

The Grade 9 Maths ANA – What Can We See After Three Years?

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INTRODUCTION

The Annual National Assessments (ANA) were introduced to address South Africa's poor performance in international mathematics assessments such as TIMSS and SACMEQ. The Grade 9 test was first written in 2012 with a national average of 12.7%. In 2013 the average increased to 13.9% but then dropped to 10.8% in 2014. The overall picture is one of very poor performance with the result that many questions are being asked about the value and purpose of the ANA.

The Department of Basic Education (DBE) identifies three purposes for the ANAs: (1) a measure for the state to gauge improvement in the education system, based on learner performance year-on-year; (2) a diagnostic assessment to identify areas of weakness in learners' performance; and (3) to provide a model of good assessment practice. While these are all important goals, they are not necessarily achievable through a single instrument. However, this is not the focus of our article. Our purpose here is to report on a content analysis of the three ANA papers which we undertook in the first quarter of 2015, paying particular attention to cognitive demand and levels of difficulty. We share our findings on these aspects, as well as on trends that arise as we look across the first three years of the Grade 9 Maths ANA.

CLASSIFICATION OF ITEMS

Classification of items into taxonomies is never a simple matter, and there are no perfect taxonomies. We have attempted to use existing taxonomies with which teachers are familiar but we are not suggesting that these are definitive levels or categories.

LEVELS OF COGNITIVE DEMAND

Levels of cognitive demand describe the nature of the item in terms of the mathematical demand. An early Grade 9 ANA document (DBE, 2011) distinguishes three levels: knowledge of basic concepts, application of concepts and non-routine problem solving. However, we chose to work with the four levels of cognitive demand as described in the CAPS document since these are the levels that teachers work with regularly.

- *Knowledge* – requires straight recall, use of mathematical facts, identification and direct use of formulae.
- *Routine procedure* – well-rehearsed and familiar algorithms, simple calculations that may involve several steps, use of formulae requiring change of subject.
- *Complex procedure* – several calculations that are not all of the same type, complex calculations, route to solution is not entirely obvious, connecting representations, developing proof, requires conceptual understanding.
- *Problem solving* – unseen, non-routine problems, route to solution is not suggested, also requires conceptual understanding.

Question Paper Ana Grade 9 Maths 2012

David A. Sousa



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PISA 2012 Assessment and Analytical Framework Mathematics, Reading, Science, Problem Solving and Financial Literacy OECD,2013-02-11 This book presents the conceptual framework underlying the fifth cycle of PISA which covers reading science and this year s focus mathematical literacy along with problem solving and financial literacy

Issues in Calculus, Mathematical Analysis, and Nonlinear Research: 2013 Edition ,2013-05-01 Issues in Calculus Mathematical Analysis and Nonlinear Research 2013 Edition is a ScholarlyEditions book that delivers timely authoritative and comprehensive information about Mathematical Analysis The editors have built Issues in Calculus Mathematical Analysis and Nonlinear Research 2013 Edition on the vast information databases of ScholarlyNews You can expect the information about Mathematical Analysis in this book to be deeper than what you can access anywhere else as well as consistently reliable authoritative informed and relevant The content of Issues in Calculus Mathematical Analysis and Nonlinear Research 2013 Edition has been produced by the world s leading scientists engineers analysts research institutions and companies All of the content is from peer reviewed sources and all of it is written assembled and edited by the editors at ScholarlyEditions and available exclusively from us You now have a source you can cite with authority confidence and credibility More information is available at <http://www.ScholarlyEditions.com>

International Perspectives on Mathematics Curriculum Denisse R Thompson,Mary Ann Huntley,Christine Suurtamm,2018-01-01 Curriculum can be defined in a variety of ways It might be viewed as a body of knowledge a product or a process Curricula can differ as they are conceptualized from various theoretical perspectives to address the needs of teachers students and the context of schooling One reason to study curriculum is to reveal the expectations processes and outcomes of students school learning experiences that are situated in different cultural and system contexts further studies of curriculum practices and changes are much needed to help ensure the success of educational reforms in the different cultural and system contexts Kulm Li 2009 p 709 This volume highlights international perspectives on curriculum and aims to broaden the wider mathematics education community s understandings of mathematics curriculum through viewing a variety of ways that curricula are developed understood and implemented in different jurisdictions countries Within this volume we define curriculum broadly as the set of mathematics standards or outcomes the messages inherent in mathematics curriculum documents and resources how these standards are understood by a variety of stakeholders and how they are enacted in classrooms The focus is on the written implied and enacted curriculum in various educational settings throughout the world

What Lies Ahead for America's Children and Their Schools Richard Sousa,2014-03-01 The coming decade holds immense potential for dramatic improvement in U S education and in the achievement of American children and in this volume members of the Hoover Institution s Koret Task Force on K 12 Education examine both the potential gains and the pitfalls that lie ahead informed by where U S education has been what changes have been made in recent years and what s still required for the comprehensive overhaul that this vital enterprise so

urgently needs Looking backward is infinitely easier than predicting the future but planning for the future is necessary if anything is to change and by analyzing the recent past and present condition of American primary and secondary school education across a host of key topics task force members in this volume chart a bold course for the years ahead Optimistic about the opportunities at hand they identify essential and feasible reforms as well as the barriers that must be overcome if those changes are to occur They offer high quality scholarship and thoughtful prescriptions for productive policy alternatives

The Complete Book of Colleges, 2012 Edition Princeton Review (Firm),2011-08-15 Presents a comprehensive guide to 1 571 colleges and universities and includes information on academic programs admissions requirements tuition costs housing financial aid campus life organizations athletic programs and student services **Illuminating and Advancing**

the Path for Mathematical Writing Research Colonnese, Madelyn W.,Casa, Tutita M.,Cardetti, Fabiana,2023-11-20 Mathematical writing is essential for students math learning but it is often underutilized due to unclear guidelines Mathematical writing is a mode of communication that provides teachers access to their students thinking and importantly offers students an opportunity to deepen their mathematical understanding engage in mathematical reasoning and learn a fundamental way to communicate mathematically Notably one needs to be able to judiciously combine mathematical symbols representations and text However more research is needed to exemplify the qualities of mathematical writing develop implementation methods and support teachers Illuminating and Advancing the Path for Mathematical Writing Research is a necessary comprehensive resource designed to enhance mathematical writing and promote equitable learning This research book provides a comprehensive understanding of the current state of mathematical writing and illuminates various perspectives on moving the teaching and learning of K 12 mathematical writing forward Mathematical writing is an important yet underutilized component of mathematical discourse and this book offers further insight into understanding what it means to write mathematically for mathematics educators and researchers It informs with research based implementation strategies and creates purposeful professional learning opportunities Ultimately K 12 students will benefit from a more informed field because they will have access to a vital mode of mathematical reasoning and communication **Evaluating Performance**

Michele Biasutti,George Waddell,Aaron Williamon,Roberta Antonini Philippe,2023-10-19 *Mathematical and Statistics Anxiety: Educational, Social, Developmental and Cognitive Perspectives* Kinga Morsanyi,Irene Cristina Mammarella,Denes Szűcs,Carlo Tomasetto,Caterina Primi,Erin Anne Maloney,2017-01-19 Mathematical anxiety is a feeling of tension apprehension or fear which arises when a person is faced with mathematical content The negative consequences of mathematical anxiety are well documented Students with high levels of mathematical anxiety might underperform in important test situations they tend to hold negative attitudes towards mathematics and they are likely to opt out of elective mathematics courses which also affects their career opportunities Although at the university level many students do not continue to study mathematics social science students are confronted with the fact that their disciplines involve learning

about statistics another potential source of anxiety for students who are uncomfortable with dealing with numerical content Research on mathematical anxiety is a truly interdisciplinary field with contributions from educational developmental cognitive social and neuroscience researchers The current collection of papers demonstrates the diversity of the field offering both new empirical contributions and reviews of existing studies The contributors also outline future directions for this line of research

School Achievement and Failure: Prevention and Intervention Strategies Edgar Galindo, Adelinda Araujo Candeias, Małgorzata Lipowska, Óscar Conceição De Sousa, Marcus Stueck, 2022-11-25

Psychology and Mathematics Education Gila Hanna, Laura Macchi, Karin Binder, Laura Martignon, Katharina Loibl, 2023-09-05 Modern Mathematics is constructed rigorously through proofs based on truths which are either axioms or previously proven theorems Thus it is par excellence a model of rational inquiry Links between Cognitive Psychology and Mathematics Education have been particularly strong during the last decades Indeed the Enlightenment view of the rational human mind that reasons makes decisions and solves problems based on logic and probabilities was shaken during the second half of the twentieth century Cognitive psychologists discovered that humans thoughts and actions often deviate from rules imposed by strict normative theories of inference Yet these deviations should not be called errors as Cognitive Psychologists have demonstrated these deviations may be either valid heuristics that succeed in the environments in which humans have evolved or biases that are caused by a lack of adaptation to abstract information formats Humans as the cognitive psychologist and economist Herbert Simon claimed do not usually optimize but rather satisfice even when solving problem This Research Topic aims at demonstrating that these insights have had a decisive impact on Mathematics Education We want to stress that we are concerned with the view of bounded rationality that is different from the one espoused by the heuristics and biases program In Simon s bounded rationality and its direct descendant ecological rationality rationality is understood in terms of cognitive success in the world correspondence rather than in terms of conformity to content free norms of coherence e g transitivity

Teaching Elementary Mathematics to Struggling Learners Bradley S. Witzel, Mary E. Little, 2016-01-24 Packed with effective instructional strategies this book explores why certain K 5 students struggle with math and provides a framework for helping these learners succeed The authors present empirically validated practices for supporting students with disabilities and others experiencing difficulties in specific areas of math including problem solving early numeracy whole number operations fractions geometry and algebra Concrete examples easy to implement lesson planning ideas and connections to state standards in particular the Common Core standards enhance the book s utility Also provided is invaluable guidance on planning and delivering multi tiered instruction and intervention

Handbook of Special Education James M. Kauffman, Daniel P. Hallahan, Paige Cullen Pullen, 2017-05-25 The purpose of the Handbook of Special Education is to help profile and bring greater clarity to the already sprawling and continuously expanding field of special education To ensure consistency across the volume chapter authors review and integrate existing

research identify strengths and weaknesses note gaps in the literature and discuss implications for practice and future research The second edition has been fully updated throughout to take into account recent changes to federal laws as well as the most current academic research and an entirely new section has been added on research methods in special education

A Local Assessment Toolkit to Promote Deeper Learning Karin Hess, 2018-02-28 For years educators have turned to the Hess Cognitive Rigor Matrices CRM when it comes to assessment Now for the first time the modules are packaged into one resource to help teachers evaluate the quality and premise of their current assessment system **Artificial Intelligence**

and Big Data for Value-Based Care Md. Mohaimenul Islam, Ming-Chin Lin, Abeer Alsadoon, 2023-03-01 **Large Deviations and Asymptotic Methods in Finance** Peter K. Friz, Jim Gatheral, Archil Gulisashvili, Antoine Jacquier, Josef Teichmann, 2015-06-16 Topics covered in this volume large deviations differential geometry asymptotic expansions central limit theorems give a full picture of the current advances in the application of asymptotic methods in mathematical finance and thereby provide rigorous solutions to important mathematical and financial issues such as implied volatility asymptotics local volatility extrapolation systemic risk and volatility estimation This volume gathers together ground breaking results in this field by some of its leading experts Over the past decade asymptotic methods have played an increasingly important role in the study of the behaviour of financial models These methods provide a useful alternative to numerical methods in settings where the latter may lose accuracy in extremes such as small and large strikes and small maturities and lead to a clearer understanding of the behaviour of models and of the influence of parameters on this behaviour Graduate students researchers and practitioners will find this book very useful and the diversity of topics will appeal to people from mathematical finance probability theory and differential geometry Students at Risk of School Failure José Jesús

Gázquez, José Carlos Núñez, 2018-10-18 The main objective of this Research Topic is to determine the conditions that place students at risk of school failure identifying student and context variables In spite of the fact that there is currently little doubt about how one learns and how to teach in some countries of the developed world there is still there is a high rate of school failure Although the term school failure is a very complex construct insofar as its causes consequences and development from the field of educational psychology the construct student engagement has recently gained special interest in an attempt to deal with the serious problem of school failure School engagement builds on the anatomy of the students involvement in school and describes their feelings behaviors and thoughts about their school experiences So engagement is an important component of students school experience with a close relationship to achievement and school failure Children who self set academic goals attend school regularly and on time behave well in class complete their homework and study at home are likely to interact adequately with the school social and physical environments and perform well in school In contrast children who miss school are more likely to display disruptive behaviors in class miss homework frequently exhibit violent behaviors on the playground fail subjects be retained and if the behaviors persist quit school Moreover engagement

should also be considered as an important school outcome eliciting more or less supportive reactions from educators For example children who display school engaged behaviors are likely to receive motivational and instructional support from their teachers The opposite may also be true But what makes student engage more or less The relevant literature indicates that personal variables e g sensory motor neurodevelopmental cognitive motivational emotional behavior problems learning difficulties addictions social and or cultural variables e g negative family conditions child abuse cultural deprivation ethnic conditions immigration or school variables e g coexistence at school bullying cyberbullying may concurrently hinder engagement preventing the student from acquiring the learnings in the same conditions as the rest of the classmates

Pacific Rim Objective Measurement Symposium (PROMS) 2016 Conference Proceedings Quan Zhang,2018-04-26 This book gathers original studies presented at the PROMS 2016 conference on Rasch theories and Rasch based applications It provides significant examples used to address practical measurement problems across a range of disciplines including Classic Testing Theory CTT Item Response Theory IRT philosophy of measurement dimensionality the role of fit statistics and research business and industrial applications health related research and the latest Rasch based computer software PROMS welcomes empirical and theoretical studies and workshops preferably with an emphasis on the Rasch model Special attention is paid to manuscripts submitted by non native English speaking authors from Pacific Rim countries regions and beyond PROMS 2016 Pacific Rim Objective Measurement Symposium was held July 30 August 3 2016 in Xi an China The goal of the conference was to bring together researchers scholars and professors from research institutes universities hospitals business and management sectors as well as professional practitioners to exchange and share ideas problems and solutions regarding the multifaceted aspects of the Rasch model and on the much debated yet highly topical issues of objective assessment

Beyin Matematiği Nasıl Öğrenir? David A. Sousa,2020-10-01 MATEMATİK KONUSUNDA T M RENCİLERE ULAŞMAK İÇİN HEM KENDİ BEYİNİNİZİ HEM DE ONLARINKİ KULLANIN Beyin Matematiği Nasıl öğrenir adlı bu kitap en son araştırmalarla desteklenen stratejiler ve rencilerinizin gelişmekte olan zihinleri hakkında rendiklerinizi matematiğe sorunsuz bir şekilde dahil etmenin etkili yolları ile siz okurlar bir sonraki seviyeye taşıyacak Matematiği öğrenmek için bilişsel mekanizmalar keşfedilene kadar neden olan faktörleri öğrenin ve sınıf deneyimini gerçeğe dönüştürmek için uygulamalarla ilgilendiren doğru adımları bir yöntem modelini izleyin Bu kitapta Ergenleri motive etmek için yeni stratejiler Sanatın matematik yöntemine entegrasyonunu Teknolojinin dikkati ve belleğin nasıl etkilendiğine dair yeni bilgiler Sayıların algılamaya ilgili genel ilmi bilgiler ve 160 tane fazla yeni referans bulacaksınız Beyin Matematiği Nasıl öğrenir adlı Sousa'nın kitabını okumadan matematik öğrenmek antrenörlerin zihinleri gibi almayacağı benzer Sousa bilişsel sinirbilimden gelen kısımları pratiğe kadar sağlam bir şekilde kuruyor Her matematik öğreneni bu iyi araştırılmış iyi düşünülmüş pratik yaklaşımdan faydalanacaktır Spencer Kagan Yabancı Profesyonel Geliştirici David Sousa tekrar başarıları ve okullarda matematiği okumak daha iyi kavrayacak zihinlerin gelişimi için son derece pratik ve araştırılabilir bir kitap hazırladı John T Almarode Eğitim Profesörü Fundamental Research in Electrical Engineering Shahram Montaser

Kouhsari,2018-07-25 This volume presents the selected papers of the First International Conference on Fundamental Research in Electrical Engineering held at Khwarazmi University Tehran Iran in July 2017 The selected papers cover the whole spectrum of the main four fields of Electrical Engineering Electronic Telecommunications Control and Power Engineering

Teaching and Learning Chinese as a Foreign or Second Language: The Educational Psychology Perspective Yang Frank Gong,Chun Lai,Jinghe Han,Chan Lu,Sihui Echo Ke,2024-02-21 Over the past two decades Chinese as a foreign or second language CFL CSL has been increasingly taught and learnt as an important language both within and outside China Studies in the field have attempted to address deep seated tensions between existing educational ideologies concepts strategies and approaches and student learning process and performance and between existent teaching methods and techniques and the globalization of Chinese language education

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