

Secondary Two Mathematics: An Integrated Approach

Module 9 Probability

By

The Mathematics Vision Project:

Scott Hendrickson, Joleigh Honey,
Barbara Kuehl, Travis Lemon, Janet Sutorius
www.mathematicsvisionproject.org

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2013 Mathematics Vision Project Answers Probability

D. R. Grey

2013 Mathematics Vision Project Answers Probability:

Nonparametric Statistics on Manifolds and Their Applications to Object Data Analysis Victor Patrangenaru,Leif Ellingson,2015-09-18 A New Way of Analyzing Object Data from a Nonparametric ViewpointNonparametric Statistics on Manifolds and Their Applications to Object Data Analysis provides one of the first thorough treatments of the theory and methodology for analyzing data on manifolds It also presents in depth applications to practical problems arising in a variety of fields

Research Methods Pedagogy: Engaging Psychology Students in Research Methods and Statistics Lynne Roberts,2016-11-09 Research methods and statistics are central to the development of professional competence and evidence based psychological practice Noun masculine research on the development of psychological literacy Despite this many psychology students express little interest in and in some cases of active dislike of learning research methods and statistics This ebook brings together current research innovative evidence based practice and critical discourse

Bringing the Common Core Math Standards to Life Yvelynne Germain-McCarthy,Ivan Gill,2014-11-20 As high school math teachers shift to the Common Core State Standards the question remains What do the standards actually look like in the classroom This book answers that question by taking you inside of real Common Core classrooms across the country You ll see how exemplary teachers are meeting the new requirements and engaging students in math Through these detailed examples of effective instruction you will uncover how to bring the standards to life in your own classroom Special Features A clear explanation of the big shifts happening in the classroom as a result of the Common Core State Standards Real examples of how exemplary teachers are using engaging strategies and tasks to teach algebra geometry trigonometry statistics mathematics across the curriculum and more A detailed analysis of each example to help you understand why it is effective and how you can try it with your own students Practical ready to use tools you can take back to your classroom including unit plans and classroom handouts

The American Mathematical Monthly ,1978 Includes articles as well as notes and other features about mathematics and the profession

Building on the Past to Prepare for the Future Janina Morska,Alan Rogerson,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 Ouader Lecture 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 Clement Ayarebilla Ali 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 Irena Bud nov 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 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 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 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 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 Hamide Dogan Angel Garcia Contreras unhappiness at failure in maths liking for maths and self rating in maths and 2 the British Abilities ScalesNumber Skills Test to establish actual mathematics performance Age had a significant effect on both liking for maths and selfrating 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 Alden J Edson 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 Allison Elowson Kristen Fye Gregory Wickliff Christopher Gordon Alisa Wickliff Paul Hunter 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 Hadas Levi Gamlieli Alon Pinto 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 Cheryl Ann Lubinski 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 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 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 Jenna O Dell 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 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 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

analysed The results implied high level of interactions during PBL in statistics Key words project based learning statistics ICT tools interaction Andrea Peter Koop School Readiness in Mathematics Development of a Screening Test for Children Starting School <https://doi.org/10.37626/GA9783959872188> 0 075 First page 395 Last page 400 Abstract The study reported in this paper involved the development of a screening test to be applied by teachers with the whole class at school entry The goal of this screening instrument is the identification of children who are at risk with respect to their school mathematics learning and therefore need immediate support and intervention The paper reports the results of a study with 1757 children from 97 Grade 1 classes in 39 primary schools in Germany that have been tested with the new screening one month after starting school Maria Piccione Francesca Ricci The Importance of Early Developing Symbol sense <https://doi.org/10.37626/GA9783959872188> 0 076 First page 401 Last page 406 Abstract In this paper we deal with the mathematical objects symbolic representation as a relevant educational problem In particular we refer to the semiotic approach a teaching model caring the distinction among sign meaning sense proposing its adoption since the very beginning of the school experience Focusing on the development of symbol sense means sharing relational learning principles reconsidering usual instrumental learning ways We aim at promoting students awareness in managing mathematical language taking into account its widespread weakness also shown by our investigation Awareness is a powerful mental attitude which enables facing difficulties and generating a proper conception of what mathematics and doing mathematics really are then enhancing affect 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 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 Jordan T Register Christian H Andersson Analysing PSTs Ethical Reasoning in a Data Driven World <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 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/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 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 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 Ann Sofi R j 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 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 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 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 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 periodicity of the tangent function For tangent function we know that $\tan \tan 1 x x$ but the expression $\tan \tan 1 x$ 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 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 S 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 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 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 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 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 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 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 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 Isosceli 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 specially for $4\sqrt{5}/3$ 14460551 where T is the Square Root of the Golden Number 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 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 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 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 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 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 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 Ariana Stanca Vacarelu 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 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 Laura Watkins Patrick Kimani April Str m 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 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 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 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 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 *Scientific and Technical Aerospace Reports*, 1991 Lists citations with abstracts for aerospace related reports obtained from world wide sources and announces documents that have recently been entered into the NASA Scientific and Technical Information Database Realising Innovative Partnerships in Educational Research Rachel McNae, Bronwen Cowie, 2017-07-18 Realising Innovative Partnerships in Educational Research examines the underlying principles and actions that support the development of and engagement in partnerships in educational research With social justice at its core the work in this book represents various architectures of innovation whereby new ways of thinking about partnership research are proposed and practices of teaching and learning are reconciled or not with existing education contexts and practices With contributions from educational researchers and practitioners from New Zealand and international commentaries provided by established scholars in the field the book draws together key experiences and insights from students teachers community members and researchers in tertiary community school and early childhood settings The research in this book seeks to address a gap in our understanding extending knowledge beyond simply the benefits of partnership work to examine how successful partnerships can be initiated enacted and sustained over time This book invites reflection on the following provocations Why engage in partnerships for educational research How has this happened in the past and what needs to happen for the future What is unique about the New Zealand context and what might researchers in other countries learn from our collaborative and culturally responsive research methodologies What could be some of the underlying principles that support the development of and engagement in collaborative research How do we evaluate the effectiveness of research partnerships in education to shift the focus to the future Acumenous Game-Based Learning in Simulation Games Souad Slyman, 2024-12-23 Drawing on a comprehensive theoretical foundation encompassing socio constructivism social learning and motivation this book offers a new theoretical contribution and sheds light on the

transformative power of acumenous game based learning to reengage learners with Mathematics and Statistics Education Foregrounding six years of research into simulation games and exploring inquisitional and acumenous theory the book ultimately explores the power of science and game based technologies applying theoretical knowledge to practice in order to reframe negative connotations associated with mathematical and statistical learning The chapters explore maths anxiety and resilience as well as understanding dyscalculia and its ramifications introducing a novel theoretical framework that will redefine traditional teaching paradigms Ultimately exploring the powerful potential of simulation games as motivational and pedagogical tools to redress the complex societal problem of negative emotions toward Mathematics and Statistics Education readers will gain invaluable insights into unlocking new learning opportunities paving the way for a future where mathematics and statistics become accessible engaging and empowering for all This book is of benefit to postgraduate students scholars and academics in the fields of educational technology mathematics education and teaching and learning in higher education more broadly

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