change their relationship with mathematics and start believing in their own potential. The tasks in Mindset Mathematics reflect the lessons from brain science that: There is no such thing as a math person - anyone can learn mathematics to high levels. Mistakes, struggle and challenge are the most important times for brain growth. Speed is unimportant in mathematics. Mathematics is a visual and beautiful subject, and our brains want to think visually about mathematics. With engaging questions, open-ended tasks, and four-color visuals that will help kids get excited about mathematics, Mindset Mathematics is organized around nine big ideas which emphasize the connections within the Common Core State Standards (CCSS) and can be used with any current curriculum.

Zero the Hero - Joan Holub 2012-02-28

Zero. Zip. Zilch. Nada. That's what all the other numbers think of Zero. He doesn't add anything in addition. He's of no use in division. And don't even ask what he does in multiplication. (Hint: Poof!) But Zero knows he's worth a lot, and when the other numbers get into trouble, he swoops in to prove that his talents are innumerable.

Ruins of Montarek - Glenda Lappan 1996

Teacher's guide for Ruins of Montarek of Connected Mathematics series. Topic is geometry.

Project-Based Learning in the Math Classroom - Chris Fancher 2021-11-05

Project-Based Learning in the Math Classroom explains how to keep inquiry at the heart of mathematics teaching and helps teachers build students' abilities to be true mathematicians. This book outlines basic teaching strategies, such as questioning and exploration of concepts. It also provides advanced strategies for teachers who are already implementing inquiry-based methods. Project-Based Learning in the Math Classroom includes practical advice about strategies the authors have used in their own classrooms, and each chapter features strategies that can be implemented immediately. Teaching in a project-based environment means using great teaching practices. The authors impart strategies that assist teachers in planning standards-based lessons, encouraging wonder and curiosity, providing a safe environment where failure occurs, and giving students opportunities for revision and reflection. Grades 6-10

DIY Project Based Learning for Math and Science - Heather Wolpert-Gawron 2015-07-22

Project based learning is a popular approach to meeting the Common Core, but it can be time-consuming to implement. In this book, award-winning teacher and Huffington Post blogger Heather Wolpert-Gawron makes it fun and easy! Part I provides 6 full project-based learning units that integrate science and math while engaging students in real-world scenarios and critical thinking. Part 2 offers mix and match lessons and tools to help you create your own PBL units. The book also contains tons of templates, such as writing outlines, checklists, and rubrics, which you can download as free eResources from our website.

Principles to Actions - National Council of Teachers of Mathematics 2014-02

This text offers guidance to teachers, mathematics coaches, administrators, parents, and policymakers. This book: provides a research-based description of eight essential mathematics teaching practices ; describes the conditions, structures, and policies that must support the teaching practices ; builds on NCTM's Principles and Standards for School Mathematics and supports implementation of the Common Core State Standards for Mathematics to attain much higher levels of mathematics achievement for all students ; identifies obstacles, unproductive and productive beliefs, and key actions that must be understood, acknowledged, and addressed by all stakeholders ; encourages teachers of mathematics to engage students in mathematical thinking, reasoning, and sense making to significantly strengthen teaching and learning.

Math Curse - Jon Scieszka 1995-10-01

Did you ever wake up to one of those days where everything is a problem? You have 10 things to do, but only 30 minutes until your bus leaves. Is there enough time? You have 3 shirts and 2 pairs of pants. Can you make 1 good outfit? Then you start to wonder: Why does everything have to be such a problem? Why do 2 apples always have to be added to 5 oranges? Why do 4 kids always have to divide 12 marbles? Why can't you just keep 10 cookies without someone taking 3 away? Why? Because you're the victim of a Math Curse. That's why. But don't despair. This is one girl's story of how that curse can be broken.

Radical Equations - Robert Moses 2002-06-10

The remarkable story of the Algebra Project, a community-based effort to develop math-science literacy in disadvantaged schools—as told by the program's founder "Bob Moses was a hero of mine. His quiet confidence helped shape the civil rights movement, and he inspired generations of young people looking to make a difference"—Barack Obama At a time when popular solutions to the educational plight of poor children of color are imposed from the outside—national standards, high-stakes tests, charismatic individual saviors—the acclaimed Algebra Project and its founder, Robert Moses, offer a vision of school reform based in the power of communities. Begun in 1982, the Algebra Project is transforming math education in twenty-five cities. Founded on the belief that math-science literacy is a prerequisite for full citizenship in society, the Project works with entire communities—parents, teachers, and especially students—to create a culture of literacy around algebra, a crucial stepping-stone to college math and opportunity. Telling the story of this remarkable program, Robert Moses draws on lessons from the 1960s Southern voter registration he famously helped organize: "Everyone said sharecroppers didn't want to vote. It wasn't until we got them demanding to vote that we got attention. Today, when kids are falling wholesale through the cracks, people say they don't want to learn. We have to get the kids themselves to demand what everyone says they don't want." We see the Algebra Project organizing community by community.

Older kids serve as coaches for younger students and build a self-sustained tradition of leadership. Teachers use innovative techniques. And we see the remarkable success stories of schools like the predominately poor Hart School in Bessemer, Alabama, which outscored the city's middle-class flagship school in just three years. Radical Equations provides a model for anyone looking for a community-based solution to the problems of our disadvantaged schools.

Bloody Lowndes - Hasan Kwame Jeffries 2010-08-02

The treatment of eating disorders remains controversial, protracted, and often unsuccessful. Therapists face a number of impediments to the optimal care fo their patients, from transference to difficulties in dealing with the patient's family. Treating Eating Disorders addresses the pressure and responsibility faced by practicing therapists in the treatment of eating disorders. Legal, ethical, and interpersonal issues involving compulsory treatment, food refusal and forced feeding, managed care, treatment facilities, terminal care, and how the gender of the therapist affects treatment figure centrally in this invaluable navigational guide.

A Guide to Mathematics Leadership - Don S. Balka 2009-11-18

Written by three noted mathematics educators, this volume presents a process-based approach to building a high-quality mathematics program based on five NCTM principles and four NCSM leadership principles.