

Foundations Of Math 11 Curriculum Education Training

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2nd Grade Jumbo Math Success Workbook - Sylvan Learning 2019-01-08
3 BOOKS IN 1! Learning at home is as easy as 1 2 3 with this super-sized workbook that's jam-packed with 320 pages of kid-friendly, teacher-reviewed exercises for kids tackling 2nd grade math.

Perfect for back to school--no matter what that looks like! Building a strong foundation in basic math is essential as 2nd graders prepare to advance to more difficult math concepts. This Jumbo Workbook (a \$39 value for just \$18.99!) is a compilation of 3 of Sylvan Learning's most popular

curriculum-based activity books* and includes 320 colorful pages all designed to help your child become familiar with basic math concepts like:

- place value & number sense
- addition & subtraction •
- grouping & sharing • fractions
- geometry & measurement •
- time & money • graphs & data ... and much more! With vibrant, colorful pages full of games and puzzles, 2nd Grade Jumbo Math Success Workbook will help your child catch up, keep up, and get ahead—and best of all, to have lots of fun doing it! *Includes the full text of 2nd Grade Basic Math, 2nd Grade Math Games & Puzzles, and 2nd Grade Math in Action

***** Why Sylvan Products Work ***** Sylvan Learning Workbooks won a National Parenting Publications Awards (NAPPA) Honors Award as a top book series for children in the elementary-aged category. NAPPA is the nation's most comprehensive awards program for children's products and parenting resources and has been critically reviewing products

since 1990. The Award recognizes Sylvan Learning Workbooks as some of the most innovative and useful products geared to parents. Sylvan's proven system inspires kids to learn and has helped children nationwide catch up, keep up, and get ahead in school. Sylvan has been a trusted partner for parents for thirty years and has based their supplemental education success on programs developed through a focus on the highest educational standards and detailed research. Sylvan's line of educational products equips families with fun, effective, and grade-appropriate learning tools. Our workbooks and learning kits feature activities, stories, and games to reinforce the skills children need to develop and achieve their academic potential. Students will reap the rewards of improved confidence and a newfound love of learning.

School Mathematics Textbooks In China: Comparative Studies And Beyond - Jianpan Wang
2021-01-28

Our collected work contains

mathematics education research papers. Comparative studies of school textbooks cover content selection, compilation style, representation method, design of examples and exercises, mathematics investigation, the use of information technology, and composite difficulty level, to name a few. Other papers included are about representation of basic mathematical thought in school textbooks, a study on the compilation features of elementary school textbooks, and a survey of the effect of using new elementary school textbooks.

On the Shoulders of Giants - National Research Council
1990-01-01

What mathematics should be learned by today's young people as well as tomorrow's workforce? *On the Shoulders of Giants* is a vision of richness of mathematics expressed in essays on change, dimension, quantity, shape, and uncertainty, each of which illustrate fundamental strands for school mathematics. These

essays expand on the idea of mathematics as the language and science of patterns, allowing us to realize the importance of providing hands-on experience and the development of a curriculum that will enable students to apply their knowledge to diverse numerical problems.

[Technology-enhanced Learning in the Early Years Foundation Stage](#) - Moira Savage

2017-05-05

Discussing learning technologies in relation to young children often provokes a wide range of passionate responses, from sceptics to enthusiasts. This text explores the issues in a holistic, pedagogical and research-informed way. It helps professionals unpick the complex issues involved, understand the scope of available technology, examine the interplay between learning and specific technologies, and more broadly create a vision for a technology-enabled learning environment that is child-centred, playful, creative and interactive. Recurring case

studies are analysed from a number of theoretical perspectives, and the approach deliberately goes beyond the scope of 'understanding of the world' to consider the contribution of technology-enhanced learning to a range of different contexts and subject areas. Throughout there are clear links to professional standards, the Early Years Foundation Stage and the characteristics of effective learning.

Foundations for the Future in Mathematics Education -

Richard A. Lesh 2020-10-07

The central question addressed in Foundations for the Future in Mathematics Education is this: What kind of understandings and abilities should be emphasized to decrease mismatches between the narrow band of mathematical understandings and abilities that are emphasized in mathematics classrooms and tests, and those that are needed for success beyond school in the 21st century? This is an urgent question. In fields ranging from

aeronautical engineering to agriculture, and from biotechnologies to business administration, outside advisors to future-oriented university programs increasingly emphasize the fact that, beyond school, the nature of problem-solving activities has changed dramatically during the past twenty years, as powerful tools for computation, conceptualization, and communication have led to fundamental changes in the levels and types of mathematical understandings and abilities that are needed for success in such fields. For K-12 students and teachers, questions about the changing nature of mathematics (and mathematical thinking beyond school) might be rephrased to ask: If the goal is to create a mathematics curriculum that will be adequate to prepare students for informed citizenship—as well as preparing them for career opportunities in learning organizations, in knowledge economies, in an age of

increasing globalization—how should traditional conceptions of the 3Rs be extended or reconceived? Overall, this book suggests that it is not enough to simply make incremental changes in the existing curriculum whose traditions developed out of the needs of industrial societies. The authors, beyond simply stating conclusions from their research, use results from it to describe promising directions for a research agenda related to this question. The volume is organized in three sections:

*Part I focuses on naturalistic observations aimed at clarifying what kind of “mathematical thinking” people really do when they are engaged in “real life” problem solving or decision making situations beyond school. *Part II shifts attention toward changes that have occurred in kinds of elementary-but-powerful mathematical concepts, topics, and tools that have evolved recently—and that could replace past notions of “basics” by providing new foundations for the future. This

section also initiates discussions about what it means to “understand” the preceding ideas and abilities. *Part III extends these discussions about meaning and understanding—and emphasizes teaching experiments aimed at investigating how instructional activities can be designed to facilitate the development of the preceding ideas and abilities. Foundations for the Future in Mathematics Education is an essential reference for researchers, curriculum developers, assessment experts, and teacher educators across the fields of mathematics and science education.

Contextualized Mathematics -
Hector R. Valenzuela, Ph.D.
2021-10-11

What is contextualized mathematics? What are the foundational research underpinnings of contextualized math curriculum? What have we learned about contextualized math curriculum that will improve math education in the

future? These questions build the foundation for a reader to begin a journey with Dr. Valenzuela on this crucial topic for math education and for our society.

Scientific and Technical Manpower Needs of New Mexico - United States.

Congress. Senate. Committee on Commerce, Science, and Transportation. Subcommittee on Science, Technology, and Space 1981

Beast Academy Guide 2D - Jason Batterson 2019-02-25
Beast Academy Guide 2D and its companion Practice 2D (sold separately) are the fourth part in a four-part series for 2nd grade mathematics. Book 2d includes chapters on big numbers, algorithms for additional and subtractions, and problem solving.

Second International Handbook of Mathematics Education - Alan Bishop
2012-02-02

ALAN 1. BISHOP The first International Handbook on Mathematics Education was published by Kluwer Academic

Publishers in 1996. However, most of the writing for that handbook was done in 1995 and generally reflected the main research and development foci prior to 1994. There were four sections, 36 chapters, and some 150 people contributed to the final volume either as author, reviewer, editor, or critical friend. The task was a monumental one, attempting to cover the major research and practice developments in the international field of mathematics education as it appeared to the contributors in 1995. Inevitably there were certain omissions, some developments were only starting to emerge, and some literatures were only sketchy and speculative. However that Handbook has had to be reprinted three times, so it clearly fulfilled a need and I personally hope that it lived up to what I wrote in its Introduction: The Handbook thus attempts not merely to present a description of the international 'state-of-the-field', but also to offer synthetic and

reflective overviews on the different directions being taken by the field, on the gaps existing in our present knowledge, on the current problems being faced, and on the future possibilities for development. (Bishop et al. , 1996) Since that time there has been even more activity in our field, and now seems a good time to take stock again, to reflect on what has happened since 1995, and to create a second Handbook with the same overall goals.

Building on the Past to Prepare for the Future - Janina Morska
2022-09-01

Abstract of Book This volume contains the papers presented at the International Conference Building on the Past to Prepare for the Future held from August 8-13, 2022, in King's College, Cambridge, UK. It was the 16th conference organised by The Mathematics Education for the Future Project - an international educational and philanthropic project founded in 1986 and dedicated to innovation in mathematics, statistics, science and

computer education world wide. Contents List of Papers and Workshop Summaries Fouze Abu Qouder & Miriam Amit The Ethnomathematics of the Bedouin - An Innovative Approach of Integrating Socio Cultural Elements into Mathematics Education <https://doi.org/10.37626/GA9783959872188.0.001> First page: 1 Last page: 6 Abstract Our study attempted to address young Bedouin (desert tribes) students' persistent difficulties with mathematics by integrating ethnomathematics into a standard curriculum. First, we conducted extensive interviews w 35 Bedouin elders and women to identify: 1. The mathematical elements of their daily lives- particularly traditional units of length and weight, 2. The geometrical shapes in Bedouin women's traditional dress embroidery. Then we combined these with the standard curriculum to make an integrated 90 hours 7-8th grade teaching units that were implemented in Bedouin schools and in the Kidumatica

Math Club for Excellent Students. Comparisons between the experimental groups (186) and the control group (62) showed that studying by the integrated curriculum improved: 1. The cognitive aspects of the students 2. The affective aspects. Keywords: Bedouin Cultures, ethnomathematics.

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Nadine Adams & Clinton Hayes
 Why Everyone should know Statistics!
<https://doi.org/10.37626/GA9783959872188.0.002> First page: 7 Last page: 11 Abstract
 "Decision is the central intellectual activity in our everyday lives" and statistics is central to these activities (Longford, 2021, p. xi). The ability to manipulate and interpret data is an important component in decision making. A misunderstanding or poor grasp of data distributions and statistical methods can lead to assumptions that are not accurate. When these inaccurate assumptions are

presented as factual to decision makers also possessing little or no statistical knowledge, poor decisions can be made. This paper investigates how an interpretation of statistics played a role the decision to remove multiple-choice questions from invigilated examinations at a regional Australian university. The case is further argued that it is important for everyone to have a basic understanding of statistics.

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Anita N. Alexander The Perspectives of Effective Teaching and Learning of Current Undergraduate and Graduate Mathematics Students
<https://doi.org/10.37626/GA9783959872188.0.003> First page: 12 Last page: 17 Abstract
 Some mathematics professors engage their students in discourse and explorations to promote a deep understanding of critical concepts. Still, lecture remains the norm in mathematics courses according

to current mathematics students' survey responses (Mostly Lecture 52%; Lecture & Discussions 35%; N = 89). Students were asked the best way for them to learn mathematics, whether their career plans are teaching related (Teaching Related: Yes 22%; Not Sure 36%; No 42%), as well as what they enjoy and want to change about their mathematics courses. Students requested "more discussions, and more questions to solve in class," and described lecture as "an unacceptable way to teach," and that "it is the worst way to learn." Students' perspectives on effective teaching and learning are critical for their continued passion to pursue STEM related fields, rather than stating that "I do not love mathematics anymore."

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Clement Ayarebilla Ali & Ernest Kofi Davis Applications of Basketry to Geometric Tessellations
<https://doi.org/10.37626/GA978>

3959872188.0.004 First page: 18 Last page: 23 Abstract We present applications of basketry to geometric tessellation in the primary school mathematics. Even though there are various forms of tessellations, we present three regular and Archimedean tessellations for conceptual analysis of the geometric concepts. With a case study design of 15 pupils through interviews and observations, the findings show that pupils can apply baskets to learn geometric tessellations. It was there recommended that baskets be used to extend learning as they play, game and fun.

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Nurten Alpaslan & Emre Alpaslan Mathematics for Everybody
<https://doi.org/10.37626/GA978>

3959872188.0.005 First page: 24 Last page: 25

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Cynthia Oropesa Anhalt,

Ricardo Cortez, Brynja Kohler & Will Tidwell Interrogation of Social Justice Contexts in Mathematical Modeling: The Use of Simulations of Practice in the Mathematical Preparation of Teachers <https://doi.org/10.37626/GA9783959872188.0.006> First page: 26 Last page: 31 Abstract Research in prospective teachers' development of mathematical modeling knowledge for teaching is gaining momentum. The Mathematics of Doing, Understanding, Learning, and Educating for Secondary Students [MODULE(S2)]* project developed a curriculum in modeling for teacher education that includes simulations of practice, in which prospective teachers reflect on and plan a discussion around student thinking, their models, and the contextualization of their results. We present an analysis of prospective teachers' modeling work on the decreasing area of Indigenous reservation land in the U.S., and a simulation of practice

which explores different methods for finding the area of land in connection to the injustice deeply rooted in the treatment of Indigenous people. This problem explores a critical social issue and calls for explicit attention to pedagogical knowledge in structuring discussions around the contextualization of the mathematical results.

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Takako Aoki & Shin Watanabe Find out Mathematics on a Football: Making a football with paper <https://doi.org/10.37626/GA9783959872188.0.007> First page: 32 Last page: 34 Abstract We are aiming for a workshop method as a way to teach mathematics in future school education. It is important to cooperate with each other and understand mathematics. In this workshop, we aim to discover the mathematics hidden in the footballs we handle every day. As an aid to thinking, I would like to make football by paper first and

learn mathematics while looking at concrete things. You need 20 equilateral triangles. A regular hexagon is made from this equilateral triangle, and a regular pentagon uses the method of making a hole. In particular, pay attention to the four-color problem in mathematics, make sure that the colours of adjacent regular hexagons are different, and use three colours (red, green, yellow). For example, in a football, how many equilateral triangles of each colour are used is one of the issues. I am looking forward to holding a workshop to see what kind of problems there are. Key words: football Introduction with paper, the truncated icosahedron, the color coding of the three colors, Euler's polyhedral formula

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Sarah Bansilal Analysing the Demands of an Assessment in a Geometry Pedagogic Content Knowledge Module
<https://doi.org/10.37626/GA9783959872188.0.008> First page:

35 Last page: 40 Abstract With the onset of the pandemic, universities were forced to move to online platforms for teaching and for assessments. In this paper, I reflect on the use of multiple-choice questions in a geometry PCK module for pre-service mathematics teachers. The study involves a secondary analysis of the data generated by the responses of 92 students to an assessment consisting of 25 items. The aim of the study was to distinguish between, and if possible, characterise possible levels of demands of the test items. The results suggested that there are four distinct groups of items relating to common content knowledge of early and late high school respectively, PCK related to deductive reasoning skills and critical thinking in an open book setting.

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Mike Bedwell Three or Four numbers: A Teacher's Tale
<https://doi.org/10.37626/GA9783959872188.0.009> First page:

41 Last page: 43

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Esther Billings & Lisa Kasmer
Learning Experiences that
Support Primary Teacher
Candidates' Understanding and
Enactment of Core
Mathematics Teaching
Practices

<https://doi.org/10.37626/GA9783959872188.0.010> First page:

44 Last page: 49 Abstract In many teacher preparation programs, instruction focuses on learning about strategies and practices for teaching rather than directly enacting and honing these skills (Grossman, Hammerness, & McDonald, 2009): a corepractice approach in teacher education necessitates organizing coursework and fieldwork around practices of the teaching profession while simultaneously providing teacher candidates (TCs) ample opportunities to “practise” by enacting these teaching practices. In this paper, we share our corepractice instructional strategies, along

with TC work used in our teacher preparation mathematics education courses (prior to student teaching) to engage TCs’ understanding and development of their ability to enact core practices, specifically the mathematics teaching practices outlined in National Council of Teachers of Mathematics (NCTM) (2014).

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Victoria Bonaccorso, Joseph DiNapoli & Eileen Murray
Promoting Meaningful
Conversations among
Prospective Mathematics
Teachers

<https://doi.org/10.37626/GA9783959872188.0.011> First page:

50 Last page: 55 Abstract Recent circumstances due to the COVID-19 pandemic and restrictions on entering public schools have created barriers for prospective teachers (PT) to gain valuable exposure to real classrooms. As a result, we have transitioned some teacher preparation from in person experiences to video case study analysis. Our research seeks to

determine how this transition can foster development of critical teaching skills by infusing a model of powerful teaching with video of real classrooms. Our findings suggest that with online video case analysis PTs were able to advance their discursive conversations to strategic conversations by building on and transforming each other's articulation of proposed teacher moves. This model for PT preparation has the potential to foster more meaningful discourse among participants by providing a space to build on and refine their understanding of mathematics teaching.

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Primo Brandi, Rita Ceppitelli & Anna Salvadori Elementary Dynamic Models: A Strategic Bridge Connecting School and University

<https://doi.org/10.37626/GA9783959872188.0.012> First page: 56 Last page: 62 Abstract We present an innovative educational path thought as a

link between High School and University studies. The topic is the introduction to dynamic models (both discrete and continuous) which represent a key tool in a wide range of disciplines: sciences, techniques, economics, life sciences and more.

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Simone Brasili & Riccardo Piergallini Introducing Symmetry and Invariance with Magic Squares

<https://doi.org/10.37626/GA9783959872188.0.013> First page: 63 Last page: 68 Abstract Magic squares are key tools in mathematics teaching. They favor reasoning and creativity in problem-solving. As well, they bring students closer to the history of mathematics. Our work presents the magic squares in a learning progression introducing the symmetry linked with the idea of invariance "sameness in change" early at primary school in Montegranaro (Italy). Using the 3x3 magic square and manipulation games, a

sample of 101 pupils (8 years) internalizes symmetries, reflections, and rotations associated with the square. The proposed activities provide tools and experience for geometric cognitive processes transferable from magic squares to main geometric shapes. The findings confirm that symmetry linked to the search for invariance is appropriate and accessible for primary school pupils through manipulation games.

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Angela Broaddus & Matthew Broaddus Assessing Mathematical Reasoning: Test Less - Explain More <https://doi.org/10.37626/GA9783959872188.0.014> First page: 69 Last page: 74 Abstract Mathematics educational researchers have long offered recommendations for effective mathematics teaching, learning, and assessment, yet educators still struggle to implement fair and practical assessments that promote engagement and inspire

students. This study describes assessments that (1) reduced anxiety, frustration, and rote imitation of procedures; (2) increased accessibility, motivation, and psychological resilience; and (3) improved engagement, strategic competence, self-assessment, and depth of understanding. Writing assignments prompted students to explain their reasoning about problems or their understanding of main ideas. Students revisited assignments in response to feedback and resubmitted them later in the course, which motivated students to deepen their understanding over time. Sample assignments, responses, and lessons learned will be shared.

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Irena Budínová & Jitka Panáčová Children with Reduced Cognitive Effectivity, their Problems and Optimal Way of Education <https://doi.org/10.37626/GA9783959872188.0.015> First page: 75 Last page: 80 Abstract The

contribution deals with children with reduced cognitive efficiency, their specific, and frequent difficulties in learning mathematics in the first years of education. Two examples of children with reduced cognitive efficiency will illustrate the specific ways in which reduced cognitive efficiency can manifest itself in mathematics, how children can be helped to overcome the mathematics curriculum. Problems in learning two basic arithmetic operations will be presented. The differentiation of teaching will be briefly introduced as an effective opportunity to work with these children.

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Gail Burrill Data Science and Mathematical Modeling: Connecting Mathematics to the World in which Students Live <https://doi.org/10.37626/GA9783959872188.0.016> First page: 81 Last page: 89 Abstract The increasing need for statistical and quantitative thinking and reasoning makes it more important than ever that using

mathematics and statistics to make sense of the world should be a central component of schooling. Data have transformed the way we look at the world. Shouldn't this emphasis on data also impact what we teach both in mathematics and statistics? Research suggests that engaging with real data can motivate students, encourage them to take an interest in STEM fields, and allows the interests of diverse communities to be used as opportunities for learning. This paper summarizes the research looking at why connecting mathematics to the world is important for student learning, describes the role of data science and modeling in doing so, and provides examples of opportunities for students to interact with the world in which they live and work. "The development of mathematics is intimately interwoven with the progress of civilization,.."
(Ebrahim, 2010)

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Gail Burrill & Thomas Dick
Connecting Mathematics to the
World: Engaging Students with
Data Science

<https://doi.org/10.37626/GA9783959872188.0.017> First page:

90 Last page: 94 Abstract
Mathematics and statistics can
be used to describe, explore,
and understand this
complicated world in which we
live. The workshop focus is on
several potentially messy, real-
world problems from
predicting herd immunity, to
exploring the quality of life
across countries to modeling
the change in CO2 levels. Each
situation begins with a
question and a set of data. The
activities are open ended with
multiple ways students might
develop mathematical and
statistical models, use
technology to analyze the data,
and make sense of terms such
as herd immunity or vaccine
efficacy or to investigate
situations such as optimizing
resources during a flood.

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Elizabeth A. Burroughs & Mary

Alice Carlson Fostering
Empathy in Mathematics
through Mathematical
Modeling

<https://doi.org/10.37626/GA9783959872188.0.018> First page:

95 Last page: 100 Abstract
Modeling, a cyclic process by
which mathematicians develop
and use mathematical tools to
represent, understand, and
solve problems, provides
learning opportunities for
school students. Mathematical
modeling situates
mathematical problem solving
squarely in the middle of
everyday experiences.

Modeling engenders the habits
and dispositions of problem
solving and empowers students
to identify critical issues
important to them, use their
mathematical tools to address
these problems, and view
mathematics as a force for
societal good.

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Bernardo Camou The
Adventure of Learning
Mathematics and Lakatos's
Legacy

<https://doi.org/10.37626/GA9783959872188.0.019> First page: 101 Last page: 104 Abstract Mathematics is normally described as abstract, exact, general and perfect. However, mathematics is a human creation and thus we can ask: How can humans with flaws and defects are able to create something perfect and infallible? Mathematics have its foundations in concrete problems, trials and errors approximations and representations. Learning mathematics is a fascinating trip, back and forth between concrete and abstract, between approximations and accuracy, between particular and general. Our poor representations are the road to conceptualize mathematical objects that then, seem to become perfect. In this workshop we will handle polyhedral and work with Euler's Formula, with angular defects and its relation with surface's curvature. In Lakato's book Proofs and Refutations the author might have committed a mistake,

though his book gives us a brilliant insight about the logic of mathematical discovery.

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Carrie Chiappetta, Christopher Walsh, Annie Smith & Javier Perez K-12 Schools after the Global Pandemic: How a Regional School District in the United States Accelerated Learning for Students, Teachers & Administrators <https://doi.org/10.37626/GA9783959872188.0.020> First page: 105 Last page: 110 Abstract After the global pandemic, Regional School District 15 will start the 2021-2022 school year by accelerating learning for students, teachers, and administrators. For teachers, the focus will be on "purposeful planning," "differentiation," and "formative assessment" to ensure that all students learn grade level content. For administrators, the focus would be on supporting teachers in these three areas of focus. The Assistant Superintendent, the Mathematics/Science Department Chair, and the

elementary and middle school mathematics instructional coaches will share the plan that they have implemented to work with K-12 teachers and administrators to ensure that students were able to learn grade level content even after the interrupted education that occurred during the global pandemic.

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Kathleen Cotter Clayton
Fractions of the Future
<https://doi.org/10.37626/GA9783959872188.0.021> First page: 111 Last page: 116 Abstract
Explore the simplicity and beauty of fractions of the future with a linear model, not with circle sets. When fractions are approached with this linear perspective, fractions can be easily taught, explored, and applied in daily life. Learn how to ask the right questions to guide your pupils to a solid understanding. Children as young as five can see that $1/3$ is less than $1/2$ and more than $1/4$. They can also see why $9/8$ is more than 1, why $1/4$ plus

$1/8$ is $3/8$, and why $1/2 \times 1/2$ is $1/4$. Fractions are a delight when they are taught the right way. Allow the children to explore the whole picture and relationships within the whole using the linear fraction model. Learn about activities and games to build confidence and develop a deep understanding of fractions. Uncover the joy of fractions!

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Joan A. Cotter Teaching
Primary Mathematics without Counting and Place Value with Transparent Number Naming
<https://doi.org/10.37626/GA9783959872188.0.022> First page: 117 Last page: 122 Abstract
Counting - memorizing the sequence and coordinating pointing with recitation - is problematic for many children. Children with poor counting skills often struggle to learn their beginning math with various approaches. Yet, counting is unnecessary. Babies are born with the ability to subitize; that is, to detect quantities at a glance, up to

three. By age 3, they can subitize up to five; by age 4 they can subitize up to 10 by grouping in fives, similar to their fingers. After children know the names for quantities 1 to 10, their next step should be place-value starting with temporary transparent number naming. For example, 11 is "ten-1", 12 is "ten-2", and 24 is "2-ten-4." The counting words in Far Asian languages reflect this transparency, enhancing their pupils' mathematics achievement. Place-value knowledge combined with subitizing gives pupils a way to master number combinations.

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Celisa Counterman M.A.T.H. =
Making Algebraic Thinking
Holistic

<https://doi.org/10.37626/GA9783959872188.0.023> First page: 123 Last page: 127 Abstract
Students in mathematics often need more than just definitions and examples. The first step is leaving their anxiety at the door. Hands-on work engages students by utilizing group

learning, discovery, and active learning both with and without technology lessening the fears of math. Faculty members will be given sample activities, rubrics, and sample student work. Special focus on creating Spirolaterals and quilting teach geometric movement and pattern recognition. Puzzles are created with mathematical problems in linear equations, linear inequalities, and compound inequalities bringing the focus on skills and historical facts. Faculty members will work in teams to recreate the materials themselves to see where issues in understanding come from.

There will be time for both questions and answers.

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Scott A. Courtney The Impact of Remote Instruction on Mathematics Teachers' Practices
<https://doi.org/10.37626/GA9783959872188.0.024> First page: 128 Last page: 133 Abstract
The coronavirus pandemic has impacted all aspects of society.

As the virus spread across the globe, countries and local communities closed workplaces, moved schools to remote instruction, limited in-person contact, cancelled public gatherings, and restricted travel. At one stage, over 91.3% of students worldwide, from pre-primary through tertiary education, were impacted by school closures. In the United States, many institutions continue to provide remote and hybrid learning options throughout the 2021-2022 academic year. Attempts to mitigate Covid-19 through mass remote instruction has provided unique opportunities for researchers to examine the resources teachers utilize to drive and supplement their practices. In this report, I describe remote instruction's ongoing impact on grades 6-12 mathematics teachers and their students in rural area and small-town schools in the Midwestern United States.

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Mili Das Building on the Past to Prepare for the Future - Impact of Teaching Skills and Professionalism to Reduce Mathematics Phobia
<https://doi.org/10.37626/GA9783959872188.0.025> First page: 134 Last page: 138 Abstract In India mathematics is a compulsory subject for the primary, upper primary and secondary classes. In secondary school curriculum among the compulsory subjects MATHEMATICS is the most vital subject and at the same time it is the most difficult one as per the learners' opinion as well as the parents. So, the subject is neglected by many students and as a consequence Mathematics Phobia is often developed in the students' mind. There are many more factors which are connected to this growing distaste in learning mathematics like in appropriate curriculum organization, methodology of teaching, teachers' knowledge, assessment techniques [Das,M.2010] and management of classroom environment. The said problem is not a new one

but in present teachers' training course special attention is given on it. In this paper author will discuss that how the teaching skills and teachers' professionalism can create a positive environment to motivate students.

Keywords: Mathematics Teacher, Learners, Curriculum, Professionalism

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Thomas P. Dick Combining Dynamic Computer Algebra and Geometry to Illustrate "the most marvelous theorem in mathematics"

<https://doi.org/10.37626/GA9783959872188.0.026>

First page: 139 Last page: 144 Abstract

Dynamic geometry software (DGS) allows for constructions and measurements that instantly update when a virtual geometric figure is manipulated. Likewise, dynamic computer algebra systems (CAS) enable symbolic calculations that instantly update when an expression or equation is altered. Linking geometric objects to symbolic

parameters combines these two powerful tools together.

We will illustrate a unique feature of "locked"

measurement in a special DGS to create a Steiner ellipse. We then illustrate the use of a dynamic CAS to create dynamic first and second

derivative zeroes of a cubic function whose zeroes can be graphically manipulated.

Finally, we will link a dynamic geometric construction based on these zeroes to illustrate the Siebeck-Marden Theorem, an astounding result that has been justifiably called "the most marvelous theorem in mathematics."

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Hamide Dogan, Angel Garcia Contreras & Edith Shear

Geometry, Imagery, and Cognition in Linear Algebra

<https://doi.org/10.37626/GA9783959872188.0.027>

First page: 145 Last page: 150 Abstract

This paper discusses features of five college-level linear algebra students' geometric reasoning, revealed on their

interview responses to a set of predetermined questions from topics relevant to linear independence ideas. Our qualitative analysis identified three main themes (Topics). Each theme, furthermore, revealed similarities and differences, providing insight into technology's potential effect.

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Ann Dowker, Olivia Cheriton & Rachel Horton Age Differences in Pupils' Attitudes to Mathematics

<https://doi.org/10.37626/GA9783959872188.0.028> First page: 151 Last page: 156 This study investigated children's and adolescents' attitudes to mathematics, with a particular focus on whether and how these are affected by age and gender. 216 pupils from Years 2, 6, 9 and 12 participated in the study. They were given (1) the Mathematics Attitude and Anxiety' questionnaire (Thomas & Dowker, 2000), which assesses levels of maths anxiety; unhappiness at failure

in maths; liking for maths, and self-rating in maths; and (2) the British Abilities Scales Number Skills Test to establish actual mathematics performance. Age had a significant effect on both liking for maths and self-rating in maths: older children were lower than younger children in both. Gender had a significant effect on self-rating: boys rated themselves higher than girls, though there was no significant gender difference in mathematical performance. Self-rating, but not anxiety, predicted mathematics performance.

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Alden J. Edson & Elizabeth Difanis Phillips The Potential of Digital Collaborative Environments for Problem-Based Mathematics Curriculum <https://doi.org/10.37626/GA9783959872188.0.029> First page: 157 Last page: 162 Abstract In this paper, we present an overview of the design research used to develop a digital collaborative environment with an embedded

problem-based curriculum. We then discuss the student and teacher features of the environment that promote inquiry-based learning and teaching.

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Belinda P. Edwards Learning to Teach Mathematics using Virtual Reality Simulations <https://doi.org/10.37626/GA9783959872188.0.030> First page: 163 Last page: 168 Abstract Researchers (Lampert, et al., 2013; Zeichner, 2010; Grossman, et al., 2009a) recommend the use of rehearsals in teacher education classrooms to help preservice teachers (PST) bridge theory to practice. Rehearsals enable PSTs to practice teacher moves, such as asking purposeful questioning and engaging students in mathematical discourse during an episode of teaching a lesson (NCTM, 2014). During a rehearsal, the PST's teacher education instructor provides coaching that helps the PST make flexible adjustments to

their instruction. Using a phenomenological approach, this research investigates the use of Virtual Reality (VR) simulations to support PSTs learning to teach mathematics through rehearsals. The presentation will include samples of PSTs' mathematics teaching episodes with attention to successes, challenges, and lessons learned from the use of VR simulations in teacher education classrooms.

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Allison Elowson, Kristen Fye, Gregory Wickliff, Christopher Gordon, Alisa Wickliff, Paul Hunter & David Pugalee Student Research in a Mathematics Enrichment Program <https://doi.org/10.37626/GA9783959872188.0.031> First page: 169 Last page: 174 Abstract Increasing emphasis is placed on the development of research skills for students in STEM content areas. As part of a four-week summer enrichment program, 24 high school

students participated in a mathematics course highlighting the historical development of mathematics through the lens of history and culture. Each student designed and conducted their own research study under the mentorship of instructors with expertise in mathematics, writing and technical communication, and student research. This paper presents a case study of one project selected on the basis of strong performance in meeting course goals. Data demonstrates the mathematical understanding of the student researcher, their scientific literacy and research skills, and their mathematical communication. The student prepared both a paper and a poster to report their research study.

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Antonella Fatai Improving Relational and Disciplinary Competences by Rondine Method
<https://doi.org/10.37626/GA9783959872188.0.032> First page:

175 Last page: 180 Abstract
The present work describes an educational experience, being implemented since 2015, based on the Rondine Method application in mathematics teaching. This experience has involved 135 students from State Schools throughout Italy. The general method was developed by an Italian research team aiming at resolving conflicts in situations of contrast. The goal of the work is highlighting how the care of relationships may be a means for overcoming difficulties in mathematics. Below we describe activities referring to the general principles of active education and of socio-constructivism, which are oriented to train students both in learning by action and participation, and in bringing their own contribution to the whole class work.

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Courtney Fox Integrating Mathematics and Science: A Plan for a High School Integrated Pre-Calculus and

Physics Course
<https://doi.org/10.37626/GA9783959872188.0.033> First page: 181 Last page: 185 Abstract
This paper explores the integration of mathematics and science as a means to improve learning for high school students. Scholars have acknowledged the benefits of integration for over 50 years, but in the United States we have failed in large measure to adopt an integrative curriculum. This work provides a corrective to this problem by creating a practical curriculum for an integrated Pre-Calculus and Physics course with suggestions for implementation in any school.

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Kathy R. Fox Building an Understanding of Family Literacy: Changing Perspectives Regarding Authentic Learning Opportunities in the Home
<https://doi.org/10.37626/GA9783959872188.0.034> First page: 186 Last page: 191 Abstract
Home to school engagement

has often been a one-way path, with teachers seen as facilitators only. When schools were forced to rapidly switch to virtual instruction, teachers were suddenly entering kitchens, living rooms and other spaces to deliver virtual instruction. Findings from this qualitative study of eleven practicing teachers showed new teaching opportunities through virtual home visits. Doors were literally and figuratively opened as teachers became beneficiaries of cultural and academic practices in the home. Math instruction took on a real-world quality, as teachers were privy to home environments for authentic teaching materials. As schools open and teacher, parent, and caregiver relationships return to a more distant space, these participants described small but significant changes in the way they continued to engage parents and caregivers after the experiences of the virtual home visits.

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Grant A. Fraser Mathematics
for Living: A Course that
Focuses on Solving Problems in
Today's World
<https://doi.org/10.37626/GA9783959872188.0.035> First page:
192 Last page: 195 Abstract
The author has developed and
taught a course for University
students who are not
specializing in mathematics,
science, or engineering. In
contrast to traditional courses
of this type, this course focuses
on topics from the real world
that students will encounter in
later life. The aim of the course
is to provide students with
mathematical tools that they
can use to create meaningful,
practical solutions to problems
that arise in these topics.
Students work individually on
projects and present their
solutions in class. Other
students then critique these
solutions. With practice,
students develop the skills
necessary to analyze more
complicated kinds of problems.
A final project enables students
to use their newly acquired
techniques to deal with more

realistic problems. The author
discusses the content of the
course and the impact it has
had on students.

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Toshiakira Fujii Roles of Quasi-
variables in the Process of
Discovering Mathematical
Propositions

<https://doi.org/10.37626/GA9783959872188.0.036> First page:
196 Last page: 201 Abstract

The purpose of this paper is to
clarify roles of quasi-variables
by focusing on the process of
discovering mathematical
propositions. For this purpose,
the author analyzed the
assignment reports of third-
year undergraduate students.
As a result, the author found
that "looking back" is
important in the
generalization-oriented inquiry
process, but it is not enough. It
is important to "re-examine"
the found matter and its form
of expression from the
perspective of a new concept.
In the process of "looking
back" and "re-examine", it was
confirmed from the description

of the metacognitive part of the students that the use of quasi-variables clarified the object of consideration and made it easier to clarify which numbers contributed to the generalization and expansion in what sense.

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Ben Galluzzo, Katie Kavanagh, Karen Bliss, Michelle Montgomery & Christopher Musco Math Modelling: Common Pitfalls and Paths for Student Success <https://doi.org/10.37626/GA9783959872188.0.037> First page: 202 Last page: 207 Abstract Mathematical modelling 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 applying a formula and the actual creation of a mathematical relationship. Approaching open-ended problems can be challenging for students. In this two part workshop, we first share examples of how students can

get off-track while creating models, in particular making choices or assumptions that undermine the solution quality. In the second part, we demonstrate how to facilitate authentic math modelling so that students can be creative and innovative in the modelling process while having ownership over their solution. Participants will assess real student modelling solutions from Mathworks Math Modeling Challenge (M3 Challenge), a program of Society for Industrial and Applied Mathematics (SIAM), and discuss ways that they would advise teams towards improvement.

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Parker Glynn-Adey & Ami Mamolo Modelling Beauty: Hands-on Experiences in Group Theory <https://doi.org/10.37626/GA9783959872188.0.038> First page: 208 Last page: 213 Abstract In the 19th century, geometric models were valued as tools for exploring complex

mathematics. Quartic surfaces and hyperboloids elaborately modelled with plaster gave access to powerful ideas and brought alive wonderful new mathematics. In this workshop, we explore a diverse set of geometric models that capture mathematical beauty and we showcase how they can be used to bring alive wonderful new-for-students mathematics. We discuss the value of these experiences for fostering mathematical ways of being that can help disrupt preconceived notions about a homely, rote and rigid nature of mathematics, and capture some of the visual richness of older mathematical models.

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Gerald A. Goldin, Lisa B. Warner, Roberta Y. Schorr & Daniel Colaneri Exploring Prospective Mathematics Teachers’ Motivating Desires during Group Problem Solving Activity

<https://doi.org/10.37626/GA9783959872188.0.039> First page: 214 Last page: 219 Abstract

Earlier research has characterized recurrent patterns of cognition, affect, and behavior during in-the-moment mathematical activity. Each pattern, termed an “engagement structure,” is named by a specific motivating desire that evokes it: e.g., Get The Job Done, I’m Really Into This, Value My Culture, etc. This study explores prospective teachers’ motivating desires as they engage in small-group problem solving sessions. Participants were enrolled in courses required for teaching certification at two eastern U.S. state universities. Based on survey, individual interview, and focus group data, we identify the most frequently occurring desires, their perceived importance and accompanying emotional feelings. We present and discuss some findings briefly, including the motivating desire to Carry My Weight with a team of peers.

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John Gordon & Kehinde

Emmanuel Adenegan Are
Abstract Mathematical
Thinkers Born or Can They Be
Trained?

<https://doi.org/10.37626/GA9783959872188.0.040> First page:

220 Last page: 224 Abstract
Abstract mathematical thinkers
in the fields of pure
Mathematics and theoretical
computer science have
contributed significantly to the
body of knowledge that has
fundamentally altered the
course of human civilization
and technological advances.
This paper explores whether
these thinkers are naturally
gifted or if there are
pedagogical strategies that can
be implemented that will bring
about the same outcomes.

Keywords: Abstract, critical,
thinkers, Mathematics

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John Gordon Reuniting
Exponents and Logarithms:
Teaching Exponents, Inverse
functions, and Logarithms, as
one Cohesive Pedagogical Unit

<https://doi.org/10.37626/GA9783959872188.0.041> First page:

225 Last page: 230 Abstract
Exponents, inverse functions,
and logarithms are
fundamentally important
concepts in almost every
branch of technical science.
However, they are not taught
together as a cohesive,
comprehensive, pedagogical
unit in many instances. As a
result, students lose deep
insight into their meaning and
applicability. Additionally,
particularly in the concept of
the inverse function, the
richness, and beauty inherent
in the concept are reduced to a
purely mechanical process.
This paper seeks to remedy
this situation by outlining a
pedagogical strategy that links
exponents, inverses, and
logarithms together in such a
manner as to preserve their
natural dependence,
coherency, and logic.

Keywords: Exponents, inverse,
functions, logarithms.

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Debra Hydorn Infographics to
Develop Graphical Literacy
<https://doi.org/10.37626/GA978>

3959872188.0.042 First page: 231 Last page: 236 Abstract Tools for easily creating infographics are widely available, both online and through statistics, mathematics, and other programs. Determining the appropriate graphs to produce for different kinds of data is an important skill for students at all levels to learn, as is determining the best graph for a specific audience. With the increased availability of data comes the increased expectation that researchers in all disciplines can effectively communicate their findings to a wide range of audiences. Experts in graphical design have defined aspects of “graphical excellence,” but the effectiveness of graphically portrayed information depends a great deal on the needs and abilities of the intended audience. To create effective graphs, students not only need to be familiar with tools for creating graphs, they also need to be familiar with the communication, cognitive, and aesthetic principles associated

with infographic design.
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Andrew Izsák Foregrounding Multiplicative Structure in Essential Calculus Topics <https://doi.org/10.37626/GA9783959872188.0.043> First page: 237 Last page: 242 Abstract Approaches to calculus have emphasized limits, derivatives, and integrals, among other topics. Yet, across different approaches, the subject continues to pose significant challenges. The present study reports a new approach to calculus that takes multiplicative structure as an equally essential topic that is often overlooked or taken for granted. In an experimental course, 18 college students learned to reason about multiplication understood as coordinated measurement with two different units and proportional relationships understood from the variable-parts perspective. They then worked with piecewise linear functions and step functions to derive key calculus results. A

first strand involved division, proportional relationships, slopes of lines, function composition, and the chain rule. A second strand involved multiplication, areas, inversely proportional relationships, and integration by substitution.

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Brian L. Johnson & Ioannis Kkigkitzis Interesting Facts about Terminating Decimals <https://doi.org/10.37626/GA9783959872188.0.044> First page: 243 Last page: 248 Abstract The set of rationals is dense in \mathbb{R} . In fact, this is even true for the smaller family of terminating decimals. Unlike density ratios in the physical world, this is an absolute property implying that infinitely many such decimals exist in even the "smallest" intervals we can imagine. However, it is possible to construct this infinite density in an increasing sequence of finite "densities"--starting with the discrete set of integers. While the terminating decimals do not seem to receive as much

formal discussion as \mathbb{Z} , \mathbb{Q} and \mathbb{R} , they are an essential part of the mathematics curriculum, from elementary school through college. Keywords: integers, rational numbers, algebra, density.

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Iris DeLoach Johnson Exploring a Collection of Approachable, Stimulating and Thought-Provoking Problems: Face-to-Face or Virtual? Related or not? <https://doi.org/10.37626/GA9783959872188.0.045> First page: 249 Last page: 253 Abstract Students thrive when engaged in solving problems that they find to be approachable, stimulating, and thought-provoking. This workshop includes many such problems with various real-world and contrived contexts. Participants will work in groups to find the solutions as well as identify similarities and contrasts among the problems. We will explore whether there are related mathematical concepts (e.g., algebra, discrete

mathematics, geometry) or mathematical processes (reasoning, connecting, communicating, representing, problem-solving, selecting tools and strategies). Many of these problems are taken from resources published broadly for students from ages 11-19+. We will compare our findings and experiences with those of school students and discuss use of technology in both face-to-face and online settings: from the past to the future!
Keywords: problem-solving, reasoning, communication, collaboration, algebra, representations, Chalk Talk, Thinker-Doer problems

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Gibbs Y. Kanyongo, Nandini Bhowmick & Erika Williams
Structural Equation Modeling: Focus on Confirmatory Factor Analysis
<https://doi.org/10.37626/GA9783959872188.0.046> First page: 254 Last page: 255 Abstract
This workshop will expose participants to the statistical technique of Structural

Equation Modeling (SEM), with a focus on confirmatory factor analysis (CFA), using the statistical software AMOS. Structural equation modeling is a multivariate statistical analysis technique that is used to analyze structural relationships. Confirmatory Factor Analysis examines whether collected data fit a hypothesized model of what the data are meant to measure. It is the measurement part of SEM, which shows relationships between latent variables and the observed variables.

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Anna Khalemsky & Yelena Stukalin
Combining Various Data Mining Techniques in Binary Classification Teaching
<https://doi.org/10.37626/GA9783959872188.0.047> First page: 256 Last page: 260 Abstract
Binary classification is one of the most common data analytics tasks. It appears in a wide range of applications including finance, sociology, psychology, education,

medicine, and public health. In statistical and analytics courses, binary classification is usually handled by logistic regression. Other alternatives, such as decision trees, neural networks, and Naïve Bayes are not commonly taught in traditional undergraduate programs. We suggest making these methodologies accessible as alternatives or complementary approaches to binary classification. We treat the teaching of the subject as a dynamic process that involves the understanding of the analytical task, understanding terms and concepts, visualizing, analyzing, interpreting the results, and decision making.

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Richard Kitchen Leveraging Pólya’s Heuristic to Support Mathematical Reasoning and Language Development
<https://doi.org/10.37626/GA9783959872188.0.048> First page: 261 Last page: 266 Abstract An iteration of an instructional framework designed to provide

emergent bilinguals (EBs) with opportunities to simultaneously engage in mathematical reasoning and learn the language of mathematics is illustrated in this paper. The “Discursive Mathematics Framework” (DMF) builds on Pólya’s iconic problem-solving heuristic by integrating research-based “language practices” and essential teaching practices. Videotapes and student work from problem solving lessons were examined using grounded theory methodology to illustrate the development of the DMF. Theoretically, this study contributes to the literature by providing explicit examples of how practices that promote mathematical reasoning and the learning of the language of mathematics can be taught concurrently during problem solving lessons.

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Sergiy Klymchuk An Innovative Way of Teaching and Assessing Critical Thinking in Mathematics

<https://doi.org/10.37626/GA9783959872188.0.049> First page: 267 Last page: 272 Abstract
This paper deals with the use of deliberately misleading mathematics questions in teaching and assessment as an innovative pedagogical strategy. The intention of using such questions is to enhance students' critical thinking. Critical thinking is understood here as "examining, questioning, evaluating, and challenging taken-for-granted assumptions about issues and practices" as defined by the New Zealand Ministry of Education. The study is based on a survey of 82 secondary school mathematics teachers who attended introductory workshops on the suggested pedagogical strategy at their regional conferences. Although the vast majority of the participants (96%) agreed to use such strategy in teaching, only 63% percent of the participants were willing to use it in assesment. Teachers' attitudes are analysed in the paper. Key words: critical thinking, assesment, school

mathematics teachers.
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Allison M. Kroesch & Albert Otto Magic Throughout the Years
<https://doi.org/10.37626/GA9783959872188.0.050> First page: 273 Last page: 276 Abstract
Too often teachers use the word "trick" in their mathematics lessons. There are no tricks in mathematics, but there are explanations for what appears to be a trick. Throughout this paper, we will address this history of magic, including the history of playing cards.
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Aradhana Kumari Do not Teach the Symbols in Mathematics, Teach the Meaning of the Symbols
<https://doi.org/10.37626/GA9783959872188.0.051> First page: 277 Last page: 282 Abstract
Unnecessary use of symbols in introducing ideas in mathematics makes it difficult to learn. From a student's

perspective, these symbols are the hurdle for them to understand the concepts/ideas in mathematics. One example is when we ask students the following: What is the meaning of the square root of a number, often their reply is the symbol $\sqrt{\quad}$. This shows that they did not understand the actual meaning of the square root of a number, which is the number raised to power one-half. I will present many examples and show how we can avoid using unnecessary symbols and teach the ideas and concepts in mathematics.

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Sebastian Kuntze, Marita Friesen, Jens Krummenauer, Karen Skilling, Ceneida Fernandez, Pere Ivars, Salvador Llinares, Libuše Samkova & Lulu Healy Support for Mathematics Teachers through Representations of Practice - Vignette-based Approaches in the Project coReflect@maths

<https://doi.org/10.37626/GA9783959872188.0.052> First page:

283 Last page: 288 Abstract Teachers' analysis of vignettes can be a key for connecting specific classroom situations with mathematics education theories. As vignettes are representations of practice with relevance for professional requirements of the mathematics classroom, vignettes also represent or portray meaningful theoretical elements. The use of vignettes in pre-service and in-service teacher professional development needs, however, conceptual and evidencebased exploration. Building on prior work with video, text, and cartoon vignettes, the project coReflect@maths aims at exploring the potentials of vignette-based work both for supporting professional learning and for research into aspects of mathematics teachers' expertise. Key aspects of the project work will be presented.

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Barbara H. Leitherer, Pankaj R. Dwarka, Entela K. Xhane &

Jignasa R. Rami Undergraduate Research in a 2-Year College: Climate Change, Global Learning, Process and Observations
<https://doi.org/10.37626/GA9783959872188.0.053> First page: 289 Last page: 294 Abstract In order to thrive and be successful in an increasingly interconnected world, 21st century students require multiple opportunities to engage with global learning (Landorf et al., 2019). Mathematics faculty guided 2-year college honors students in the US through an independent study analyzing real-world global climate change data supplied by the World Wildlife Fund (WWF). This proposal will elaborate in depth about the undergraduate research process, lessons learned, and observations made. Presenters will reflect on strategies used to support both collaborative and independent learning; how students increased their awareness of climate change as a global problem; how this contributed to students' ownership, success and

enhancement in undergraduate research leading to preparedness for further education and a successful career in science, technology, engineering, and mathematics.
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 Hadas Levi Gamlieli, Alon Pinto & Boris Koichu Secondary-Tertiary Transition and Effective Ways of Coping with it: A Perspective of Lecturers
<https://doi.org/10.37626/GA9783959872188.0.054> First page: 295 Last page: 300 Abstract The secondary-tertiary transition (STT) in mathematics education is a longstanding concern. This study explores university mathematics lecturers' perspectives on the challenges underlying STT and on the effectiveness of university-level coping measures currently employed. The analysis of 311 responses to an international survey suggests that there is considerable variability regarding the prevalent perspectives on STT among university lecturers. While

most respondents recognized school-related factors, the coping measures they recommended were mainly university-related. The findings stress the need to improve communication, both between university mathematics lecturers and the school mathematics education community, and across universities, for promoting comprehensive initiatives to address STT.

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Sigal Levy & Yelena Stukalin
Introducing Main Statistical Concepts to Non-statisticians
<https://doi.org/10.37626/GA9783959872188.0.055> First page: 301 Last page: 303 Abstract In this paper we present and discuss the results of an academic open-end mid-term statistics exam given to high-school teachers qualifying to teach Mathematics at a matriculation-exam level. The exam focused mainly on defining and understanding key terms and concepts in statistical inference. The

purpose of this study is to identify what questions would be good predictors of the overall score, thus indicating a good understanding of statistics. Item analysis showed that the ability to properly define a parameter, state research hypotheses and interpret the findings were more inclined to do well in the exam. Keywords: Statistical concepts, teaching statistics, non-statisticians

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Nicole Lewis, Ryan Andrew Nivens, Jamie Price, Jennifer Price & Anant Godbole
Pandemic-Driven Mathematical Initiatives within the East Tennessee State University Center of STEM Education
<https://doi.org/10.37626/GA9783959872188.0.056> First page: 304 Last page: 309 Abstract We describe three Mathematics Education initiatives launched as a result of the global pandemic. (i) The Eastman-funded MathElites professional development (PD) program for K-8 teachers was

offered online. Teachers were vastly more involved due to their greater autonomy. Old outcomes and those from 2020 will be compared. (ii) ETSU's Governor's School, which offers high school students Statistics and Biology college courses, went online too, and we used Columbia University Virology lessons and Covid19 data sets to make the courses more engaging to students. Student projects were assessed to be of a higher quality than in years past. (iii) With Niswonger Foundation support, we have launched a PD thrust for teachers in 2021, in the new areas of Epidemiology, Artificial Intelligence, and Statistics-with-R.

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Hung Liu Students' Perceptions of Paradoxes of the Infinity

<https://doi.org/10.37626/GA9783959872188.0.057> First page: 310 Last page: 315 Abstract
 Infinity is a significant element for understanding calculus, yet studies consistently suggest

that its counter-intuitive nature confused college students. The purpose of this study was to investigate Taiwanese college students' perceptions of paradoxes of the infinity and observe how their perspectives shifted back and forth while facing contradictory facts. It was found the 1-1 correspondence was the most used criterion for comparing the cardinality of infinite sets, which is somewhat different from previous studies, and students' reasoning on Zeno's paradoxes was feeble. The study suggests future research of this line should pay attention to the dialectical process of students' discourse to detect their core beliefs about the infinity.

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Hong Lu & Xin Chen The Relationship between Teacher-student Relationship, Interest, Self-efficacy and Mathematics Achievement - Does Gender Play a Role in it?

<https://doi.org/10.37626/GA9783959872188.0.058> First page:

316 Last page: 321 Abstract
This study compared the mechanism by which the teacher-student relationship (TSR) affects mathematics achievement in different gender groups through interest and self-efficacy in mathematics. The results suggest that (1) in both samples, TSR positively predicted interest and self-efficacy, interest positively predicted self-efficacy, and self-efficacy in turn positively predicted mathematics achievement; (2) Gender differences were also detected; The positive relationships of TSR to self-efficacy, and interest to self-efficacy, were stronger among the male than the female students. Overall, the findings confirm that TSR have an important influence on Chinese students' mathematics academic motivation and achievement and that gender differences affect the patterns of these relationships. Possible explanations for the results and practical implications are discussed. Key words: teacherstudent relationship,

interest, self-efficacy, mathematics achievement, crossgender comparison.
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Cheryl Ann Lubinski & Allison Kroesch Developing, Not Teaching, Problem-Solving Strategies
<https://doi.org/10.37626/GA9783959872188.0.059> First page: 322 Last page: 324 Abstract
Many teachers use explicit instruction to teach students how to solve a problem and then have their students practice a specific strategy. Research indicates this type of teaching does not necessarily improve problem solving skills. Students need to solve problems using their intuitive strategies which might include pictures and concrete materials. For a specific problem, we will share the strategies used by students in the United States, 17-year-old brothers and their family in Poland, and teachers of students ages 5-17 in Zimbabwe. Findings indicate that most people do not choose

a picture strategy but a trial-and-error strategy using symbols. Most are unsuccessful at solving the problem. We will share teaching strategies that encourage developing, not teaching, problem-solving strategies.

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Jürgen Maaß Professional Mathematical Modelling: What we can Learn about Teaching Real World Mathematics from the Real Application of Mathematics in our World? <https://doi.org/10.37626/GA9783959872188.0.060> First page: 325 Last page: 330 Abstract lessons, more motivation and a more sustainable learning success. Professional mathematical modelling is an important foundation for modern, technology-based societies. We are all significantly influenced by the results of mathematical modelling. The decisions for lock down, masks and travel restrictions in connection with Corona are a current example. This article drafts what we as

teachers & researchers can learn about successful mathematical modelling from professional working mathematicians who are using & applying mathematics in the natural sciences, technology development, medicine, economics, social and humanities research & practice, consultancy for politics, the financial world & other economic sectors). The background for this article is my research on mathematics as a technology, its acceptance as a concept and ways of technology transfer, as well as decades of experience with colleagues from industrial mathematics (<https://www.indmath.uni-linz.ac.at/>) and the RISC (<https://www.jku.at/institut fuer-symbolisches-rechnen-risc/anwendungen/risc-software-gmbh/>) who started their work here in Linz a long time ago. As a co-founder and co-organizer, I organized and enjoyed many lectures on mathematics and society, industrial mathematics, etc. at the Johannes Kepler

Symposium

(<https://www.numa.unilinz.ac.at/JKS/2020/>

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Jodelle S. W. Magner & Susan McMillen Making Word Problems Accessible to All: Innovating through Meaningful Models

<https://doi.org/10.37626/GA9783959872188.0.061> First page: 331 Last page: 332 Abstract Working with a large urban district over 14 years of Mathematics Science Partnership [MSP] grants, over 500 teachers of mathematics, special education teachers, mathematics coaches and administrators have come together to create engaging mathematics within grade 3 through 12 classrooms. Workshop participants will engage with an innovative use of a mathematical model and learn how it makes mathematics more accessible to students at all levels, especially to English Language Learners. Workshop participants will experience the

use of the model in a variety of problem-solving contexts.

Obstacles to teachers adopting these materials to use within their instruction and strategies used to overcome these challenges will be discussed.

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Rafael Alberto Méndez-Romero & María Angélica Suavita-Ramírez The mINNga Labs: an Initiative of the Universidad del Rosario to Strengthen STEM Skills, Social Sensitivity and Youth Empowerment in Colombia

<https://doi.org/10.37626/GA9783959872188.0.062> First page: 333 Last page: 337 Abstract The challenge of educating the generation of the digital age leads us to resort to pedagogical innovations that are sensitive, empathetic, analytical and multidisciplinary in nature. Additionally, these new student communities are characterized by appropriating causes, mobilize, manifest and are genuinely curious, which confronts us as educators with a greater and fascinating

challenge. On the other hand, the historical moment of Colombia forces us to seek the unity of the country and generate a sum of forces from the specific talents of the people in the regions, to solve, as a body, the emerging needs of the moment. In this article we show a technological pedagogical innovation designed at the Universidad del Rosario, which is based on strengthening STEM skills and youth empowerment through the use of our mINNga labs, a version of a living laboratory as a social an open innovation.

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Jennifer Missen A Process for Updating Mathematics Teaching for 21st Century Students
<https://doi.org/10.37626/GA9783959872188.0.063> First page: 338 Last page: 343 Abstract It is inevitable and necessary that the curriculum, pedagogy, and school and classroom structures for the teaching of Mathematics will continue to change over the next 30 years.

However, teachers are time poor, there are more and more who are teaching Mathematics when it is not their primary content area, and who may have knowledge of Mathematics but not the current pedagogical knowledge. Early career teachers need support in building a portfolio of tools and resources that work for them and their students. Experienced, traditional teachers are more comfortable with direct teaching and mastery practice and, understandably, are resistant to change. Inquiry based teaching and collaborative strategies, differentiated and tailored for the class and its individuals, combined with direct teaching and mastery practice, allow for greater equity and increased preparation of students for the ever-changing workforce. This two part workshop has participants work through the process of transitioning existing, traditional or textbook units of work to flexible, differentiated units with

enough detail and resources to support any teacher to walk into the classroom knowing that they will serve all the students well.

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Shelby Morge & Christopher Gordon Using Squeak Etoys to Model Mathematical Ideas <https://doi.org/10.37626/GA9783959872188.0.064> First page: 344 Last page: 349 Abstract Effective mathematics instruction involves students in making sense of mathematical ideas and reasoning mathematically (NCTM, 2014). Unfortunately for many US students in grades 6-8 (ages 10-14), mathematics is a repeat of topics learned in elementary school with an emphasis on computation. For this reason, students start to see mathematics as something that is hard to understand and not enjoyable. In this workshop, we share how a technology tool, Squeak Etoys, was used in a lesson to engage grade 6-8 students in discovering the relationship between the

number of sides and the angle measure in regular polygons.

We describe a lesson implementation and engage participants in the development of a Squeak Etoys computer model. In addition, conclusions related to mathematics instructional practices are shared. Key words: Squeak Etoys, modeling, problem solving, lesson, geometry, polygons

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Janina Morska New Methods and Forms of Work during Online Maths Lessons <https://doi.org/10.37626/GA9783959872188.0.065> First page: 350 Last page: 353 Abstract In more than 38 years as a mathematics teacher, I have always tried to look for interesting methods and new forms of work. I wondered how to explain the new material to students so that they would understand and be able to use the information in the future. The previous school year has been a huge challenge in the field of distance learning. From

October 2020 to May 2021, all teachers in Poland conducted Online lessons. As a result, we had to switch from traditional classroom teaching to online teaching. So I decided to look for appropriate tools and solutions of how to conduct such lessons. Keywords: online learning, distance learning, applications, computer programs, teaching materials, virtual notes, IT tools, online mathematics.

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Patricia S. Moyer-Packenham
Relationships among Semiotic
Representational
Transformations and Math
Outcomes in Digital Games
<https://doi.org/10.37626/GA9783959872188.0.066> First page:
354 Last page: 354

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Svenja Müller & Anna Fath-
Streb Risk Literacy in the
Context of Stochastics and
Mathematical Education
<https://doi.org/10.37626/GA9783959872188.0.067> First page:

355 Last page: 360 Abstract
The purpose of this risk literacy study was to explore the ways of integrating examples of global challenges into mathematics education. The examples follow an approach to introduce risk literacy in teacher education along with a curriculum analysis for secondary education in Germany to include risk literacy within the given requirements and constraints. Two main examples, microplastic pollution and extreme events due to climate change, are analysed in the interdisciplinary context of global challenges and their understanding of mathematical knowledge for teaching and learning stochastics.

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M.
Estela Navarro Robles
Elementary Teachers Reaching
a Quasi-complete Knowledge of
Rational Numbers through an
Online Course
<https://doi.org/10.37626/GA9783959872188.0.068> First page:

361 Last page: 366 Abstract
There is evidence that most of the Elementary Teachers in Mexico have various conceptual deficiencies in their knowledge about rational numbers; however, the deficiencies were not the same in all the cases. So, we decided to design a non-traditional-personalized online course, constructed as an adaptative system, in which it was identified if the participant covered each one of the different conceptual approaches in various contexts. When it was identified that a conceptual approach was not covered, interactive materials and videos were presented to them that allowed them to understand what they had not covered. The aim of the course is to enable teachers to reach a quasicomplete conceptualization, whose meaning for us it is to understand the topic from different conceptual approaches in a deep way. This paper presents the structure of one module of the course, one detailed example, and results

of the pilot test of this module.
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Benita P. Nel Noticing through Self-reflection by Mathematics Teachers using Video Stimulated Recall
<https://doi.org/10.37626/GA9783959872188.0.069> First page:
367 Last page: 372 Abstract
Continuous professional development should be navigated in a teacher's own context, addressing their particular needs where timeous feedback can be of great benefit. However, the major teachers' union in South Africa hindered government officials to enter the classroom, limiting support. Most professional development (PD) initiatives are thus off-site and not always customised to the needs of the individual teacher. In this study, the use of Video-stimulated recall (VSR) was used as a PD tool where self-reflection is foregrounded, reporting on one teacher. The research question was: What did the teachers notice and act upon when VSR was

incorporated as a PD amongst mathematics teachers?

Through Mason's discipline of noticing the teacher's noticing was investigated. Key Words: Video-stimulated recall, Mathematics education; continuous professional development; teacher noticing; in-house setting

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Zanele Ngcobo Evoking School Mathematical Knowledge among Preservice Secondary Mathematics Teachers through Error Analysis

<https://doi.org/10.37626/GA9783959872188.0.070> First page:

373 Last page: 373 Abstract

This article explores how attention to Specialised Content Knowledge (SCK) could evoke the development of school mathematics concepts among pre-service mathematics teachers (PSMTs). At the heart of the repeated debate about the delivery of professional mathematics teacher education curricula has been the reported lack of development of PSMTs

knowledge for teaching.

However, discussion of what mathematical knowledge for teaching is needed by PSMTs and how it should be developed had been uneven. In South Africa, attention to improving the status quo of learners' poor performances in mathematics has been directed toward improving in-service teachers' mathematical knowledge for teaching. However, research has shown that the problem does not only emerge when teachers become practitioners. The problem of low levels performance and of understanding of school mathematics by pre-service teachers has been identified by many studies but is often not addressed during teacher training. This article explores an under-examined strategy for addressing the repeated concerns about the quality of pre-service mathematics teachers' education. It examines how attention to specialised content knowledge (SCK) within a preservice teacher education curriculum could potentially influence

deeper quality mathematical knowledge to pre-service mathematics teachers' professionalism. This is a qualitative study conducted in 2018 and 2019. Data was generated from (n=61) PSMTs that were enrolled for Bachelor of Education majoring in mathematics. Data was conducted using written task, open ended questionnaires and focus group interviews. The findings from this small-scale study showed that error analysis has the potential to influence the development of SMK. Furthermore, findings suggest that attention to SCK has the potential to evoke school mathematics concepts and the evolution of subject matter knowledge. Based on the findings it is recommended that future research should be conducted to determine the veracity of these conclusions and their generalization to other mathematical topics. Considering the suggestions made by in literature that the description of knowledge is only valid at the time of the investigation, there is a need of

large scale to ascertain the effect of error analysis toward the development of PSMTs' SMK of other school mathematics topics. Keywords: Error analysis, Pre-service mathematics teachers, Specialised Content Knowledge.

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Jenna O'Dell & Todd Frauenholtz Recruiting Mathematics and Mathematics Education Majors to a University
<https://doi.org/10.37626/GA9783959872188.0.071> First page: 374 Last page: 377 Abstract
This paper will present strategies used to recruit students to a four-year university to complete a double major in mathematics and mathematics education, then enter the teaching field. The recruiters are two professors who work in both the Mathematics and Education departments at a university in the United States. The mathematics department has been especially supportive of

the initiative as it will double the number of mathematics majors in their programs for two years from four to nine students. The recruiting included contacting community colleges, professional organizations, word of mouth, the university marketing department, and visits to collegiate mathematics classrooms at the level of calculus and above. This project was supported by The National Science Foundation (NSF) as a Noyce project and will support students financially with full cost of attendance for the final two years of the four-year program.

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Elizabeth Oldham & Aibhín Bray Undergraduate Mathematics Students' Reflections on School Mathematics Curricula after a Major Curriculum Change in Ireland
<https://doi.org/10.37626/GA9783959872188.0.072> First page: 378 Last page: 383 Abstract
After decades in which the

Irish post-primary (grades 7-12) mathematics curriculum changed incrementally, a major innovation project was approved in 2008, and a "reform"-type curriculum was phased in over several years. The project was controversial, and some students developed negative attitudes to the change. This paper examines recent students' opinions: in particular, the opinions of mathematics undergraduates who had experienced the transition and who took a Mathematics Education module at one Irish university in 2019-20. They studied old and new curriculum documents and examination papers, and watched videos of reform-type lessons; their reflective comments were posted to a discussion board. Thematic analysis of posts from the 18 (out of 25) students who gave permission for use of their work in research indicates that, by then, these students supported many aspects of the reformed curriculum.

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Nick Vincent Otuma Mismatch
between Spoken Language and
Visual Representation of
Mathematical Concepts
<https://doi.org/10.37626/GA9783959872188.0.073> First page:
384 Last page: 388 Abstract
This paper examines secondary
students' mismatch in meaning
between spoken language and
visual representation of
mathematical concept of a
rightangled triangle. Forty-
eight students, age 16-17years
participated in the case study.
Students were asked to select
plane figures that matched the
descriptions given on each
questionnaire item. In group
interview, participants were
asked to give properties of
selected plane figures and
draw a diagram representing
the same plane figures. The
results of this research
suggested that many students
had similar imperfect
conception of a right-angled
triangle. Keywords:
Mathematical language,
conceptual understanding.
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Jenny Pange & Alina Degteva
Project-based Learning in
Statistics
<https://doi.org/10.37626/GA9783959872188.0.074> First page:
389 Last page: 394 Abstract
Online teaching process is
triggered by the Covid-19, and
project-based learning (PBL)
goes through a new stage of
development as it includes ICT
tools and up-to-date teaching
methods. We applied this
approach in an online
undergraduate course in
statistics. This paper describes
the process and evaluates the
outcome of PBL in teaching
statistics course to a group of
undergraduate students at the
University of Ioannina, Greece.
Students had to attend the
class and react to practical
exercises according to the
demands of the PBL. They were
asked to use questionnaires
and go through interviews to
evaluate the teacher-to-
student, student-to-student,
and student-to-content
interactions in PBL method.
Data obtained from online
questionnaire and were

generating a proper conception of what mathematics and doing mathematics really are, then enhancing affect.

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Maria Piccione & Francesca Ricci Activities and tools for Early Developing Symbol-sense <https://doi.org/10.37626/GA9783959872188.0.077> First page: 407 Last page: 412 Abstract This work deals with practical aspects of semiotic and relational approaches in teaching/learning. It is based on the Early Algebra principle by which mental models of algebraic thought can be constructed starting with Primary School, by teaching Arithmetic "algebraically". Here, the problem of the symbolic representation of mathematical objects is tackled. The aim is to allow students to clearly distinguish between the two worlds - the one of signs and the one of meanings - and to use signs of mathematical language with full awareness rather than just manipulating them. We present

activities and tools which take into consideration different semiotic fields (gestural, iconic, natural, ...) to achieve the mathematical field.

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Shelley B. Poole The "Yes, and..." Approach to Teaching Mathematical Modelling <https://doi.org/10.37626/GA9783959872188.0.078> First page: 413 Last page: 417 Abstract Mathematical modelling can be a particularly creative tool when students are asked to solve open-ended problems. As instructors, when implementing mathematical modelling in the classroom, we can build on the ideas of our students. Utilizing the concept of "yes, and..." from improvisational theatre, we can foster students' creativity and empower them to take ownership of the mathematics when solving open-ended problems. Using this approach allows us an opportunity to let go of the structure of old and embrace new approaches and ideas in the classroom.

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Jordan T. Register & Christian
H. Andersson Analysing PSTs
Ethical Reasoning in a Data
Driven World
[https://doi.org/10.37626/GA978
3959872188.0.079](https://doi.org/10.37626/GA9783959872188.0.079) First page:
418 Last page: 423 Abstract
The prevalence of Big Data
Analytics as a proxy for human
decision-making processes in
globalized society, has
catalyzed a call for the
modernization of the
mathematics curriculum to
promote data literacy and
ethical reasoning. To support
this initiative, ten preservice
mathematics teachers (PSTs) in
Sweden (SWE) and the United
States (US) were interviewed
to identify what ethical
considerations preservice
teachers (PSTs) make in their
mathematical analyses of data
science contexts. Preliminary
results indicate that teachers
make a myriad of ethical
considerations in their
mathematical work that are
tied to their critical
mathematics consciousness

(CMC), conceptions of data
literacy, and experiences. As a
result, it is imperative that
educators simultaneously
design educational curricula to
foster students' CMC and work
to transform teacher held
definitions of data literacy to
reflect changes brought on by
globalization.

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Sarah A. Roberts, Cameron
Dexter Torti & Julie A.
Bianchini A Mathematics
Specialist Supporting District
Shifts in Instruction for
Multilingual Learners through
Studio Days
[https://doi.org/10.37626/GA978
3959872188.0.080](https://doi.org/10.37626/GA9783959872188.0.080) First page:
424 Last page: 428 Abstract
Mathematics specialists fill a
gap in providing individualized
professional learning for
classroom teachers, including
furnishing much needed
professional learning related to
multilingual learners. This
qualitative study examines the
role a secondary district
mathematics specialist in the
United States played in

supporting shifts in instruction for multilingual learners through the enactment of studio days professional learning. Interviews across two years with a mathematics specialist were examined. Using a framework of multilingual learner principles and adaptive reasoning, we share instructional shifts around the adaptive reasoning categories of flexibility, understanding, and deliberate practice, as related to multilingual learners. We conclude with implications for both research and practice related to secondary mathematics specialists, multilingual mathematics instruction, and studio day professional learning.

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Keith Robins Applying Mathematical Thinking Principles to Real Life Situations to Create an Objective Thinking Strategy <https://doi.org/10.37626/GA9783959872188.0.081> First page: 429 Last page: 433 Abstract

Teaching set thinking can make a great difference in teaching and learning mathematics as it demonstrates its relevance to real life. The following examples include how socialising is a mathematical process and how one can create a mathematical model for any experience or system rather than creating perceptions.

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Christine Robinson & Karen Singer-Freeman Digital Enhancements for Common, Online Mathematics Courses <https://doi.org/10.37626/GA9783959872188.0.082> First page: 434 Last page: 438 Abstract The University of North Carolina System Office (UNC System) established the Digital Enhancement Project to rapidly develop high-quality, online course materials to support faculty and student success in online courses. Content was created for Calculus I, a course that is critical to student progress, is in high demand,

and has large enrollments. To evaluate the usefulness and impact of the materials, project evaluators developed assessment instruments that included a survey for students enrolled in classes being taught by early adopters. Overall, students rated the quality of classes using project materials to be high. However, underrepresented ethnic minority students were somewhat less positive than other students and all students were less positive about the alignment of course content with course assessments than they were about other aspects of the course design.

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Ann-Sofi Røj-Lindberg Trends in Mathematics Education in Finland
<https://doi.org/10.37626/GA9783959872188.0.083> First page: 439 Last page: 444 Abstract
Since PISA 2000 there has been a huge international interest towards education in Finland. Are there particular explanations to the PISA-

success, a philosophers' stone, to be found? Is it possible to export innovative components found in Finnish schools to other countries and what exactly are these components? Is it about accessibility? Can the successful components be noticed and described? And why has the Finnish PISA-results in mathematics dropped lately? Questions like these have been asked over the years. In the paper I discuss trends in the Finnish public schooling that I find to be of particular importance and highlight changes in the curriculum and trends in mathematics education generally. I connect my arguments to research findings as well as to anecdotal stories.

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Sheena Rughubar-Reddy & Emma Engers Video Tutorials and Quick Response Codes to Assist Mathematical Literacy Students in a Non-classroom Environment
<https://doi.org/10.37626/GA9783959872188.0.084> First page:

445 Last page: 450 Abstract
This paper discusses effectiveness of video tutorials, accessed via Quick Response codes, on Grade 10 mathematical literacy students' ability to complete their homework. To assist them outside of the classroom, an intervention involving video tutorials explaining specific sections of work and how to go about solving problems, was devised. Students could access the relevant tutorials on a mobile device via the scanning of barcodes provided on the worksheets. The effectiveness of the intervention was assessed both quantitatively and qualitatively, through analysis of the participating students' homework submissions and interviews with the students after the intervention had ended. Feedback from students via focus group interviews and questionnaires revealed that they found the tutorials helpful. This would indicate that the intervention was potentially beneficial. Keywords: Quick Response codes, video

tutorials, homework.
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Sheryl J. Rushton, Melina Alexander & Shirley Dawson
Mathematics to Teacher Education Persistence
<https://doi.org/10.37626/GA9783959872188.0.085> First page: 451 Last page: 456 Abstract In 2017, a university in Northern Utah's Teacher Education and Mathematics Departments moved from a two-course mathematics requirement to incorporate a three-course mathematics requirement for Elementary and Special Education Teacher Education majors to satisfy university and Utah State Board of Education Quantitative Literacy graduation requirements. The proposed research seeks to determine how persistence rates differ from the original two-course math series to the new three-course destination series.
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Robyn Ruttenberg-Rozen In-

the-Moment Narratives:
 Interventions with Learners
 Experiencing Mathematics
 Difficulties
<https://doi.org/10.37626/GA9783959872188.0.086> First page:
 457 Last page: 462 Abstract
 Despite a significant amount of planning, so much of what occurs in mathematics teaching and learning intervention interactions, for both teacher and learner, are based on fleeting in-the-moment decisions and responses. At the root of these in-the-moment interactions are narratives that position the learner, teacher, and mathematics. In this paper I explore the interplay between in-the-moment decisions and responses, narratives, and positioning within a mathematical intervention for a learner experiencing mathematics difficulties. I use data from a mathematics intervention study of learners experiencing mathematics difficulties to show that interventions in mathematics can be a reciprocal and partnered activity. Importantly,

since these narratives emerge in the reciprocal space of an intervention, narratives also evolve through the interaction.
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 Tanishq Kumar Sah Extension of Theories
<https://doi.org/10.37626/GA9783959872188.0.087> First page:
 463 Last page: 465 Abstract
 From an atom to this universe, from a bowl of water to the cosmic ocean this constant is present everywhere. This constant is π (periodicity of the tangent function). For tangent function we know that $\tan(\tan^{-1}(x))=x$, but the expression $\tan(n \tan^{-1}(x))$ looks very complicated but is actually an expression of the type polynomial divided by another polynomial. The sine function is very important not only for graphs but for geometry too. There are some inputs whose behavior is very strange from the usual ones. Geometrical shapes and their relations are very important for many thing such as for vectors and many more but the triangle is very

special because it is the least sided polygon. Riemann zeta function is very crucial for prime numbers. Infinite series related to them may be a game changer for it. Wallis's integral formula is a boon but its domain is very constrained and needs another solution to it.

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Ishola A. Salami & Temitope O. Ajani Mathematics Songs to Hip-hop Music: Power to Engage Pupils and Improve Learning Outcomes in Primary Mathematics

<https://doi.org/10.37626/GA9783959872188.0.088> First page: 466 Last page: 471 Abstract Song-based strategy has been one of the most effective approaches of making learners remembering rule-governed educational contents like that of Mathematics. But the extent to which learners enjoy Mathematics songs and get engaged in it within and outside the school system is limited. Besides, many of the available Mathematics songs are for preschool while

research studies have shown that learners' scores in Mathematics started to decline from Primary IV class. One of the music types children love most is hip-hop and they easily memorize the lyrics. This led to the production of Mathematics hip-hop music with its lyrics being Mathematics principles, ideas, formulae and procedures for upper primary classes. This study determines the effectiveness of Mathematics Hip-hop music on improved Mathematics learning outcomes. Keywords: Hip-hop music, MATMUSIC, Upper primary Mathematics.

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R Santhanam Teaching Mathematics using Storytelling and Technology

<https://doi.org/10.37626/GA9783959872188.0.089> First page: 472 Last page: 475 Abstract Storytelling coupled with technology is an attractive method to teach geometry. The following story was told to a set of students of the age group 14 - 16 years, who are familiar

with the GeoGebra software. A pirate hid his treasures in an island and left a note for the treasure hunt to his son. The instructions are as follows. "Find two palm trees in the island with markings of a heart (♥) on them. There will be a very small pond near them. From the pond go to one palm tree and turn 90 degrees and proceed equal distance to mark a point P on the ground. Do the same for the second palm tree to get another point Q. The treasure is hidden at the midpoint of PQ". When his son went there, he could find the two palm trees but there was no pond nearby. But with his geometric knowledge, he could find the treasure. How? The students tried and some found the solution. In this short paper, this is discussed.

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Ipek Saralar-Aras & Betul Esen
Designing Lessons for the 5th
Graders through a Design
Study on Teaching Polygons
<https://doi.org/10.37626/GA9783959872188.0.090> First page:

476 Last page: 481 Abstract It has been argued by researchers that learning about polygons is important. Student performance on polygons, particularly at the middle school level, was found to be lower than expected. Thus, this paper presents brief summaries of RETA-based lesson plans on polygons. The RETA is a maths model, which supports realistic, exploratory, technology-enhanced and active lessons. The participants of the study were 60 middle school students. Data was collected through lesson recordings of 5 lessons, pre-tests and post-tests to measure students' performance on polygons, lesson evaluation forms and interviews. The findings show that students found the RETA-based lessons engaging but some of the parts were difficult for them. The lesson plans presented in this paper were the 2nd version of the plans, amended after the 1st cycle of designbased research. It is hoped that the lesson plans set an example for teachers and teacher

candidates.

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Stephanie Sheehan-Braine & Irina Lyublinskaya A Framework for Online Problem-Based Learning for Mathematics Educators <https://doi.org/10.37626/GA9783959872188.0.091> First page: 482 Last page: 487 Abstract Research shows that problem-based learning (PBL) has the capacity to make mathematics culturally relevant, so there is a need to adapt this successful learning model to virtual environments. This study proposes the Framework for Online Problem-Based Learning for Educators (OnPBL-E) to add this challenge. The content components of the OnPBL-E framework were developed by unpacking PBL instructional principles and identifying interactions between the essential elements of PBL: the context, the educator, and the learner. Then, the Multimodal Model for Online Education was used to identify online

modules for these interactions. This study also describes an example of implementing PBL in an online mathematics modeling course.

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M. Vali Siadat Keystone Model of Teaching and Learning in Mathematics <https://doi.org/10.37626/GA9783959872188.0.092> First page: 488 Last page: 493

Introduction Keystone model presents a holistic approach to math education at the college. It is a dynamic system of frequently assessing student learning and adjusting teaching practices. Its philosophy is based on the belief that all students can learn mathematics provided they are engaged in the learning process. Keystone views classroom as a learning community where through peer-to peer interaction and cooperation, all students achieve. Contrary to other programs that put the students in competition with one another, essentially pitting

them against each other for grades, our program challenges students to cooperate so that all attain the standards of excellence.

Keystone is an alternative model to traditional educational practices and its basic principles should be applicable to all disciplines.

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Parmjit Singh, Nurul Akma Md Nasir & Teoh Sian Hoon The Dearth of Development in Mathematical Thinking Among High School Leavers

<https://doi.org/10.37626/GA9783959872188.0.093> First page:

494 Last page: 499 Abstract The prime rationale of the high school math curriculum is to develop the intellectual mind of learners who can think and apply learnt content into solving problems of different areas of learning. Thus, to assess this context, a mixedmethod approach was undertaken to assess the levels of the 640 High school leavers' mathematical thinking acumen in the context of their

preparation in facing the challenges of tertiary level. The findings depict low-level mathematical thinking attainment regarding their dearth in critical thinking and creative thinking to solve higher-order thinking tasks.

They lack a heuristics repertoire to use their contextual knowledge in solving fundamental nonroutine problems. This then begs the question: how are these students to face the upcoming hurdles and challenges bound to be thrown their way at the tertiary level?

Keywords: Mathematical thinking, problem solving, non-routine, heuristics

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Praneetha Singh Mathovation-Creativity and Innovation in the Mathematics Classroom

<https://doi.org/10.37626/GA9783959872188.0.094> First page:

500 Last page: 505 Abstract The 21st century is predicted as the century of rapid development in all aspects of life. People are creative, but

the degree of creativity is different (Solso, 1995). The perspective of mathematical creative thinking expressed by experts such as Gotoh (2004) and Krulik and Rudnick (1999) refer to a combination of logical and divergent thinking, which is based on intuition but has a conscious aim and process. This thinking is based on flexibility, fluency and the uniqueness of mathematical problem solving. This paper will aim to assist the readers to find out the competencies that are required to assess the creative thinking ability and characteristic of mathematical problems that can be used in creative thinking.

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Charles Raymond Smith & Cyril Julie Towards Understanding Integrating Digital Technologies in the Mathematics Classroom <https://doi.org/10.37626/GA9783959872188.0.095> First page: 506 Last page: 511 Abstract In the context of ICT integration, a presentation by a teacher

during a continuing professional development session is analyzed from the instrumental orchestration as well as the Technological Pedagogical (And) Content Knowledge (TPACK) perspective. The results indicate that some of the components of instrumental orchestration were used by the teacher during the presentation. In realising these orchestrations, the teacher had to delve into the different knowledge components that constitute TPACK. It is concluded that CPD providers need to take such complexities into account when delivering training programs. Keywords: GeoGebra, ICT integration, instrumental orchestration, TPACK, mathematics teacher practices

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Panagiotis Stefanides “Generator Polyhedron”, Icosahedron Non-Regular, Discovered Invention <https://doi.org/10.37626/GA9783959872188.0.096> First page:

512 Last page: 517 Abstract
 The Invented [2017]
 Polyhedron, is a Non-Regular Icosahedron, it has 12 Isosceles triangles and 8 Equilateral ones. Its Skeleton Structure consists of 3 Parallelogramme Planes Orthogonal to each other, with sides' ratios based on the Square Root of the Golden Number [ratios of $4/\pi$ specially for $\pi = 4/T = 3.14460551\dots$, where T is the Square Root of the Golden Number ($\sqrt{\Phi}$) equal to 1.27201965..] and related directly to the Icosahedron, whose structure is based on the Golden Number and to the Dodecahedron, whose structure is based on the Square of the Golden Number. Its geometry relates to Plato's Timaeus "Most Beautiful Triangle", a proposed theorization by the author ["contra" the standard usual International interpretations], presented to various national and international conferences [the Magirus/ Kepler one is a constituent part of this triangle, similar to it, but not the same with it].

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 Michelle Stephan & David Pugalee
 The Future of Mathematics Education in the Digital Age
<https://doi.org/10.37626/GA9783959872188.0.097> First page:
 518 Last page: 521 Abstract
 How do the mathematics content and processes taught in school today need to change in order to prepare students for participation in the digital and information age? We propose to stimulate a discussion about what mathematics education should aim for in preparing students for employment and local/global citizenship in this ever-changing technological world. Our group will develop a forward-minded agenda on implementation of mathematics content and practices. This will include detailing 1) what content/practices should be kept, changed or deleted from the curriculum, 2) potential impediments to teachers implementing them and possible strategies to address these, and 3) necessary

research projects to study implementations in order to make ongoing recommendations. We will aim to start with middle school (ages 12-15) with a vision to continue this working group through multiple conferences.

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Yelena Stukalin & Sigal Levy
Introducing Probability Theory to Ultra-Orthodox Jewish Students by Examples from the Bible and Ancient Scripts
<https://doi.org/10.37626/GA9783959872188.0.098> First page: 522 Last page: 525 Abstract
Cultural diversity in the classroom may motivate teachers to seek examples that reflect their students' cultural backgrounds, thus making the course material more appealing and understandable. In this context, the Holy Bible is a source of many stories and anecdotes that may be included in teaching probability theory to even ultra-Orthodox Jews. This paper aims to demonstrate the use of stories from the Bible to introduce some

concepts in probability. We believe that this approach will make learning probability and statistics more understandable to the Ultra-Orthodox students and increase their motivation to engage in their studies.

Keywords: cultural diversity, biblical examples, non-statisticians

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Emily K. Suh, Lisa Hoffman & Alan Zollman STEM SMART: Five Essential Life Skills Students Need for their Future
<https://doi.org/10.37626/GA9783959872188.0.099> First page: 526 Last page: 530 Abstract
To be successful in a future STEM-focused world, students need to know more than content: students need to be STEM SMART. A STEM SMART student has the mindset of an intellectual risk taker, the tenacity to tackle tough problems while learning from mistakes, and the critical thinking skills to separate scientific information from opinions and beliefs. We use the SMART acronym (Struggle,

Mistakes, All, Risk, Think) to introduce five essential life skills not obviously related to STEM (Science, Technology, Engineering, and Mathematics) disciplines but necessary for success in STEM. For each of our five essential skills, we provide an explanation of its importance, connections to relevant educational research, and real-world applications.

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Janet (Hagemeyer) Tassell, Jessica Hussung, Kylie Bray, Darby Tassell & Haley (Clayton) Carbone Elementary Pre-Service Teachers' Beliefs about Mathematics Fluency: Transforming Through Readings & Discussions <https://doi.org/10.37626/GA9783959872188.0.100> First page: 531 Last page: 536 Abstract Teacher candidates continue to enter Elementary Math Methods with the belief that mathematics fluency is synonymous to speed and rote memorization -assessed best by timed tests. In the Elementary Math Methods

2018-2021 school years, fall and spring semesters, qualitative data were gathered from pre-service elementary mathematics teachers' pre/post-assessments of reading mathematics fluency journal articles, viewing video samples, and participating in full-class discussions. The pre-to post-assessment themes show that reading research articles may be a possible intervention to add to their clinical school observations in the K-6 setting.

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Eleni Tsami, Dimitra Kouloumpou & Andreas Rokopanos The Gender Gap in Statistics Courses: A Contemporary View on a Statistics Department <https://doi.org/10.37626/GA9783959872188.0.101> First page: 537 Last page: 541 Abstract Gender equality remains a strategic objective of the EU educational system. The present paper provides a contemporary view of the gender balance in the

Department of Statistics and Insurance Science at the University of Piraeus. Our results indicate that a gender gap is prevalent in this specific department, although this gap is only marginal in terms of the statistics on students. On the other hand, statistics for the academic staff reveal that the department is clearly male dominated, thus stirring the discussion of gender preferences and systemic gender bias. Our findings support the notion that the institutional change currently taking place across departments and academic communities worldwide is yet to come to fruition and considerable effort is needed in order to bridge the gender gap in science, technology, engineering and mathematics (STEM) courses.

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Ching-Yu Tseng, Paul Foster, Jake Klinkert, Elizabeth Adams, Corey Clark, Eric C. Larson & Leanne Ketterlin-Geller Using Cognitive Walkthroughs to

Evaluate the Students' Computational Thinking during Gameplay
<https://doi.org/10.37626/GA9783959872188.0.102> First page: 542 Last page: 547 Abstract In this paper, we describe how a team of multidisciplinary researchers, including game designers, computer scientists, and learning scientists, created a learning environment focused on computational thinking using a commercial video game Minecraft. The learning environment includes a Minecraft mod, a custom companion application, and a learning management system integration. The team designed the learning environment for students in Grades 6-8. Working with a group of educators, the researchers identified eleven high-priority Computer Science Teacher Association (CSTA) standards to guide game development. The team decomposed the standards into essential knowledge, skills, and abilities. In this study, we describe how we used a cognitive walkthrough with a middle

school student to investigate:
(a) the ways in which the game supports student learning (b) the barriers to learning, and (c) the necessary changes to facilitate learning.

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Ariana-Stanca Vacaretu
GROWE in Math
<https://doi.org/10.37626/GA9783959872188.0.103> First page: 548 Last page: 553 Abstract
Getting Readers on the Wavelength of Emotions (GROWE) is an Erasmus+ project initiated with the aim to develop all (including math) teachers' competences to address students' literacy and emotional learning needs. The GROWE classroom approach includes meaningful reading and writing learning activities and develops mastery of such strategies using diverse authentic texts (i.e. not `clean` textbook texts), while learning the discipline. Simultaneously, the students enhance their social-emotional skills by learning to recognise and manage their emotions,

establish positive relationships, and make responsible decisions. This paper presents my experience in implementing the GROWE approach in my maths lessons with high-school students: the authentic texts I used and related tasks, and some implementation results.

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Shin Watanabe & Takako Aoki
In School and Out School
<https://doi.org/10.37626/GA9783959872188.0.104> First page: 554 Last page: 559 Abstract
Currently, learning in developed countries is centred on school education. It is not only Japanese teachers who regret that few students enjoy learning mathematics under the current school system. And in the age of 100 years of life, everyone should continue to study academics even after graduating from school. Unfortunately, learning mathematics is difficult after graduating from school. It is clear that lifelong learning has now become an important learning venue for all. I

decided to call this school education “In School”, and to be released from the school system and call learning “Out School”. I will describe the richness of the future of “Out School”, which is a place for learning in the future. Out School is an important mathematical education that is an extension of In School. Key words: In School, Out School, Creativity, Mathematical Learning

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Laura Watkins, Patrick Kimani, April Ström, Bismark Akoto, Dexter Lim Representational Competence with Linear Functions: A Glimpse into the Community College Algebra Classroom

<https://doi.org/10.37626/GA9783959872188.0.105> First page: 560 Last page: 565 Abstract Teaching and learning strategies that encourage students to develop the ability to use mathematical representations in meaningful ways are powerful tools for building algebraic

understandings of mathematics and solving problems (American Mathematical Association of Two-Year Colleges [AMATYC], 2018). The study of functions in algebra courses taught at community colleges in the United States provides students the opportunity and space to make connections between important characteristics of various families of functions. Using examples of teaching and learning linear functions from intermediate and college algebra courses in community colleges, we explore the ways instructors and students use a variety of representations (visual, symbolic, numeric, contextual, verbal, and/or physical) in teaching and learning linear functions, while connecting between and within these representations.

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Ian Willson Formative Assessment Activities for Introductory Calculus <https://doi.org/10.37626/GA9783959872188.0.106> First page:

566 Last page: 568 Abstract A hands-on workshop in which participants engage as beginning learners in an extensive range of stand-alone tasks, and in which some of the tenets and guiding principles of formative assessment are used to highlight what many consider to be the best kind of teaching practice—and that which is critically important if we are to improve the quality of instruction for all. The idea is that clear articulation of just what is meant by formative assessment is provided in the actual context of ready-to-use classroom tasks.

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Kay A. Wohlhuter & Mary B. Swarthout Number Talks: Working to Deepen and Grow Number Sense Knowledge <https://doi.org/10.37626/GA9783959872188.0.107> First page: 569 Last page: 573 Abstract Deep, flexible number understandings are foundational for mathematics learning. This workshop is based on two mathematics

teacher educators' journey to better understand how to facilitate future teachers' development and use of number sense. Engaging preservice teachers in Number Talks enabled the educators to identify and to examine the strategies preservice teachers used during number talks while also providing a context for improving and expanding their own professional knowledge about number sense.

Participant engagement includes experiencing Number Talks, examining preservice teachers' work samples, and responding to the educators' observations about number sense language (decomposition of numbers, fluency and flexibility with numbers, and mathematical properties).

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Ryan G. Zonnefeld & Valorie L. Zonnefeld Rural STEM Teachers: An Oasis in the Desert <https://doi.org/10.37626/GA9783959872188.0.108> First page: 574 Last page: 579 Abstract

Teacher preparation programs for STEM education should prepare teachers for all settings, including rural schools. Students across geographic locales show equal interest in STEM fields, but rural students often lack access to highly qualified STEM teachers. UNESCO (2014) notes that the disparity in education between rural and urban schools is a concern of many countries. In the United States, the National Center for Educational Statistics confirms that twenty percent of students are educated in rural schools and the STEM teachers in these schools are often the only STEM expert. These teachers become backbone teachers that set the foundation and direction of STEM education in the entire school. This paper reviews the landscape of STEM education in rural schools, explores strategies for ensuring high-quality STEM education in rural schools, and outlines early successes of a university teacher preparation program in meeting these needs.

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Valorie L. Zonnefeld
Pedagogies that Foster a Growth Mindset Towards Mathematics
<https://doi.org/10.37626/GA9783959872188.0.109> First page: 580 Last page: 584 Abstract
Research demonstrates that a student's mindset plays an important role in achievement and that mindsets are domain specific. Carol Dweck claimed that mathematics needs a mindset makeover and has shown that teachers can foster a growth mindset through their pedagogical choices. This paper shares how one university trains preservice teachers in mathematics pedagogies that are key to fostering a growth mindset. These practices include educating students on brain function, equitable access, metacognition strategies, feedback practices, the importance of productive struggle, and learning from mistakes.

1973 National Science

Foundation Authorization, Hearings Before...and the Subcommittee on Sciences, Research, and Development..., 92-2, on H.R. 12753 (superseded by H.R. 14108), February 9, 22, 23, 24, 29; March 1, 2, 7, 8, 1972 - United States. Congress. House. Science and Astronautics 1972

Helping Children Learn Mathematics, 3rd Australian Edition - Robert Reys

2020-01-21

The third edition of Reys' Helping Children Learn Mathematics is a practical resource for undergraduate students of primary school teaching. Rich in ideas, tools and stimulation for lessons during teaching rounds or in the classroom, this edition continues to provide a clear understanding of how to navigate the Australian Curriculum, with detailed coverage on how to effectively use Information and Communications Technology (ICT) in the classroom. This is a full colour printed textbook with an interactive eBook code

included. Great self-study features include: auto-graded in-situ knowledge check questions, video of teachers demonstrating how different maths topics can be taught in the classroom and animated, branched chain scenarios are in the e-text.

Learning and Teaching

Early Math - Douglas H.

Clements 2020-12-30

The third edition of this significant and groundbreaking book summarizes current research into how young children learn mathematics and how best to develop foundational knowledge to realize more effective teaching. Using straightforward, practical language, early math experts Douglas Clements and Julie Sarama show how learning trajectories help teachers understand children's level of mathematical understanding and lead to better teaching. By focusing on the inherent delight and curiosity behind young children's mathematical reasoning, learning trajectories ultimately make teaching more

joyous: helping teachers understand the varying levels of knowledge exhibited by individual students, it allows them to better meet the learning needs of all children. This thoroughly revised and contemporary third edition of Learning and Teaching Early Math remains the definitive, research-based resource to help teachers understand the learning trajectories of early mathematics and become confident, credible professionals. The new edition draws on numerous new research studies, offers expanded international examples, and includes updated illustrations throughout. This new edition is closely linked with Learning and Teaching with Learning Trajectories-[LT]2—an open-access, web-based tool for early childhood educators to learn about how children think and learn about mathematics. Head to LearningTrajectories.org for ongoing updates, interactive games, and practical tools that support classroom learning.

The Philosophy of Mathematics Education -

Paul Ernest 2002-11-01

Although many agree that all teaching rests on a theory of knowledge, there has been no in-depth exploration of the implications of the philosophy of mathematics for education. This is Paul Ernest's aim. Building on the work of Lakatos and Wittgenstein it challenges the prevalent notion that mathematical knowledge is certain, absolute and neutral, and offers instead an account of mathematics as a social construction. This has profound educational implications for social issues, including gender, race and multiculturalism; for pedagogy, including investigations and problem solving; and challenges hierarchical views of mathematics, learning and ability. Beyond this, the book offers a well-grounded model of five educational ideologies, each with its own epistemology, values, aims and social group of adherents. An analysis of the impact of these groups on the National

Curriculum results in a powerful critique, revealing the questionable assumptions, values and interests upon which it rests. The book finishes on an optimistic note, arguing that pedagogy, left unspecified by the National Curriculum, is the way to achieve the radical aims of educating confident problem posers and solvers who are able to critically evaluate the social uses of mathematics.

1972 National Science Foundation Authorization - United States. Congress. House. Committee on Science and Astronautics. Subcommittee on Science, Research, and Development 1971

Learning and Understanding - National Research Council 2002-08-06

This book takes a fresh look at programs for advanced studies for high school students in the United States, with a particular focus on the Advanced Placement and the International Baccalaureate programs, and asks how

advanced studies can be significantly improved in general. It also examines two of the core issues surrounding these programs: they can have a profound impact on other components of the education system and participation in the programs has become key to admission at selective institutions of higher education. By looking at what could enhance the quality of high school advanced study programs as well as what precedes and comes after these programs, this report provides teachers, parents, curriculum developers, administrators, college science and mathematics faculty, and the educational research community with a detailed assessment that can be used to guide change within advanced study programs.

Algebra 2 - 2001-09-14

Second Handbook of Research on Mathematics Teaching and Learning -

Frank K. Lester 2007-02-01

The audience remains much the same as for the 1992

Handbook, namely, mathematics education researchers and other scholars conducting work in mathematics education. This group includes college and university faculty, graduate students, investigators in research and development centers, and staff members at federal, state, and local agencies that conduct and use research within the discipline of mathematics. The intent of the authors of this volume is to provide useful perspectives as well as pertinent information for conducting investigations that are informed by previous work. The Handbook should also be a useful textbook for graduate research seminars. In addition to the audience mentioned above, the present Handbook contains chapters that should be relevant to four other groups: teacher educators, curriculum developers, state and national policy makers, and test developers and others involved with assessment. Taken as a whole, the chapters reflects the mathematics education

research community's willingness to accept the challenge of helping the public understand what mathematics education research is all about and what the relevance of their research findings might be for those outside their immediate community.

Transforming the Workforce for Children Birth Through Age 8 - National Research Council 2015-07-23

Children are already learning at birth, and they develop and learn at a rapid pace in their early years. This provides a critical foundation for lifelong progress, and the adults who provide for the care and the education of young children bear a great responsibility for their health, development, and learning. Despite the fact that they share the same objective - to nurture young children and secure their future success - the various practitioners who contribute to the care and the education of children from birth through age 8 are not acknowledged as a workforce unified by the common knowledge and competencies

needed to do their jobs well. Transforming the Workforce for Children Birth Through Age 8 explores the science of child development, particularly looking at implications for the professionals who work with children. This report examines the current capacities and practices of the workforce, the settings in which they work, the policies and infrastructure that set qualifications and provide professional learning, and the government agencies and other funders who support and oversee these systems. This book then makes recommendations to improve the quality of professional practice and the practice environment for care and education professionals. These detailed recommendations create a blueprint for action that builds on a unifying foundation of child development and early learning, shared knowledge and competencies for care and education professionals, and principles for effective professional learning. Young children thrive and learn best

when they have secure, positive relationships with adults who are knowledgeable about how to support their development and learning and are responsive to their individual progress.

Transforming the Workforce for Children Birth Through Age 8 offers guidance on system changes to improve the quality of professional practice, specific actions to improve professional learning systems and workforce development, and research to continue to build the knowledge base in ways that will directly advance and inform future actions. The recommendations of this book provide an opportunity to improve the quality of the care and the education that children receive, and ultimately improve outcomes for children.

Research in Education - 1974

Principles and Standards for School Mathematics - 2000

This easy-to-read summary is an excellent tool for introducing others to the messages contained in Principles and Standards.

Understanding and Teaching Primary Mathematics - Tony Cotton
2016-05-26

Written by an education consultant with widespread experience of teaching mathematics in the UK and internationally, *Understanding and Teaching Primary Mathematics* seamlessly combines pedagogy and subject knowledge to build confidence and equip you with all the skills and know-how you need to successfully teach mathematics to children of any age. This 3rd edition has been fully updated to reflect the latest research developments and initiatives in the field, as well as key changes to both the UK National Curriculum and International Baccalaureate, including a brand new chapter on 'Algebra' and a reworked focus on the early years. Extra features also include helpful call-outs to the book's revised and updated companion website, which offers a shared site with a range of resources relevant to both this book and its new companion volume,

Teaching for Mathematical Understanding. Stimulating, accessible and well-illustrated, with comprehensive coverage of subject knowledge and pedagogy, *Understanding and Teaching Primary Mathematics* is an essential purchase for trainee and practising teachers alike. Companion website features new to this edition include: video clips in which the author demonstrates the concepts covered in the book through teaching to a real class PowerPoint presentations which provide support for those using the book as a part of a teacher training course updated weblinks to external sites with useful teaching information and resources

How to Teach Maths - Steve Chinn 2020-11-23

How to Teach Maths challenges everything you thought you knew about how maths is taught in classrooms. Award-winning author Steve Chinn casts a critical eye over many of the long-established methods and beliefs of maths teaching. Drawing from decades of classroom

experience and research, he shows how mathematics teaching across the whole ability range can be radically improved by learning from the successful methods and principles used for the bottom quartile of achievers: the outliers. Chinn guides readers through re-adjusting the presentation of maths to learners, considering learners' needs first, and explains the importance of securing early learning to create a conceptual foundation for later success. This highly accessible book uses clear diagrams and examples to support maths teachers through many critical issues, including the following: The context of maths education today Topics that cause students the most difficulty Effective communication in the mathematics classroom Addressing maths anxiety The perfect resource for maths teachers at all levels, this book is especially useful for those wanting to teach the foundations of mathematics in a developmental way to learners of all ages and

abilities. It has the potential to change the way maths is taught forever.

Teaching Mathematics 3-5: Developing Learning In The Foundation Stage - Gifford, Sue 2005-08-01

The book places particular emphasis on adult-initiated, number-focused activities and playful, challenging and sensitive teaching strategies to engage younger children. The strategies are based on research and work with practitioners, and are illustrated by children's own responses, such as making number jokes. It covers key areas of mathematics, including number, shape and space, measures and problem solving, with appropriate expectations and common difficulties as well as suggested activities.

South African Schooling: The Enigma of Inequality - Nic Spaull 2019-11-05

This volume brings together many of South Africa's leading scholars of education and covers the full range of South African schooling: from

financing and policy reform to in-depth discussions of literacy, numeracy, teacher development and curriculum change. The book moves beyond a historical analysis and provides an inside view of the questions South African scholars are now grappling with: Are there different and preferential equilibria we have not yet thought of or explored, and if so what are they? In practical terms, how does one get to a more equitable distribution of teachers, resources and learning outcomes? While decidedly local, these questions resonate throughout the developing world. South Africa today is the most unequal country in the world. The richest 10% of South Africans lay claim to 65% of national income and 90% of national wealth. This is the largest 90-10 gap in the world, and one that is reflected in the schooling system. Two decades after apartheid it is still the case that the life chances of most South African children are determined not by their ability or the result of

hard-work and determination, but instead by the colour of their skin, the province of their birth, and the wealth of their parents. Looking back on almost three decades of democracy in South Africa, it is this stubbornness of inequality and its patterns of persistence that demands explanation, justification and analysis. "This is a landmark book on basic education in South Africa, an essential volume for those interested in learning outcomes and their inequality in South Africa. The various chapters present conceptually and empirically sophisticated analyses of learning outcomes across divisions of race, class, and place. The book brings together the wealth of decades of research output from top quality researchers to explore what has improved, what has not, and why." Prof Lant Pritchett, Harvard University "There is much wisdom in this collection from many of the best education analysts in South Africa. No surprise that they conclude that without a large and sustained expansion

in well-trained teachers, early childhood education, and adequate school resources, South Africa will continue to sacrifice its people's future to maintaining the privileges of the few." Prof Martin Carnoy, Stanford University

"Altogether, one can derive from this very valuable volume, if not an exact blueprint for the future, then certainly at least a crucial and evidence-based itinerary for the next few steps." Dr Luis Crouch, RTI

Advances in Education Research - 1999

Learning to Teach Mathematics in the

Secondary School - Sue

Johnston-Wilder 2010-09-13

What is the role of mathematics in the secondary classroom? What is expected of a would-be maths teacher? How is mathematics best taught and learnt? Learning to Teach Mathematics in the Secondary School combines theory and practice to present a broad introduction to the opportunities and challenges of teaching mathematics in the

modern secondary school classroom. Written specifically with the new and student teacher in mind, the book covers a wide range of issues related to the teaching of mathematics, including: The role of ICT Assessment for Learning NEW Using mathematics in context NEW Communicating mathematically Planning mathematics lessons Including special-needs pupils Teaching mathematics post-16 Professional Development Already a major text for many university teaching courses, this fully revised third edition takes into account new developments in the National Curriculum as well as recent changes to the standards for Qualified Teacher Status. Featuring two brand new chapters, a glossary of useful terms, addresses for resources and organisations, and tasks designed to prompt critical reflection and support thinking and writing at Masters level, this book will help you make the most of school experience, during your training and beyond. Designed for use as a

core textbook, this new edition of Learning to Teach Mathematics in the Secondary School provides essential guidance and advice for all trainee and practising teachers of secondary mathematics.

Educational Foundations - Leslie Kaplan 2014-02-28

EDUCATIONAL

FOUNDATIONS, Second

Edition, explains today's schools for those who are trying to picture themselves within the education

profession. The book makes educational foundations topics relevant and personally meaningful to both young learners and mature adult learners-while also offering the comprehensive scope, scholarly depth, and conceptual analysis of contemporary issues that will help readers understand the field and transition smoothly into their career. This new edition includes a greater emphasis on InTASC and Common Core State Standards, and incorporates a number of new features that enable readers to gain a realistic and insightful perspective of the

education profession.

Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

1973 National Science Foundation Authorization -

United States. Congress.

House. Committee on Science and Astronautics.

Subcommittee on Science, Research, and Development
1972

Mathematics Framework for California Public Schools, Kindergarten Through Grade Twelve - 1985

Supervision for Learning -

James M. Aseltine 2006

Traditional methods of supervision and evaluation focus on teachers' inputs: their lesson plans, instruction, and classroom management practices. But what matters most is the outcome they achieve: learning. This book introduces Performance-Based Supervision and Evaluation (PBSE), a data-driven and teacher-directed approach

proven to build educators' analytical and instructional capacity to address the learning needs of their students. It's a move away from disconnected annual goals and outside-in improvement initiatives, and toward the full integration of teacher evaluation, strategic professional development, and school improvement planning. Supervision for Learning is an important resource for school leaders looking to * Honor the judgment of teachers while targeting student performance in areas of essential knowledge and skills articulated in standards; * Empower all teachers to use performance data as the basis for instructional decisions and monitor the effectiveness of these decisions through action research; * Develop meaningful collaborative relationships with and among teachers; and * Acquire authentic evidence of teacher and student growth. Authors James M. Aseltine, Judith O. Faryniarz, and Anthony J. Rigazio-DiGilio explain the best-practice

foundations of their approach and provide guidelines for its implementation. Sample artifacts and illustrative vignettes bring the PBSE process to life, clarifying the supervisor's role, the teachers' responsibilities, and the students' gains. You'll also find a planning and monitoring tool that maps milestones within the development and evaluation cycle, along with strategies for reconciling this approach with district reporting requirements and budget realities.

Mathematics Curriculum, Teacher Professionalism, and Supporting Policies in Korea and the United States - National Academies of Sciences, Engineering, and Medicine 2015-10-21

On July 15-17, 2012 the United States National Commission on Mathematics Instruction and Seoul National University held a joint Korea-U.S. workshop on Mathematics Teaching and Curriculum. The workshop was organized to address questions and issues related to math teaching and curriculum that

were generated by each country, including the following: What are the main concerns in the development of the curriculum? What issues have been discussed or debated among curriculum developers, teachers, teacher educators, and scholars regarding the curriculum? How have textbooks been developed for the curriculum? How are curricular tasks designed and what criteria are used? What is the role of learning trajectories in the development of curriculum? This report summarizes the presentations and discussions at the workshop.

Resources in Education - 1999-10

Popular Complete Smart Series: Complete

MathSmart 11 - Popular Book Company
2017-12-28

Complete MathSmart is a comprehensive, curriculum-based workbook series which helps students develop a thorough understanding of mathematical concepts and

master the essential skills. Concise explanations with examples are provided at the beginning of each chapter, followed by abundant exercises so that students will build a solid math foundation in preparation for their higher education.

Learning Policy - David K. Cohen 2008-10-01

Education reformers and policymakers argue that improved students' learning requires stronger academic standards, stiffer state tests, and accountability for students' scores. Yet these efforts seem not to be succeeding in many states. The authors of this important book argue that effective state reform depends on conditions which most reforms ignore: coherence in practice as well as policy and opportunities for professional learning. The book draws on a decade's detailed study of California's ambitious and controversial program to improve mathematics teaching and learning. Researchers David Cohen and Heather Hill report that state policy

influenced teaching and learning when there was consistency among the tests and other policy instruments; when there was consistency among the curricula and other instruments of classroom practice; and when teachers had substantial opportunities to learn the practices proposed by the policy. These conditions were met for a minority of elementary school teachers in California. When the conditions were met for teachers, students had higher scores on state math tests. The book also shows that, for most teachers, the reform ended with consistency in state policy. They did not have access to consistent instruments of classroom practice, nor did they have opportunities to learn the new practices which state policymakers proposed. In these cases, neither teachers nor their students benefited from the state reform. This book offers insights into the ways policy and practice can be linked in successful educational reform and shows why such linkage

has been difficult to achieve. It offers useful advice for practitioners and policymakers seeking to improve education, and to analysts seeking to understand it.

Using Mobile Technologies in the Teaching and Learning of Mathematics -

Nigel Calder 2018-08-09

Mobile technologies influence the way that we interact with the world, the way that we live. We use them for communication, entertainment, information and research. In education settings, there has been substantial investment in mobile devices, often without a concomitant investment in developing pedagogy and practices. With mobile technologies evolving rapidly, and the number of educational apps growing, there is a need for research into how they facilitate mathematics learning. Such research is of particular importance regarding how such devices may be used to open up new ways of envisaging mathematics and mathematics education, and to help develop

conceptual rather than procedural or declarative knowledge. This volume draws upon international research and reports on a range of research projects that have incorporated mobile technologies for mathematics education. It presents research on the use of mobile technologies, such as iPads, iPods, iPhones, Androids, and Tablets, across a diverse range of cultures, year levels and contexts. It examines the ways in which mobile technologies, including apps, might influence students' engagement, cognition, collaboration and attitudes, through the reshaping of the learning experience. In addition, the book presents appropriate ways to integrate mobile technologies into teaching and learning programmes. It is a significant reference book for those involved with teaching mathematics or using mobile technologies in education, while also offering insights and examples that are applicable to the use of digital technologies in education generally.

Educating Gifted, Talented, Creative and Dissimilar Learners - 2022-10-17

This book presents powerful approaches, research and tools for educating 21st-century gifted, talented, creative and dissimilar learners in the context of rapidly evolving global educational reforms.

One of the key strengths of this book is the diversity of contexts in which the various aspects of the book's themes are evidenced and discussed.

New Directions in Two-Year College Mathematics - Donald J. Albers 1985-06-14

by Donald J. Albers ix

INTRODUCTION In July of 1984 the first national conference on mathematics education in two-year colleges was held at Menlo College. The conference was funded by the Alfred P. Sloan Foundation. Two-year colleges account for more than one-third of all undergraduate enrollments in mathematics, and more than one-half of all college freshmen are enrolled in two-year colleges. These two facts alone suggest the importance of

mathematics education in two-year colleges, particularly to secondary schools, four-year colleges, and universities. For a variety of reasons, four-year colleges and universities are relatively unaware of two-year colleges. Arthur Cohen, who was a participant at the "New Directions" conference warns: "Four-year colleges and universities ignore two-year colleges at their own peril." Ross Taylor, another conference participant, encouraged two-year college faculty to be ever mindful of their main source of students--secondary schools- and to work hard to strengthen their ties with them. There are many other reasons why it was important to examine two-year college mathematics from a national perspective: 1. Over the last quarter century, no other sector of higher education has grown so rapidly as have two-year colleges. Their enrollments tripled in the 60's, doubled in the 70's, and continue to increase rapidly in the 80's. x 2. Twenty-five years ago, two-year colleges

accounted for only one-seventh of all undergraduate mathematics enrollments; today the fraction is more than one-third.

1977 National Science Foundation Authorization - United States. Congress. House. Committee on Science and Technology. Subcommittee on Science, Research, and Technology 1976

Principles of Mathematics + Teachers Guide - Katherine Loop 2016-09-02

Katherine Loop has done the remarkable! She has written a solid math course with a truly Biblical worldview. This course goes way beyond the same old Christian math course that teaches math with a few Scriptures sprinkled in and maybe some church-based word problems. This course truly transforms the way we see math. Katherine makes the argument that math is not a neutral subject as most have come to believe. She carefully lays the foundation of how math points to our Creator, the God of the Bible. The nature of

God, His Creation, and even the Gospel itself is seen through the study of math. Katherine does a marvelous job of revealing His Glory in this one-of-a-kind math course. Katherine Loop's Principles of

Mathematics Biblical Worldview Curriculum is a first of its kind. It takes math to a whole new level students and parents are going to love. It is a guaranteed faith grower!