2013

Mathematic Abstracts

Seventh Annual International Conference on Mathematics Education & Statistics Education, Mathematics and Statistics

17-20 June 2013, Athens, Greece

Edited by Gregory T. Papanikos

THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH

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Preface

This abstract book includes all the summaries of the papers presented at the *7th Annual International Conference on Mathematics Education & Statistics Education, Mathematics and Statistics 17-20 June 2013,* organized by the Mathematics & Statistics Research Unit of the Athens Institute for Education and Research. In total there were 60 papers and 78 presenters, coming from 33 different countries (Algeria, Australia, Belgium, Brazil, Canada, France, Hong Kong, India, Iraq, Ireland, Israel, Japan, Jordan, Malaysia, Mauritius, Mexico, Pakistan, Philippines, Poland, Portugal, Qatar, Romania, Russia, Saudi Arabia, Singapore, South Africa, South Korea, Spain, Taiwan, Trinidad and Tobago, Turkey, UK, USA). The conference was organized into XIII sessions that included areas of Teaching and Teachers of Mathematics and Statistics, Curriculum, Mathematics I: Algebra & Analysis, Theoretical Statistics and other related fields. As it is the publication policy of the Institute, the papers presented in this conference will be considered for publication in one of the books of ATINER.

The Institute was established in 1995 as an independent academic organization with the mission to become a forum where academics and researchers from all over the world could meet in Athens and exchange ideas on their research and consider the future developments of their fields of study. Our mission is to make ATHENS a place where academics and researchers from all over the world meet to discuss the developments of their discipline and present their work. To serve this purpose, conferences are organized along the lines of well established and well defined scientific disciplines. In addition, interdisciplinary conferences are also organized because they serve the mission statement of the Institute. Since 1995, ATINER has organized more than 150 international conferences and has published over 100 books. Academically, the Institute is organized into four research divisions and nineteen research units. Each research unit organizes at least one annual conference and undertakes various small and large research projects.

I would like to thank all the participants, the members of the organizing and academic committee and most importantly the administration staff of ATINER for putting this conference together.

Gregory T. Papanikos
President

FINAL CONFERENCE PROGRAM
7th Annual International Conference on Mathematics Education & Statistics Education, Mathematics and Statistics, 17-20 June 2013, Athens, Greece
Conference Venue: Titania Hotel (52 Panepistimiou Avenue)

PROGRAM

ORGANIZING AND SCIENTIFIC COMMITTEE

Administration

C O N F E R E N C E P R O G R A M

(The time for each session includes at least 10 minutes coffee break)

Monday 17 June 2013

08:00-08:30 Registration

08:30-08:45 Welcome and Opening Remarks

- Dr. George Poulos, Vice-President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.
- Dr. Gregory T. Papanikos, President, ATINER.
- Dr. Vladimir Akis, Head, Mathematics & Statistics Research Unit, ATINER & Professor, Department of Computer Science and Department of Mathematics, California State University, Los Angeles, USA.

08:45-11:00 Session I (Room A): Teaching and Teachers of Mathematics and Statistics I

Chair: Dr. Nicholas Pappas, Vice-President of Academics, ATINER & Professor, Sam Houston University, USA.

1. Chih-Ru Hsiao, Professor, Soochow University, Taiwan. Some Approaches to Teaching and Learning Mathematical Modelling.
2. Amal Sharif-Rasslan, Head of Mathematics Department, The Academic Arab College for Education, Israel, Elias Abboud, Head of Mathematics Department, Beit Berl Academic College, Israel & Fathi Saleh, Lecturer, The Academic Arab College for Education, Israel. Connectivity between Various Representations of Sets and their Relations among Teacher-Training Students.
3. Tamara Awerbuch Friedlander, Lecturer, Harvard School of Public Health, USA. Teaching the analysis of COMPLEX SYSTEMS as a Problem Oriented Approach: Mathematical Models in Biology and Public Health.
4. Kam Ling Lao, Assistant Professor, The Open University of Hong Kong, Hong Kong. How Elementary School Teachers from Shanghai and Hong Kong Interpret Broken Line Graph.

11:00-13:00 Session II (Room A): Curriculum

Chair: George Poulos, Vice-President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.

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2. *Alexander S. Belenky, Professor of Applications of Mathematical Methods, Center for Engineering Systems Fundamentals, Massachusetts Institute of Technology and Department of Mathematics for Economics, National Research University Higher School of

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Chair: Akis, V., Head, Mathematics & Statistics Research Unit, ATINER & Professor, Department of Computer Science and Department of Mathematics, California State University, Los Angeles, USA.

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2. Paul Samuel Ignacio, Instructor, University of the Philippines Baguio, Philippines, Joel Addawe, Assistant Professor, University of the Philippines Baguio, Philippines, Wilfredo Alangui, Professor, University of the Philippines Baguio, Philippines & Job Nable, Assistant Professor, Ateneo de Manila University, Philippines. Computation

Economics, Russia. Tools for Developing Optimal Individual Curricula for College Students. 3. Petro Erasmus, Lecturer, North West University, South Africa. The Relationship between Emotional Intelligence, Study Orientation in Mathematics and the Mathematics Achievement of the Middle Adolescent. 4. Mark Winter, Research Fellow, University of the Witwatersrand, South Africa. Mathematics Content or Contextual Understandings: Issues of Primacy in South African Mathematical Literacy Classrooms. 5. Youyu Phillips, Professor, Keystone College, USA. Bilingual Mathematics Education and Mathematical Olympiads.	of the Square and Cube Roots of p-adic Numbers via Newton-Raphson Method. 3. Codruta Stoica, Assistant Professor & Lecturer, Aurel Vlaicu University of Arad, Romania. Cocycles over Multivalued Non-autonomous Dynamical Systems on Banach Spaces. 4. Imed Bachar, Associate Professor, King Saud University, Saudi Arabia. Singular Sublinear Polyharmonic Problems in an Exterior Domain. 5. Byung Kang, Professor, POSTECH, South Korea. Noetherian Property of Subrings of Power Series Rings.

13:00-14:00 Lunch (details during registration)

14:00-15:30 Session IV (Room A): Theoretical Statistics **Chair:** *Betty Mc Donald, Professor, The University of Trinidad and Tobago, Republic of Trinidad and Tobago.	**14:00-15:30 Session V (Room B): Mathematics II: Analysis/Applied Sciences** **Chair:** *Alexander S. Belenky, Professor of Applications of Mathematical Methods, Center for Engineering Systems Fundamentals, Massachusetts Institute of Technology and Department of Mathematics for Economics, National Research University Higher School of Economics, Russia.
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Chair: *Gholamhossein Hamedani, Professor, Marquette University, USA.

1. *Hussam Alshraideh, Assistant Professor, Jordan University of Science and Technology, Jordan, Hazem Smadi, Jordan University of Science and Technology, Jordan, Jalal Abo-Taba, Jordan University of Science and Technology, Jordan & Obaidah Alomari, Jordan University of Science and Technology, Jordan. A Gauge Repeatability-and-Reproducibility study for Vitamin B12 Measurements in Jordan.
2. Wai Kwong Cheang, Lecturer, Nanyang Technological University, Singapore. Time Series Trend Analysis of the Singapore Monthly Temperature Data.
3. *Jose Torrecilla, Professor, Complutense University of Madrid, Spain, Pablo Diaz-Rodriguez, Complutense University of Madrid, Spain, John C. Cancilla, Complutense University of Madrid, Spain, Gemma Matute, Complutense University of Madrid, Spain & Ana I. Flores, Complutense University of Madrid, Spain. Neural Networks to Estimate Purity in Imidazolium-Based Ionic Liquids by Their Molecular Weight.
4. *Zalihe Yarkiner, Researcher, Kingston University, UK, Rosie O'neil, Lecturer, Kingston University, United Kingdom, Gordon Hunter, Lecturer, Kingston University, United Kingdom & Penelope Bidgood, Lecturer, Kingston University, United Kingdom. Application of Linear Mixed Models to Routinely Collected General Practice Data: A case study in chronic kidney disease (CKD) in the UK.
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6. *Vijay Sarode, Associate Professor, Mulund College of Commerce, India. Does Low Immunized Children in Slums in Mumbai are Morbid?

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Tuesday 18 June 2013

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1. Graham Barr, Professor, University of cape Town, South Africa. Teaching Strategy, Risk and Return with a Roulette Simulation.
2. Adnan Jaber, Assistant Professor, Babylon University, Iraq. Markovian_Fuzzy Model for Manpower Planning.
3. Gonpot Preethee, Senior Lecturer, University of Mauritius, Mauritius, Khemduth Singh Angateeah, Lecturer - PhD Student, University of Mauritius, Mauritius, Hurryramsingh Hurchand, Lecturer, University of Mauritius, Mauritius & Kaviraj Sharma Sukon, Director-General, Open University of Mauritius, Mauritius. A Comparison of the Impact of Natural Language and Manipulatives on Students' Performance on Word Problems.
4. Catarina Maria Neto da Cruz, PhD Student, University of Aveiro, Portugal & Ana Maria D'Azevedo Breda, Associate Professor, University of Aveiro, Portugal. Some Insights about PL(7,2) Codes.
5. Ruei-Chang Lo, PhD Student, National Changhua University of Education, Taiwan, Erh-Tsung Chin, Associate Professor, National Changhua University of Education, Taiwan & Dai-Wei Chien, PhD Student, National Changhua University of Education, Taiwan. Introducing a Collaborative Inquiry-oriented Model for Helping Teachers Design Mathematical Inquiry Tasks.

10:00-12:00 Session X (Room A): Teaching and Teachers of Mathematics and Statistics II

Chair: *Zalihe Yarkiner, Researcher, Kingston University, UK & *Wilfredo Alangui, Professor, University of the Philippines Baguio, Philippines.

1. Carla Thompson, Associate Professor, University of West Florida, USA & Ernest Bourget, Research Associate, University of West Florida, USA. Integrating Community Outreach Research and Learning (CORAL) Projects in Teaching Graduate Statistics in the Social Sciences.
2. *Sophie Chrysostomou, Lecturer, University of Toronto Scarborough, Canada. Easy Does it, or Does it not? The Effect of Teaching First Year Calculus at Half the Speed.
3. Dai-Wei Chien, PhD Student, National Changhua University of Education, Taiwan, Ruei-Chang Lo, PhD Student, National Changhua University of Education, Taiwan & Erh-Tsung Chin, Associate Professor, National Changhua University of Education, Taiwan. Development and Exploration of the Instrument of Mathematics Inquiry Teaching Competence for Mathematics Teachers.
4. Sule Sahin, Lecturer, Hitit University, Turkey. A Case Study Focusing on the Motivational Factors Affecting Vocational Students in Mathematics Lectures.
5. Gohar Marikyan, Associate Professor, Empire State College/ State University of New York, USA. Strategies for Development of Analytical Thinking through Teaching Mathematics.
6. Haitham Alkhateeb, Professor, Qatar University, Qatar, Amna Ashgar, Student, Qatar University, Qatar & Tooba Akbar, Student, Qatar University, Qatar. Sixth Grade Mathematics Students: Expert-Novice Distinction of Area and Perimeter of the Rectangle.

12:00-13:30 Session XI (Room A): Teaching Methodology and Learning II

Chair: *Sophie Chrysostomou, Lecturer, University of Toronto Scarborough, Canada.

1. Laurel Cooley, Associate Professor, Brooklyn College, City University of New York, USA & Draga Vidakovic, Professor of Mathematics, Georgia State University, USA. Understanding Introductory Linear Algebra using Applications.
2. Simarekha Bhagowati, Associate Professor, Morigaon College, India & Jnanjyoti Sarmah, Associate Professor, R.G.Barua College, India. Impact of Knowledge of Symbols on Mathematics Learning among the Secondary School Students of Morigaon District (Assam, India).
3. Tasos Barkatsas, Assistant Professor, Monash University, Australia & Wee Tiong Seah, Assistant Professor, Monash University, Australia. Mathematical Tasks Preferred by

12:00-13:30 Session XII (Room B): Mathematics III: Geometry-Topology-Combinatorics

Chair: *Pulakesh Maiti, Associate Professor, Indian Statistical Institute, India.

1. Ana Maria Reis D'Azevedo Breda, Associate Professor, University of Aveiro, Portugal & Patricia Santos Ribeiro, Auxiliary Professor, Polytechnic Institute of Setubal, Portugal. Towards the Standard Spherical Tiling.
2. Atasi Deb Ray, Assistant Professor, West Bengal State University, India. Extensions of Generalized Topological Spaces via Stacks.
3. Frantz Olivier, Lecturer, Miami Dade College, USA. Global Positioning System as it is Related to Trisecting Angles.
4. Cristian Octav Olteanu, Professor, University Politehnica of Bucharest, Romania. Mazur-Orlicz Theorem and Moment Problems on Concrete Spaces.
5. Toshio Sakata, Professor, Faculty of

Australian Secondary Students and their Underlying Values and Beliefs. 4. Tadashi Misono, Associate Professor, Shimane University, Japan. An Analysis of Functions of Expressions in an Authorized 7th Grade Mathematics Textbook in Japan. 5. Naomi Prusak, Lecturer, The Hebrew University, Israel, Rina Hershkowitz, The Weizmann Institute, Israel & Baruch B. Schwarz, Professor, The Hebrew University, Israel. Integration of Non-verbal Channels in Peer Argumentation towards Learning Early Geometry in a Problem Solving Context.	Design, Kyushu University, Japan, Toshio Sumi, Associate Professor, Kyushu University, Japan & Rieko Sakurai, Master Student, Kyushu University, Japan. Holonomic Descent Maximum Likelihood Estimation for the Generalized Fisher Distribution.

13:30-14:30 Lunch (Details during registration)

14:30-16:00 Session XIII (Room A): Theoretical Statistics II
Chair: Atasi Deb Ray, Assistant Professor, West Bengal State University, India.

1. Alan Ker, Professor, University of Guelph, Canada. Semiparametric Estimation of the Link Function in Binary-Choice Single-Index Models. (Statistics)
2. *Pulakesh Maiti, Associate Professor, Indian Statistical Institute, India. Estimation of the Variance of HT Estimator of Population Total in Presence of Measurement Error: Interactive Linear Models.
3. Diarmuid O'Driscoll, Head, Mary Immaculate College, Limerick, Ireland & Donald Ramirez, Professor, University of Virginia, USA. Anomalies of the Magnitude of the Bias of the Maximum Likelihood Estimator of the Regression Slope.

17:30-20:30 Urban Walk (Details during registration)

21:00-22:00 Dinner (Details during registration)

Wednesday 19 June 2013
Cruise: (Details during registration)

Thursday 20 June 2013
Delphi Visit: (Details during registration)

Part 1: Mathematics

Imed Bachar
Associate Professor, King Saud University, Saudi Arabia

Singular Sublinear Polyharmonic Problems in an Exterior Domain

In this paper, we prove the existence of positive continuous solution $u \in C_0(D)$, of the following m-polyharmonic singular problem involving sublinear nonlinearity: $(-\triangle)^m u = \varphi(.,u) + \psi(.,u)$ in the complementary D of the unit closed ball in $\mathbb{R}^n$, $n > 2m$. Our result improve and extend the corresponding result of [11] to the polyharmonic case.

[11] S. Yijing and L. Shujie, *Structure of ground state solutions of singular semilinear elliptic equations*, Nonlinear Anal. **55** (2003), 399-417.

Xiao-Chuan Cai
Professor, University of Colorado Boulder, USA

Multilevel Space-Time Domain Decomposition Methods for Stochastic Parabolic Problems

We consider a domain decomposition based implicit space-time approach for solving stochastic parabolic PDEs. The equation is first discretized in space and time using a stochastic Galerkin method and then decoupled into a sequence of deterministic systems with a Karhunen-Loeve expansion and double orthogonal polynomials. A Schwarz preconditioned recycling GMRES method is employed to solve the systems with similar structures. We report experiments obtained on a parallel computer with a large number of processors. This is a joint work with C. Cong.

Sophie Chrysostomou
Lecturer, University of Toronto Scarborough, Canada

Easy Does it, or Does it not? The Effect of Teaching First Year Calculus at Half the Speed

What will it take for a student who is a "math-phobic" to become successful in a first year calculus course? This is the question that a lot of mathematicians, who teach first year courses, are trying to find the answer to. The root of the problem is that most of these students are in a program (such as a life sciences or management program) that requires first year calculus. Such programs attract a wide spectrum of students, a large group of which, though they completed the math requirements in high school, yet they are not equipped to deal with the first year calculus at the university level.

At the Computer and Mathematical Sciences department of the University of Toronto Scarborough, such students caused a large attrition rate for MATA30F (Calculus I for Biological and Physical Sciences) and MATA32F (Calculus for Management I) for many years. In the many attempts to alleviate the problem many resources were provided to the students: "Math Aid Room", "math modules", summer preparedness course, "virtual tutor", "Facilitated Study Groups", seminars, workshops, "WebAssignments", web option lectures, mentors, etc. Regardless, the attrition rate remained the same among this group of students.

The theory that emerged out of these failed attempts is that this group of students needs more time to learn the material. After all, these students need to fill in any deficiencies they have and to complete the course requirements for the calculus they are registered in. All of that is to be done in 12 weeks (the duration of the one term). This is more work than the well-prepared students for the course are required to do.

For this reason, for each of the courses MATA30F and MATA32F, new sections were created: MATA30Y and MATA32Y. These sections are 24 weeks long (two terms) and run at half the pace of their respectively "regular" paced courses. The corresponding F and Y sections of the same course have exactly the same content and the difficulty of the assignments, quizzes and tests is at the same level. More resources are available to the Y sections in order to fill in the deficiencies these groups of students have.

A first look at how successful this project is will be done on April 2013. I wish to submit this study in the form of a paper and I propose to present it at this conference.

Ana Maria Reis D'Azevedo Breda
Associate Professor, University of Aveiro, Portugal
Patricia Santos Ribeiro
Auxiliary Professor, Polytechnic Institute of Setubal, Portugal

Towards the Standard Spherical Tiling

An *isometric folding* is a map that sends piecewise geodesic segments into piecewise geodesic segments of the same length.
Given two isometric foldings f and g of a surface M, f is said to be deformable into g if there exists a continuous map $H: [0,1]xM \rightarrow M$, such that, for each $t \in [0,1]$, H_t given by $H_t(x)=H(t,x)$ is an isometric folding.
It is known, that any planar non-trivial isometric folding of is deformable into the standard planar folding ($f(x,y)=(x,|y|)$). However, the correspondent situation on the sphere remains an open question.
Related to spherical isometric foldings are *spherical f-tilings*, edge to edge decompositions of the sphere by geodesic polygons, such that all vertices are of even valency and both sums of alternate angles, around any vertex, are π. The relation between these two sets comes from the fact that the set of singularities of any non trivial isometric folding be a spherical f-tiling.
Denoting by $T(S^2)$ the set of all spherical f-tilings and given $\tau, \tau' \in T(S^2)$, τ is said to be deformable into τ', if there exists a map $\alpha:[0,1] \rightarrow T(S^2)$, such that α is continuous, $\alpha(0)=\tau$ and $\alpha(1)=\tau'$.
As expected, the problem of isometric folding deformations gives rise to a similar problem of spherical f-tiling deformations. More precisely, is any spherical f-tiling deformable into the standard tiling (f-tiling whose underline graph is a great circle)?
Unfortunately, the deformation of isometric foldings does not induce a deformation of its associated f-tilings (the set of singularities) and so the Hausdorff metric is not enough. In order to overcome this problem a new metric was defined in $T(S^2)$ by giving to each face of a spherical f-tiling a convenient orientation.
Deformations into the standard f-tilin of a classe of spherical dihedral f-tilings will be given.

Atasi Deb Ray
Assistant Professor, West Bengal State University, India

Extensions of Generalized Topological Spaces via Stacks

Compactification of topological spaces has been studied widely by various mathematicians of different times. In 1973, it has been observed by W. J. Thron that from any T_0 topological space (X, τ) one may construct X^*, a collection of grills on X and topologize X^* in such a way that X is embedded in X^* as a dense subspace. A necessary and sufficient condition for X^* to be compact has also been established in the same work.
In our paper in 2000, we have constructed an H-closed extension of a T_2 topological space via certain grills on the given space.

The main purpose of this paper is to show that a more general structure than topological spaces, known as generalized topological spaces (in short, GTS), due to Á. Császár, possess extensions via stacks, a generalization of grills. We have also established several necessary and sufficient conditions on the collection of stacks, so that, the collection becomes g-closed, a unification of compact-like covering properties of a GTS.

It is well known that for any topological space (X, τ), the collection of open sets, semiopen sets, δ-open sets, θ-open sets, preopen sets, etc., form generalized topologies (in short, GT) on the underlying set X. We have shown that if (X, τ) is any T_0 topological space, then for suitable choice of the GT, the existing theories corresponding to compact extensions and H-closed extensions follow as special cases.

Apart from H-closedness, mention may be made of near compactness, S-closedness, s-closedness, p-closedness, etc., as other variant forms of compactness. Though a good number of researchers have worked on these generalizations of compact spaces, extensions like S-closed, s-closed or p-closed extensions do not exist in the literature. Here we show that suitable choice of the GT may also yield S-closed, s-closed and p-closed extensions.

Petro Erasmus
Lecturer, North West University, South Africa

The Relationship between Emotional Intelligence, Study Orientation in Mathematics and the Mathematics Achievement of the Middle Adolescent

There is both internationally and nationally great concern about the poor achievement of learners in mathematics. Numerous studies have been undertaken to explain this phenomenon, since mathematics achievement is of cardinal importance to any developing country. Research has shown inter alia that mathematics achievement at school is one of the best predictors of success at tertiary level and that there is a statistically significant correlation between mathematics achievement and aspects of study orientation in mathematics.

The study focused especially on the nature of emotional intelligence and study orientation in mathematics, the nature and meaning of mathematics achievement, the extent to which (a combination of facets of) emotional intelligence and study orientation predict(s) the mathematics achievement of middle-adolescents and also compared the performance of the different grade groups (represented in this study).

The study was based on a socio-constructivist paradigm, which had developed from the interpretivist paradigm. Both quantitative and qualitative data-gathering techniques (QUAN-qual) were implemented in this study. Altogether 435 learners in Grades 9 and 11 from the three English medium high schools in the Mafikeng region took part in the study. The quantitative component of the study comprised the implementation of two standardised questionnaires: an EI questionnaire, the *Bar-On EQ-i: YV*^{TM}, and the *Study Orientation Questionnaire in Mathematics (SOM).* Qualitative techniques implemented in the study included focus group interviews, observation, field notes, and the use of a reflective journal.

The results indicated that a combination of the facets of emotional intelligence and the dimensions of study orientation could be considered potential predictors of the middle adolescent's mathematics achievement. The following EI components also emerged from the results as predictors of mathematics achievement: *General mood, Adaptability* and *Intrapersonal behaviour.* The following SOM dimensions were predictors of mathematics achievement: *Problem-solving behaviour, Study habits, Information processing* and *Mathematics anxiety.*

Halina France-Jackson
Professor, Nelson Madela Metropolitan University, South Africa

On Bad Supernilpotent Radicals

Let μ be a hereditary, that is, closed under ideals class of associative rings and let U(μ) denote the class of all rings which have no nonzero homomorphic images in μ. For a radical α, the class of all α-semisimple rings is denoted by S(α). π is the class of all prime rings and β=U(π) is the prime radical. A radical that is not the class of all rings is called nontrivial. A radical α is special if α=U(π(α)), where $\pi(\alpha)=\pi \cap S(\alpha)$. A hereditary radical containing β is supernilpotent.
Since special radicals are supernilpotent, V. A. Andrunakievich asked whether every supernilpotent radical is special.
We call a supernilpotent radical α bad if $\pi(\alpha)=\{0\}$. Clearly, nontrivial bad supernilpotent radicals provide natural counter examples to Andrunakievich's question. The first such example was given by Yu. M. Ryabukhin . In this talk, we will construct infinitely many bad supernilpotent radicals which forms a generalization of Ryabukhin's example. We will show that the family of all bad supernilpotent radicals is a sublattice of the lattice of all supernilpotent radicals and give examples of supernilpotent radicals that are not bad..

Paul Samuel Ignacio
Instructor, University of the Philippines Baguio, Philippines
Joel Addawe
Assistant Professor, University of the Philippines Baguio, Philippines
Wilfredo Alangui
Professor, University of the Philippines Baguio, Philippines
Job Nable
Assistant Professor, Ateneo de Manila University, Philippines

Computation of the Square and Cube Roots of p-adic Numbers via Newton-Raphson Method

Let p be prime, Q_p and Z_p be the fields of p-adic numbers and p-adic integers respectively. The introduction of the p-adic norm in the field Q paves the way to the construction of Q_p as the completion of Q so radically different from R, the completion of Q with respect to the Euclidean norm. Hensel's lemma has had a significant impact in the study of these fields by providing sufficient conditions for the existence of roots in Z_p of polynomials in $Z_p[x]$. A classic application of Hensel's lemma deals with the problem of finding square roots of p-adic numbers in Q_p, where $p \neq 2$. A recent development on this problem is the application and analysis of convergence of numerical methods in approximating p-adic numbers.

In their paper, Zerzaihi, Kecies, and Knapp (2010) computed the Hensel codes of the square roots of p-adic numbers in Q_p, $p \neq 2$ using a fixed point method. Zerzaihi and Kecies (2011) then extended this problem to finding cube roots of p-adic numbers in Q_p using the secant method.

In this paper, we compute for the square roots and cube roots of p-adic numbers in Q_p, using the Newton-Raphson method. Given a root of order r, we determine the order of the approximate root after n iterations. The paper confirms earlier results on the square roots of p-adic numbers, and highlights the advantages of the Newton-Raphson method over the fixed point and the secant methods. We also determine the speed of convergence of this method and provide the number of iterations required for any desired number of correct digits in the approximate.

Byung Kang
Professor, POSTECH, South Korea

Noetherian Property of Subrings of Power Series Rings

Wan asked when the subrings between a mixed extensions R[[Y]][X] and R[X][[Y]] is a Noetherian ring. We give an answer to this question.

Catarina Maria Neto da Cruz
PhD Student, University of Aveiro, Portugal
Ana Maria D'Azevedo Breda
Associate Professor, University of Aveiro, Portugal

Some Insights about PL(7,2) Codes

A code M is a perfect r-error correcting code in a given metric space if the set of spheres of radius r centered at codewords of M forms a partition of the space.
Here we consider perfect codes in the metric space (Z^n, ρ_L), where ρ_L stands for the Lee metric. The existence and enumeration of these codes are central problems in the area of Lee codes. A well known conjecture of Golomb and Welch [1] states that for $n > 2$ and $r > 1$ there are no perfect r-error-correcting Lee codes, shortly $PL(n, r)$ codes. There is an extensive literature on the subject; however the conjecture is still far from being solved. The Golomb-Welch conjecture has been proved for pairs (n, r) where $n \leq 5$, and also for n=6 and r=2. There are many papers dealing with special cases, for example showing that there are no periodic perfect Lee codes. It seems that the prove of the non-existence of a perfect r-error correcting code is most difficult for r=2. In this contribution we discuss the case of the nonexistence of $PL(7,2)$ code.

[1] S. W. Golomb and L. R. Welch, *Perfect codes in the Lee metric and the packing of polyominos*, SIAM J. Applied Math. 18 (1970), 302-317.

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Mazur-Orlicz Theorem and Moment Problems on Concrete Spaces

In the first part of this work, we apply a generalization of the Mazur-Orlicz theorem to operators defined on Banach spaces with Schauder basis, in particular on Hilbert spaces. We consider two types of target spaces: L^{∞} spaces and spaces of selfadjoint operators.

A special case is that of the L^{1} - domain-space, which leads to distinct results and is studied separately. In this case, we obtain results which do not depend on polynomials or on the structure of $R^{n}\cdot$ However, such results yield sufficient conditions for the existence of the solution of the Markov moment problem for unbounded non semi-algebraic subsets of R^{n}.

The last part of the work concerns generalizations of some of our earlier results on the moment problem in spaces of analytic functions of one variable, to the corresponding spaces of analytic functions of several variables. All these spaces are structured as real ordered vector spaces.

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Global Positioning System as it is Related to Trisecting Angles

Many problems of geometry seem to have persisted over the years. The most famous:"the three problem of antiquity". [1]
We are only going to consider the problem of trisecting angles.
Which mean;
a) Dividing an arbitrary angle into three equal parts subject to one main restriction
b) You are allowed to used only a straight edge and compass as tools in your construction.
Since 450 BC the initial search by Hippias of Eliss on the trisecting problem, a valid purely geometric solution was not available until Gauss suggested a way with his study of regular polygons.[2]

In the article Modal logic Melvin Fitting introduce us to necessity as a mother of modality.[3] Here we view mathematics as a set of worlds accessible to each other thus the treatment of trisecting an angle is proposed using calculus. We need to define the geometric series as a set of aggregates elements of regions that converge to a total covering of limit 1/3. Each element $c_1>c_2>c_3\ldots c_n$ converges closer to 1/3 as the series of circles degenerate in magnitude. Namely Georg Cantor's disappearing table. Thus we will reach a critical region that is no bigger in magnitude than a point, theorem 1.
Theorem 15.4 It is impossible to trisect a 60^0 angle.[4]
We will construct an indirect trisection of angle 60^0. This is where Global positioning system plays an essential role. In order to correctly locate a point in space, standard algebraic equations, combined with measuring equipment, geometry and a known point are used. For example, a GPS method needs to move a known point in the opening of the 60^0 degree angle.

- This can be achieved by using vector Projection
- Theorem 2
- When we say this can be done with any angles this implies that we must discuss trisecting in accordance to the equation cos (3Θ)

[1] Number Theory and its History by Oystein Ore page 340
[2] "Angular Unity" The case of the missing Theorem, P 17 by Leon O. Romain
[3] Modal logic should say more than it does. P113 computational logic Lassez & plotkin
[4] Experiencing Geometry Euclidean and Non-Euclidean with History 3rd Edition by David W. Henderson ;Daina Taimina page 216

= $4\cos^3(\alpha) - 3\cos(\alpha)$ which the corner stone on how trisecting was prove not to be possible. However, we may be able to share more light on the subject at hand. We can define angle as a dynamic notion: Angle as movement.[1] The overall strategy is as the angle change position the vectors already in fixed position will eventually intersect with the angle in motion. This will create the environment where any arbitrary angle can be divided into three equal parts. Theorem 3.

- In a Heptagon, One of the angles that we found in our transformation triangle is 51^0428. This is the side of one angle in a (7 side regular polygon) up to now it is accepted that an heptagon cannot be built using straight edge and compass however the latter can be built with a mark ruler.[2] This implies for us that we need to build a unit for the construction of the angle. Vector Mapping thru projection of unit 1/6 across a line of unity. The Star of David and a pentagon must be built as a piece wise Graphic function to achieved the Central Angle of a Heptagon (7sides polygon $51^0.428$)

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Holonomic Descent Maximum Likelihood Estimation for the Generalized Fisher Distribution

An n-tensor means an n-dimensional array of datum. In various application fields, brain wave analysis, image analysis, chemical science [3,4], tensor type data are used successfully. The rank of a tensor is defined in sevral ways and we are here concerned wiht the tensor rank in the PARAFAC (CANDECOMP) analysis. Then, the rank of an n-tensor T is defined as the minimal number of rank one tensors necessary to describe T as a sum. The rank is thought to be an index related to the complexity of computations. Recall that a rank depends on the basic field. For example, the maximal rank of 3-tensors with size 2x2x2 over the real and complex number field is 3 and 2, respectively. The ranks of 3-tensors with size mxnx2 are also known over the complex and the real number field respectively for any positive integers m and n.
For higher dimensional cases, in general, a determination of a tensor rank is very hard. Brylinski [1] showed that the maximal rank of 2x2x2x2 tensor over the complex number field is 4 and Kong et al. [2] showed that the maximal rank of 2x2x2x2 tensor over the real number field is 4 or 5. In this talk, we discuss an upper bound of the ranks of n-tensors with size 2x2x...x2 over the complex and the real number field and related topics.

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Cocycles over Multivalued Non-autonomous Dynamical Systems on Banach Spaces

The aim of this paper is to describe the asymptotic behaviors of the solution of evolution equations by means of cocycles over multivalued non-autonomous dynamical systems. As the phase states of these systems are sometimes of infinite dimension or they may only be known approximately, by lack of some parameters, the approximations used bring into question the relevance of the solutions. To answer these questions, several notions of stability have been introduced in the study of evolution equations and of dynamical systems.
In this paper we present and generalize some concepts of stability, in a non-uniform setting on Banach spaces, such as exponential stability, BV-stability, polynomial stability, and a more general concept, the (h,k)-stability. Our main objective is to give characterizations for these notions and to establish connections between them. All results are underlined by illustrative examples and counterexamples.
Also, we emphasize that the skew-evolution semiflows, set out the state evolution of non-autonomous dynamical systems and are particular cases of the considered cocycles.

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Exact Solution for a Generalized Equation of Benney-Lin Type

We consider the initial value problem associated to the generalized nonlinear Benney-Lin equation and by applying the Ince transformation we establish exact travelling waves solutions.

Part 2:
Education Mathematics Statistics

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Learning Mathematics from Cultural Practice: Lessons from the Experiences of Several Schools for Indigenous Students in the Philippines

This paper reports on strategies adopted by some Philippine schools, both formal and non-formal, in the implementation of an indigenous/indigenized mathematics curriculum. Examples of integration of Indigenous Knowledge Systems and Practices (IKSPs) into the mathematics curriculum are given. In particular, the paper presents the experiences of a non-formal school for indigenous Mangyan students where cultural practice provides the context of, and serves as take off point in the discussion of mathematics lessons like fractions, algebraic expressions and the Cartesian coordinate system. The paper then discusses how this strategy resonates with an ethnomathematical curriculum model developed by Adam (2006). The paper also differentiates an indigenous mathematics curriculum from an indigenized one based on the examples presented. Finally, the paper provides some lessons and recommendations arising from the experiences of these schools in the implementation of an indigenous/indigenized mathematics curriculum.

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Sixth Grade Mathematics Students: Expert-Novice Distinction of Area and Perimeter of the Rectangle

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Tools for Developing Optimal Individual Curricula for College Students

While a rapid development of numerous courses on all academic subjects, including mathematics, provides enormous opportunities for individuals interested in acquiring knowledge, it presents a problem associated with choosing a right set of the courses understandable to a particular individual with a certain level of knowledge and with that of the ability to learn and complementing all her other studies. Two key issues are to be addressed in conformity with teaching and studying applied mathematics: a) how to develop a friendly "educational" environment in the form of a set of video and audio courses to be offered by distinguished scientists and teachers, and b) how to develop a navigator in this environment to help interested individuals either incorporate the available courses in their regular studies or develop curricula for self-studies.

The author's experience in teaching courses on systems analysis, mathematical modeling, and convex analysis is discussed from the viewpoint of the basic requirements that the structure of the offered courses should meet to help develop analytical thinking in students. The problem of developing an optimal individual curriculum for a college student based on a) her current level of analytical thinking, which is to be tested, b) a set of mandatory courses and courses of the student's choice, and c) the amount of time that can be spent for all the studies in college or for the studies within a semester, a year, etc., is formulated as an integer programming problem. A mathematical model and standard software for solving the problem are part of a decision support system that allows a student both to develop an optimal (with respect to a particular moment) individual curriculum and (if need be) to recalculate this curriculum at any moment taking into account the remaining time for studying in college and all already earned credits.

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Impact of Knowledge of Symbols on Mathematics Learning among the Secondary School Students of Morigaon District (Assam, India)

Mathematics is a subject with signs and symbols. Different symbols are used to express different expressions in a short and easy form. So importance of symbols in learning of mathematics cannot be neglected. But due to difficulties in symbols recognition or lack of understanding of symbols, affects mathematics learning. Through this paper it is tried to find out the fact how knowledge of symbols affects mathematics learning. For this purpose a study has been made on secondary level students in Morigaon district of Assam, India. In the study it has been observed that lack in knowledge of symbols affects the learning of the subject badly and proper care in symbol teaching can improve mathematics performance to some extent.

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Mathematical Tasks Preferred by Australian Secondary Students and their Underlying Values and Beliefs

Mathematical tasks are designed and presented to support student learning. This paper is based on an exploratory study into the nature of Australian Grades 7 and 8 students' mathematical task type preferences. Specifically, this paper examines the findings to the research questions:
(1) What are the mathematical task type preferences amongst Grades 7 and 8 students in Victoria, Australia?
(2) What values and beliefs might underlie these preferences?
This paper reports on the quantitative phase of a sequential mixed methods design, which aims to map the field relating to the preference for and use of different mathematical task types in Australian and Chinese classrooms. The research method adopted for the phase is a 15-item survey questionnaire containing a mix of Likert-type items, ranking exercises, and open-ended questions.
Analysis of the questionnaire responses showed that in the area of Number, Grades 7 and 8 students in Victoria, Australia, preferred (statistically significantly) mathematical tasks in the order of types, 3 (open-ended tasks), 2 (contextualised tasks) and 1 (modelling tasks), whereas in the area of Geometry, the order of preference was (statistically significantly) task types 1, 2, 3. Each respondent was also asked to provide a reason for the nomination of a particular task type as being the favourite in each of the two sets of questions. The reasons given by the respondents were coded into 7 categories. A logit polytomous statistical model was used with "fun" as the reference category, to investigate the significance of these coding categories using *easiness* (of the task) as the reference category. The majority of the reasons for students' preferences fell into one of four reason categories for Number items, which we will loosely associate with the valuing of *challenge*, *multiple solutions, real life problems and easy to do.* The corresponding reason categories for the Geometry items were the following: *challenge, multiple solution strategies, multiple answers and modelling*.

A Principal components analysis (PCA) was also used to interrogate the beliefs items in the survey. It was found that the students were mathematically confident, they like challenging tasks and that they prefer to choose the question types they do in class.

The results demonstrate that different mathematical topics appeal to different students differently and that pedagogical considerations should be mindful of this. The possibility that effective mathematics learning is associated with particular features of mathematical thinking and activities that are valued by learners is currently being further investigated by the researchers.

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Development and Exploration of the Instrument of Mathematics Inquiry Teaching Competence for Mathematics Teachers

The aim of the study is to develop and validate a questionnaire which can measure mathematics teachers' ability of applying inquiry teaching in their teaching practice. Then we apply this questionnaire to perceive 199 Taiwanese mathematics teachers' competency of inquiry teaching.
The development of the questionnaire was started from the relevant theories of the nature of mathematics, followed by reviewing the theories about inquiry-based teaching, principles and standards of mathematics education, and the viewpoint from science inquiry. Finally the conceptual structure of the questionnaire was induced and the items were designed based on the structure. The questionnaire was administered to 314 in-service mathematics teachers through stratified convenience sampling. By applying SPSS 14.0 to conduct statistical analysis, six scales were yielded which are "teacher's expectation toward inquiry teaching outcome" and "inquiry teaching competency" *understanding of inquiry nature*, *teacher's inquiry competence*, *inquiry teaching competence*, *understanding students' learning by inquiry*, *expectation toward inquiry teaching outcome* and *pedagogical content knowledge*. The Cronbach's α coefficient of the whole questionnaire is 0.953, while the six scales' Cronbach's α coefficients are 0.772, 0.888, 0.940, 0.892, 0.931 and 0.805, respectively. Besides, the Pearson's coefficients of correlation between the whole questionnaire and each of the six scales are 0.596, 0.789, 0.854, 0.554, 0.675, and 0.675, respectively. It reaches 0.01 significance standard, which indicates the high stability of test and retest of the questionnaire. In addition, the questionnaire is also examined to possess content validity, expert validity and construct validity.
The result of analysing the 199 junior high school mathematics teachers' responses to the questionnaire shows that there exists statistical significance in the scale of *understanding students' learning by inquiry* only between male and female, while there is no significance in the

factors of educational background (master or bachelor), and university major (mathematics or non-mathematics).

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Draga Vidakovic
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Understanding Introductory Linear Algebra using Applications

A group of STEM and mathematics education faculty researchers in a variety of college settings, from a small liberal arts setting in the midwest to large urban institutions, have collaborated to develop shared techniques and curriculum materials for teaching linear algebra. Our goals were to (a) create a professional learning community across STEM disciplines, (b) combine expertise in content and pedagogy in designing effective instructional practice, and (c) use learning theories to support the conceptual alignment of content and pedagogical goals.
In particular, our approach combines the use of domain-specific problems, APOS learning theory, and the development of the professional learning community. This set of practices was developed and deployed across four diverse institutions, in diverse linear algebra courses, and was effective across this diversity. We discuss the development of teaching materials, present samples of application modules used in class, and survey results from students participating in these classes. These data show that the collaboration between mathematicians and mathematics educators has been extremely valuable in our rethinking of instruction; both students and instructors recognized the effectiveness of drawing on both applications and learning theory.

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Some Approaches to Teaching and Learning Mathematical Modelling

Developing approaches to teaching and learning from models and modelling perspectives is suggested as a medium for mathematical literacy in the new age of technology (English, 1999; Doerr, & Lesh, 2011; Lesh et al 2000). An important theme about applications and modelling has been expanded in mathematics education (Houston et al, 1997; Blum et al., 2002). Werner Blum (1993) studied a cycle of the process of mathematical modelling and pointed out that all of the process is valid only for "really real" situations. However, the famous mathematical model- Black-Scholes Model of the 1997 Nobel Prize winners in economics did not work and brought the global economy into a severe financial crisis in 1998. In other words, even experts of mathematical modelling cannot guarantee that their models are close enough to "really real" situations, not to mention mathematics teachers or their students.

Since 2001, I have been the chief organizer of the Hi-MCM- "High school students' Mathematical Contest of Modelling" which is held every year in Taiwan. In 2010, in addition to high school students, we also invited elementary school students and junior high school students to participate in the mathematical contest of modelling. Since 2001, we have found that most of the participants (more than 2000 students) of Hi- MCM in Taiwan could not complete an entire process of mathematical modelling nor build a model which is close enough to "really real" situations. After interviewing the participants' supervisors- the teachers, we found that the students were misled by their teachers.

Werner Blum (1993) pointed out the following three kinds of obstacles of mathematical modelling and applications in mathematics instruction: (a) Many mathematics teachers are afraid of not having enough time to deal with problem solving, modelling and applications in addition to the wealth of compulsory mathematics included in the curriculum. (b) Problem solving, modeling and applications to other disciplines make the mathematics lessons more demanding and less predictable for learners than traditional mathematics lessons. (c) Problem solving and references to the world outside mathematics make instruction more open and more demanding for teachers because additional "non-mathematical" qualifications are necessary, and make it more difficult

to assess students' achievements. Here, I have obstacle (d) Even experts might misuse a mathematical model, not to mention teachers or students. I believe that mathematical modelling cycles proposed by Blum (2003), Blum & Leiβ(2007), Pollak(2007) and Weigand & Weller(1998), the goal of teaching mathematical modelling proposed by Julie(2002), Barbosa(2006), Greer & Verschaffel(2007) and Lehrer & Schauble (2007) and the approach of training novice teachers and prospective teachers studied by Doree (2007) and Blomhøj & Kjeldsen(2006) need to compromise with the fact that even experts might misuse mathematical modelling and the fact that very few prospective teachers and teacher educators are good at both mathematics and "really real" problems.

Based on 12 years of trial and error, analyzing the data gathered from the Hi-MCM, interviewing the participants and their supervisors of Hi-MCM and giving workshop to the teachers, we have the following approaches to teaching and learning mathematical modelling : (1) We use "SMM- semi-mathematical modelling" problems which are similar to traditional word problems and have more open answers to shorten the process of mathematical modelling, saving time while still keeping the didactical value of the activities of mathematical modelling; (2) We gave students "PMM- pseudo-mathematical modelling" problems of which the context are in the unreal carton or comic world. Students can solve the PMM problems without other disciplines and therefore reducing the risk of misusing mathematical models; (3) Some teachers and prospective teachers are able to promote their pedagogical power through designing PMM activities and SMM activities.

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Teaching the analysis of COMPLEX SYSTEMS as a Problem Oriented Approach: Mathematical Models in Biology and Public Health

We present a course which examines complex mathematical models as a basis for analyzing biological and social phenomena relevant to biology and public health. Methodological topics include differential equations, difference equations, probability, Leslie matrices, fitting models to data and computer simulation, as applied to topics that include: spread and maintenance of infectious diseases such as AIDS, Lyme disease, dengue and malaria; the heart rate in health and disease, diffusion bioassays for determining toxicity and mutagenicity of drugs; screening for breast cancer; enzyme kinetics; demographic modeling and population structures.

The course is for participants of different disciplines who jointly work on projects. The mathematics is taught as needed to solve a particular problem.

At the end of the course students will be able to combine variables from various disciplines into theoretical structures that lend themselves to qualitative and quantitative analysis. They will acquire working knowledge with some mathematical principles and apply this knowledge while working on their own projects. Moreover they will be able to think holistically in approaching a problem in Biology and Public Health.

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How Elementary School Teachers From Shangai and Hong Kong Interpret Broken Line Graph

East Asian students outperformed their Western counterparts in mathematics repeatedly in many international studies. However, the term "East Asian" is so broad that includes students from different countries or cities in a diverse spectrum of economies and cultures. Shanghai and Hong Kong, both are cities in China, are very different in their education systems and cultural background (OECD, 2012). While Shanghai came top among the other East Asia participating countries/cities, including Hong Kong, in the Program for International Student Assessment (PISA) in 2009, it is interesting to investigate the mathematical knowledge of the teachers from the two cities.

This research explores the mathematical knowledge of elementary school teachers from Shanghai and Hong Kong. Elementary school teachers from both cities were interviewed. In the semi-structure interviews, questions were asked about a hypothetical scenario in graph interpretation which is a common topic in the data handling dimension of mathematics curricula of the two cities. Data was then analyzed to find out the similarities, differences and misconception, if any, on the participants' subject content knowledge and pedagogical content knowledge.

Though research found that Shanghai teachers have profound understanding on fundamental knowledge in comparison with the US teachers (Ma, 1999), more misconceptions and missed concepts in data handling were identified from the Shanghai participants than the Hong Kong participants in this research. The paper provides empirical findings on the mathematical knowledge from the two cities that shed light on the essential mathematical knowledge in teacher education of the two cities.

Gohar Marikyan
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Strategies for Development of Analytical Thinking through Teaching Mathematics

I teach a vast range of courses in mathematics, computer science and interdisciplinary courses to a diverse student population both in one-on-one, blended and in-group modalities. As a math logician I appreciate the process of logical thinking and reasoning. That is why for all of my courses I develop methodology to nurture analytical thinking and problem solving skills. My main research topic is in mathematical logic. I also conduct research in the art of teaching mathematics. My third closely related research topic is the historical roots of teaching mathematics. My research in math educations led me to identifying the cause-and-effect of math anxiety among students. How can I use my knowledge in mathematical logic to address this issue? What can we learn from the history of math education that can be used in the contemporary diverse classroom? Is there any connection between teaching mathematics and development of computer science? Can we incorporate all these in our teaching? How to devise strategies for development of analytical thinking through teaching mathematics? Finally, how to foster student learning of higher level mathematics?

Betty Mc Donald
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Curriculum Independence of Self Assessment: Implications for Mathematics & Statistics Education

CAN SELF ASSESSMENT OPERATE ACROSS ALL CURRICULAR AREAS INCLUDING MATHEMATICS AND STATISTICS? This present paper highlights the independence of self assessment from curricular distinctions and its specific implications for Mathematics and Statistics education. Self assessment (SA) was defined as the involvement of students in identifying standards and/or criteria to apply to their work and making judgements about the extent to which they met these criteria and standards. The sample comprised 515 students (15 – 17 year olds) drawn from 10 high schools spanning all levels of academic achievement on a small Caribbean island. Mathematics with Statistics is compulsory for all participants. The research design was a Posttest-Only Control-Group Experimental Design. SA was the experimental variable and the posttest was the results of an external regional examination. Students were trained by their teachers, who were trained in SA, using 12 researcher designed SA modules. Participants responded to a 48-dichotomous item instrument called a self assessment profile 2 (SA2), derived from carefully selecting four scales (achievement, autonomy, endurance and understanding) from the Jackson Personality Research Form (PRF)-Form E, that is an acceptable standardised instrument. The methodology utilized a mixed methods (quantitative and qualitative) approach. SA2 was factor analysed (linear and nonlinear) against students' academic achievement (AA) in traditional designated curricular areas (business studies (AAb), humanities (AAh), science (AAs) and technical studies (AAt)), at the external regional examination. Results indicated that SA was independent of the curricular areas of AA, providing additional support in favor of the holistic nature of self assessment and its use as an integral part of the teaching/learning process in Mathematics and Statistics. Additional evidence came from the feedback from participants responding to semi-structured interviews, opinionnaires and students' academic records. Implications for Mathematics and Statistics education are discussed and recommendations for future research in this area are proposed.

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An Analysis of Functions of Expressions in an Authorized 7th Grade Mathematics Textbook in Japan

This study is a pilot study of text analysis of a 7th grade authorized mathematics textbook in Japan. At the first step of this study, the morphological analysis was conducted tofragmente each words. However, we must note that there are some idiomatic expressions in mathematics. Sentences tend to be overly fragmented by the usual morphological analysis. For example, "number line" ("suchokusen" in Japanese) has a special meaning or concept, and it does not mean "number" ("su" in Japanese) plus "line" ("chokusen" in Japanese). Therefore, an original dictionary, which contained approximately 500 expressions and terms used in mathematics, was constructed.

After the morphological analysis, the functions of each expressions used in a target textbook were specified. For example, "number", "number line", "aboslute value" and so on were specified as mathematical terms. For other example, "call" were specified as "mathematical difinittion". The expression was used such as "The distance from 0 to a certain number is called the absolute value of the number."

This process was exploratory. First, a sentence containing the target expression was read carefully. When the expression made its first appearance in this analysis, a new function was temporarily defined for the expression. In this step, similar functions, which had already been defined, were checked. If improvements were needed such as integrations of functions, the functions' definitions were reexamined. After that,

frequencies of the functions for each expression were counted.

The results show that the frequency of the expressions borrowed from natural language was higher than that of specific mathematical expressions such as "number," "unit," "symbol," and "formula/equation."

As Falle (2005) indicated, students could be confused in understanding meanings or concepts in mathematics and struggle with understanding these expressions. Therefore, teachers must pay attention to expressions borrowed from natural language and must help students understand them.

Based on deeper analysis, mathematical expressions which must be understood by students and taught by teachers will be clearfy.

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Coincidence Results for Single and Multi-valued Mappings

In 1969, Nadler [S. B. Nadler, Multivalued contraction mappings, Pacific J. Math. 30 (1969), 475- 480] combined the idea of multivalued mappings and contractions. He proved some remarkable fixed points results for multivalued contractions and multivalued locally contractions. Beg and Azam [I. Beg and A. Azam, Fixed points of asymptotically regular multivalued mappings, J. Austral. Math. Soc. (Series A) 53 (1992), 13-226] used the compatibility of single valued mappings with multivalued mappings and established some generalizations of the Banach contraction theorem to study common fixed points of a mixed pair of single valued and multivalued mappings. Afterwards, some extensions and applications to random operators of [I. Beg and N. Shahzad, Common random fixed points of random multivalued operators on metric spaces, Boll. Un. Mat. Itl. 7 (9A) (1995), 493-503, theorem 3.1] were followed. In the this paper we prove coincidence theorems for three mappings, out of which two are multivalued, satisfying a generalized contractive type condition by constructing their sequences of iterations. As applications, we use these coincidence theorems to prove common fixed point results for multivalued and single valued mappings. Moreover, some recent results on fixed points are obtained as corollaries.

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Bilingual Mathematics Education and Mathematical Olympiads

In July 2012, the U.S. team finished third in the 53rd International Mathematical Olympiad (IMO), after the Chinese team and the South Koran team. Greece won an individual gold medal in its 2nd consecutive year after 2011. The IMO is an annual international mathematical competitive examination for high school students prior to their university education. In recent years, the U.S. IMO team has 50% of the first-generation or second-generation Asian (such as China, South Korea, India, Vietnam, etc.) or European immigrants. These IMO team members are often bilingual and gifted students.

The author of this paper is bilingual in English and Chinese, and this paper will focus on the U.S. and Chinese mathematics education in relation to the Mathematical Olympiads, and the discussion will also expand to include other countries such as Russia, South Korea and Greece. China has won first place 17 times in the IMO, and Chinese IMO team members have won more than 100 individual gold medals. Studying sample problems of Chinese Mathematical Olympiads will help enhance students' interests in mathematics, improve their thinking ability, broaden students' mathematics understanding, and sharpen their mathematical problem solving skills.

This paper will include various sample questions and explanations of Mathematical Olympiads from different countries such as China and Russia. Learning some mathematical Olympiad problem solving tricks or skills will help young students' self-confidence in mathematics, broaden their mathematical perspectives and ideas, and stimulate their interests not only in Mathematics but also in Physics and Chemistry. There has been a long history of mathematical competitions or challenges, starting in the ancient times. For example, around 300 B.C. in ancient Alexandria of Greece, Archimedes, in a letter to Eratosthenes, challenged him to solve the "Cattle Problem". The ancient Chinese imperial examination system lasted about one thousand three hundred years from Emperor Wudi of the Han Dynasty (165 B.C.) to Emperor Guangxu of the Qing Dynasty (1901).

Many European countries mandate the teaching of two languages in high school. Although Spanish is a second language course in U.S. schools, less than half of U.S. middle and high schools offer other foreign language courses, e.g. Chinese, Korean, Japanese, Greek,

Arabic, Portuguese, etc. Since 1994, there are more than 300 Chinese language schools in the U.S. operating on Saturdays and Sundays with over 60,000 student enrollments per semester. Chinese language schools in the U.S. offer Chinese language classes as well as SAT (Scholastic Assessment Test) preparatory classes e.g. SAT mathematics classes. Some American middle or high school students take both Chinese language classes and SAT mathematics classes. However, these students typically learn mathematics and sciences in English.

Bilingual students may consider reading explanations of sample problems of Mathematical Olympiads other than English languages, e.g. Chinese, Russian, Korean, Greek… This will help bilingual students understand the English meaning of original languages. For example, when an English/Chinese bilingual student first hears "Qiu Zhi" meaning evaluating, the student may confuse it with looking for a job because of the same pronunciation for it. In the Cartesian coordinate system, a quadrant in Chinese is "Xiang Xian", a bilingual student may think it is associated to an elephant which is exactly the same writing and pronunciation. It can be fun leaning mathematics bilingually or multilingually, in the languages of English, Chinese, Korean, Greek, Japanese, French, German, Italian, Arabic, Spanish, Portuguese ...

Young students should receive their education in all possible subjects, (languages, mathematics, culture, history, geography, sports, dance, sciences, music, art…) so students will be developed in all aspects, and well developed in his or her most favorable subject. Bilingual mathematics education and studying example problems of Mathematical Olympiads form different countries are not only to train problem solvers, but also to develop these young minds to become successful problem finders in their future career challenges. No matter what kind of job a young student grows up to hold, hope that he or she will be both beneficial and useful for a family and a society.

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A Comparison of the Impact of Natural Language and Manipulatives on Students' Performance on Word Problems

Does the use of mother tongue help in learning Mathematics? Who benefits most from it? Can use of manipulatives together with use of mother tongue help to improve knowledge, understanding and performance of learners? In this paper we examine the effect of natural language and of manipulatives on students' performance on word problems in Mathematics at the lower secondary level in Mauritius – an island with multi-ethnic population. An experimental mode of inquiry was used, involving 366 students. A control group (ENG) was established, in which English (L2) was used as the language of instruction. In the first instance, the performance of students in this group was compared to the performance of students in another group (CRE) in which Creole (L1), the mother tongue, was the language of instruction. Then to investigate the effect of manipulatives we extended the comparison of these two groups to a group where both Creole and manipulatives (MCRE) were employed. All the groups are homogeneous and comparable. A questionnaire consisting of 9 items, selected mainly from the literature, was administered to all the groups first as a pre-test and then with minor modifications, while retaining the problem structure, as a post-test. ANOVA was employed at 5% level of significance, to determine differential in performance between groups. Post instruction, gain was observed in performance for all groups. Though CRE (L1 group) performed better than ENG, the difference was not found to be statistically significant. MCRE performed better than CRE with statistically significant difference. A second level analysis of the improved performance by ability grouping (High, Average and Low) was also conducted. When L1 was used, only the low ability students (i.e., in CRE) showed significant improvement over the control group. However, when L1 was used together with manipulatives significant gain was observed for both average and low abilities, with

the latter performing at par with average ability students in ENG and CRE.

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Integration of Non-verbal Channels in Peer Argumentation towards Learning Early Geometry in a Problem Solving Context

The goal of this paper is to show that principled design is crucial for instilling a culture of problem-solving and for conceptual learning. More specifically we also show that argumentation gains from being multimodal in learning geometry, especially at elementary levels.
In the paper we focus on one activity in a course, specially designed for 3rd grade students. Three groups of 20 talented 3rd graders participated in a special enrichment program in mathematics over three successive years. Each group of students attended 28 meetings over a whole academic year. The course was designed to foster mathematical reasoning in a problem solving context. The course combined problem solving in dyads or small groups, peer argumentation and teacher-led discussions. The design of the activities developed for this course relied on five principles: (a) inviting to produce multiple solutions, (b) creating collaborative situations, (c) creating socio-cognitive conflicts, (d) providing tools for checking hypotheses and (e) inviting to reflect on solutions.
In the paper we describe how students solve one task designed according to the above principles, promoted their understanding of the concept of area. We show that the design afforded the surfacing of multiple solutions and justifications in various modalities (including gestural ones).
We show that the design of the activity afforded collaboration and experiencing problem solving processes which led to multiple solutions and to various types of justifications. The socio-cognitive conflict that was used in the design triggered the enactment of non-verbal actions that helped the students to overcome difficulty of articulating verbal justifications. With the help of these multiple channels, we observed a new insight in the comprehension of the geometrical concept of area among Grade 3 students: the fact that geometrical figures might have an equal area without being congruent. We also observed the emergence of deductive argumentations' seeds.

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Student Improvement in Quantitative Literacy through Writing

At the 2012 Conference we presented about a new program at the University of Texas at San Antonio to help students develop quantitative literacy through writing. Our Writing Program will begin enhancing all writing classes with quantitative elements beginning 2013. This year is the pilot program and we will be testing assignments, pre- and post-tests, and class activities for the entire year and keeping statistics on student improvement through these activities. As part of the grant that we were awarded, we have been given teaching assistants who will help us track the statistics by level of difficulty (basic, intermediate, advanced) and by taxonomy. Robinson and Hall would like to report on the progress of this program after the one year pilot program.

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A Case Study Focusing on the Motivational Factors Affecting Vocational Students in Mathematics Lectures

In this study, our first aim is to determine the motivational factors affecting the students in mathematics lectures. The participants were senior 30 students in the department of computer programming of Vocational College in Hitit University. These 30 students all attended Mathematics I classes during 2012-2013 Spring semester and after the first examination, five students were chosen for the interview according to their performance in the exam. The students who showed the 1st and 2nd highest and the lowest performance in the exam were asked to participate. And one student with a lower score and one with an average score were voluntarily included in the interview. To be able to conduct an interview with the students, the Miller and Rollnick (1991) style of motivational interview is preferred. This method of interviewing emphasises using three crucial aspects; collaboration, evocation, and autonomy to be able to enhance intrinsic motivational factors according to (Miller, 1991, 2002). In this approach behaviour change is crucial, but we here use the advantage of this style of interviewing to make our students feel comfortable and make them aware of the motivational factors that affecting their achievement. The pilot interview is first conducted to the students of Textile Technologies Department in Hitit University. After making revisions to the first interview, the audio taped semi-structured interview is conducted to the five students who were chosen before. All the five students' interview was transcribed and coded, but here in our study we have chosen one student to examine the motivational factors. Her interview was about 16 minutes long. The transcription has been completed. The qualitative data analysis has been done according to the qualitative approach of Miles and Huberman (1994). The qualitative analysis has been done and in one case the intrinsic and extrinsic motivational indices were determined. The results show that even in a underestimated environment, students learn how to motivate themselves and they can show high motivation, both intrinsically and extrinsically.

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Various Efforts to Improve Motivation for Learning about the Mathematics

In Educational Technology, ARCS model of motivational design is well known. It was originated by J.Keller and considers how to gain attention and keep it during the learning process. There are four steps for promoting and sustaining motivation in the learning process: Attention, Relevance, Confidence, Satisfaction (ARCS).

Our aim is to lead to students' interests by using a variety of mathematical materials due to ARCS model method.

We developed teaching materials aimed at improving motivation for learning mathematics so far which correspond to "Attention" and "Relevance" in ARCS model. In order to attract the attention, we create teaching materials using Information and Communication Technology (such as animation) which helps a visual understanding, and create a problem asking the regularity of the equation in order to experience the joy of discovery. Moreover we create teaching materials associated with other fields in order to recognize the relevance.

This paper is organized as four Sections. In Section 2, we introduce some examples of teaching materials which were used in the open campus for junior high school students from 2009 to 2012. In particular, one of the authors dealt with the *Euler characteristic* and *L-S category* which were the important themes of topology. In Section 3, we give a mathematical problem with an emphasis on attention and generalization. At first we introduce a famous equation $32 + 42 = 52$ and then, we have a problem to find the equation $102 + 112 + 122 = 132 + 142$. Moreover we are allowed to generalize these equations. In Section 4, we give some examples of mathematical problem associated with other fields such as called "*Maxwell distribution*" in physical chemistry and "*Kirchhoff's law*" in electrical circuit, which correspond to "relevance" in ARCS model. Finally in the appendix, we describe the mathematical background for the examples above.

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Connectivity between Various Representations of Sets and their Relations among Teacher-Training Students

This research was motivated by a problem that deals with the inclusion relation of sets. The students were asked to find the appropriate visual representation (Van-diagram) which describes the relation between sets. Only one answer was correct.
Analyzing the problem leads to an exploration problem with several components: verbal, formal and logical-verbal.
The main goal of the research was to find out the connectivity between various representations of sets and attempt to clarify the source of error when passing from one representation to another.
The following questions were raised:

1. To what extent do teacher training students connect between various representations of sets and the inclusion relation among them?
2. What is source of errors the students make in connectivity between various representations of sets and the inclusion relation among them?
3. Do the students identify the problem variable in the verbal and logical-verbal representations?
4. Do the students understand and apply the property:

"Adding new conditions reduces the set"
A pilot questionnaire has been built according to the problem parameters. After validation and correction, it was distributed to 120 teacher training students who had been learning a basic curriculum in set theory, from two colleges of education.
The questionnaire was analyzed quantitatively and qualitatively. The quantitative analysis gave a clear-cut answer to the first question:
Teacher training students succeeded in solving problems of inclusion relation of sets described in verbal representation more than those described in formal and logical-verbal representations; moreover, they

succeeded in solving problems described in logical-verbal representation more than those in formal representation.
In order to answer the rest questions, we have analyzed the students' explanations qualitatively. The main sources of errors were:
Non identification of the problem variable or subject; adding new conditions enlarges the set; misconceptions; and partial understanding of the inclusion relation.

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Integrating Community Outreach Research and Learning (CORAL) Projects in Teaching Graduate Statistics in the Social Sciences

Two or more graduate statistics courses are required as core or general requirements of all students enrolled in graduate programs in the social sciences in the United States (education, sociology, psychology, humanities, health sciences, and others). The need for high quality student engagement and appropriate authentic learning experiences is critical for promoting student interest and student success in their statistics courses. Based on a conceptual model grounded in authentic learning theory and engagement theory, the use of Community Outreach Research and Learning (CORAL) Projects for teaching graduate statistics has shown some potential benefits for engaging graduate students. CORAL projects involve graduate students participating in service-learning statistical applications within field site locations in the community, designing authentic community-based research projects, developing project management skills, conducting/delivering data-driven research efforts, and writing/presenting original research reports, publications, and conference paper presentations. This presentation will provide an overview of the types of CORAL Projects completed since 2007 and will highlight three CORAL projects in detail relative to their respective formative and summative data and resulting student learning outcomes. Five years of evaluation data representing over 200 graduate students who have participated in the CORAL Projects program will be reported specific to mutually beneficial partnerships among university researchers and statisticians, community agency leaders, and graduate student researchers. Data retrieved from graduate students from the CORAL Projects program indicate positive increases in graduate students' statistical cognition levels and attitudes toward statistics and research, as well as, substantial increases in students' leadership and project management skills. Implications of the use of the CORAL Projects approach in graduate statistics education in the social sciences include workforce development and placement of future professionals.

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Studies in Exceptionality and the Connectivity in Mathematics

Mathematics education is complicated by issues related to cohesion and connectivity within the subject, and in its relationships to other subjects, and these issues are reflected in studies of exceptionality in mathematics. Some recent studies have argued that consideration of the connectivity of mathematics as a subject may benefit from an emphasis on broad approaches to studies of mathematics within generalist models of cognition, including approaches based in modern scientific research and recent studies of networks and complexity. This paper explores the contribution that studies in exceptionality have made in resolving the issue of connectivity in mathematics, and examines efforts being made for a more unified conceptualisation of the subject through broad approaches. A description of learning and memory, based in a novel information framework, is explored as a basis for a generalist cognitive model which may accommodate mathematics concepts within a broader educational context. This model may provide insights into the examination of the connectivity of mathematics as well as methods for teaching the subject in modern educational institutions.

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Mathematics Content or Contextual Understandings: Issues of Primacy in South African Mathematical Literacy Classrooms

This paper focuses on one novice teacher's mathematical working in selected lessons across two years (2011-2012), within the context of Mathematical Literacy teaching. Mathematical Literacy (ML), introduced in 2006 in the South African schools is broadly conceptualized as a subject, just like school mathematics. Developing critical citizenship skills among the students is given as a major rationale for its introduction. By citizenship skills, the curriculum statement for ML refers to those attributes that prepare learners for real-world problems that require numerical reasoning in both immediate and future everyday lives. The rhetoric in the curriculum points towards privileging learners with real-life situations in both routine and non-routine contexts in ML classrooms. Within this citizenship perspective, the goal for teaching and learning is the understanding of the context themselves. Thus mathematics content is backgrounded in the sense that, it is the contexts which dictate the choice of mathematical tools used to analyze the contexts.

The study adopts a case study approach where the participant was chosen purposively. The participant was enrolled into a teacher education programme at a large urban University. The novice ML teacher's teaching experience was tracked across two years (2nd and 3rd years) where selected lessons were video recorded with an aim of understanding the nature of tasks selected or designed for teaching and the teaching agendas being pushed in the classroom. I use Graven & Venkat's notion of pedagogical agendas as theoretical lenses to make sense of the teacher's classroom practices. The results from the analysis of the video transcripts indicate that the novice ML teacher adopted a more content focused agenda, foregrounding mathematics content understanding in her teaching across the two years. Although the results suggest a sharp contrast with specifications in the ML curriculum which emphasize contextual understandings, some studies done in South Africa have shown similar findings.

Part 3: Statistics

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On the Requirement that Critical Regions for Comparing two Independent Proportions must be Barnard Convex Sets

Superiority tests for comparing two binomial proportions are statistical procedures aimed to verify whether sample evidence exists to justify a conclusion that one treatment is superior to another. Similarly, non-inferiority tests are constructed to verify whether there is sufficient evidence showing that a treatment is equal to, superior to or slightly inferior than another treatment. In non-inferiority tests as well as superiority tests, there are several features whose solutions have not been definitively established. These include determining the margin of non-inferiority, the calculation of test sizes and power comparison. Researchers comparing two binomial proportions have asserted that critical regions should be Barnard convex sets to be able to effectively calculate the test sizes. This paper will illustrate why the presence of Barnard convex sets is essential when testing noninferiority as well as superiority and that without such sets these statistical tests become illogical.

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A Gauge Repeatability-and-Reproducibility study for Vitamin B12 Measurements in Jordan

Recent studies on vitamin B12 deficiency in Jordan revealed prevalence between 16 to 50% among Jordanians. Compared with neighboring countries, B12 deficiency seems much higher in Jordan. This could be due to several reasons including inaccurate gauge measurements, wrong normality range specified, or it could be due to the different genetic structure of Jordanians. In this research, a gauge Repeatability-and-Reproducibility study; known as repeated measurements experiment in Statistics literature; was performed to assess the accuracy of B12 measurements in Jordan. Two procedures are followed to measure vitamin B12 concentration in blood, a manual procedure using the standard ELISA reader and an automatic procedure with no manual work for test kit preparation. Blood samples were obtained and each sample was tested several times using both procedures. Results have shown high gauge variability resulting in high misclassification rates for the currently followed normality range. A modified normality range is recommended that provides lower misclassification rates.

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Teaching Strategy, Risk and Return with a Roulette Simulation

This paper uses the game of roulette in a simulation setting to teach students in an introductory Stats course some basic issues in theoretical and empirical probability. Using an Excel spreadsheet with embedded VBA (Visual Basic for Applications), one can simulate the empirical return and empirical standard deviation for a range of bets in Roulette over some predetermined number of plays. In particular, the paper illustrates the difference between different playing strategies by contrasting a low payout bet (say a bet on "red") and a high payout bet (say a bet on a particular number) by considering the expected return and volatility associated with the bets. The paper includes an Excel VBA based simulation of the Roulette wheel where students can make bets and monitor the return on the bets for one play or multiple plays. In addition it includes a simulation of the casino house advantage for repeated multiple plays; that is, it allows students to see how casinos may derive a new certain return equal to the house advantage by entertaining large numbers of bets which will systematically drive the volatility of the house advantage down to zero. This simulation has been shown to be especially effective at the University of Cape Town for teaching first year Statistics students the subtler points of probability, as well as encouraging discussions around the risk-return trade-off facing casino gamblers. The program has been shown to be particularly useful for teaching students the principles of theoretical and empirical probabilities as well as an understanding of volatility.

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On the Boundedness of Bernoulli Processes and its Applications

In this note we announce the a_rmative solution of the so-called Bernoulli Conjecture concerning the characterization of the sample boundedness of Bernoulli processes. We also present some applications and discuss related open problems.

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On the Limits of the Likelihood Criterion

The selection of the most suitable model, from a list of candidate models, for given data is a very important problem in statistics. This paper presents the model selection likelihood criterion, shows its limits and also explain how this criterion for evaluating statistical models led many statisticians, among them Akaike who was the pioneer, to look for information criterion where the number of parameters (complexity) of the model appears explicitly.

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Time Series Trend Analysis of the Singapore Monthly Temperature Data

According to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change in 2007, the world temperatures could rise by between 1.1°C and 6.4°C this century. This paper first analyses the overall trend in the Singapore monthly mean temperature data (June 1981 to December 2009) using time series regression model with autoregressive (AR) noise. The model suggests that since 1980, the Singapore temperature is increasing at a rate of 0.26°C per decade. Further analysis of trends in the June and December temperatures is then performed using multivariate regression model with vector AR(1) noise. Based on conditional least squares (CLS) estimation of the vector AR parameters, the rises in the June and December temperatures per decade are respectively 0.22°C and 0.40°C, indicating a steeper rate for the "winter" month.

The length of the bivariate (June, December) temperature series is not long. We want to assess the impact of biases in the vector AR estimates on inferences of the trend parameters. In Cheang (2000), 'Issues on estimation of time series regression model with autocorrelated noise', Ph.D. dissertation, University of Wisconsin-Madison, it is shown that for multivariate regression with vector AR(1) noise, the bias of the maximum likelihood (ML) estimator of the AR parameters can be decomposed into two components: one is intrinsic to the noise model and the other is attributable to the estimation of regression parameters.

Using the R language (http://www.r-project.org/), a program is written to perform CLS estimation of vector AR(1), and to calculate the ML bias approximation developed in Cheang (2000). Simulation is performed to check the adequacy of the bias approximation for the CLS estimator (which is asymptotically equivalent to the ML estimator). For the Singapore temperature data, the biases of the AR estimates are not negligible, and the trend estimates are less significant after bias correction.

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Nonparametric Least Squares Approach to Estimating a k-monotone Density

Nonparametric density estimation under shape constraints has attracted much attention recently, with multiple works concentrating on qualitative information, such as monotonicity, unimodality, convexity, log-concavity and symmetry, about the underlying density of interest. Here, we study nonparametric density estimation under a k-monotonicity constraint. The fact that a k-monotone density can be defined via a mixing distribution makes its estimation feasible within the mixture model framework. Within this framework, the essence of the problem lies in estimating the mixing distribution nonparametrically. In this talk, we focus on the nonparametric least squares approach to the problem of estimating the mixing distribution and present an algorithm for computing the nonparametric least squares estimate of the mixing distribution. With the availability of the nonparametric least squares estimate, the resulting marginal mixture density, which is our least squares density estimate of a k-monotone density, can be obtained straightaway. Through simulated and real examples, the least squares density estimator is demonstrated.

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Bayes Minimax Estimation under Power Priors of Location Parameters for a Wide Class of Spherically Symmetric Distributions

We consider Bayesian estimation of the location parameter θ of a random vector X having a unimodal spherically symmetric density $f(\|x-\theta\|^2)$ for a spherically symmetric superharmonic prior density of the form $\|\theta\|^{-2k}$ with $k>0$. Expressing the Bayes estimator as $X+g(X)$ with $g(X) \propto \nabla M(\|x\|^2)/m(\|x\|^2)$, where m is the marginal associated to $f(\|x-\theta\|^2)$ and M is the marginal with respect $F(\|x-\theta\|^2) = 1/2 \int_{\|x-\theta\|^2}^{\infty} f(t)dt$, we study its minimaxity under quadratic loss when the sampling density $f(\|x-\theta\|^2)$ is such that the ratio $F(t)/f(t)$ is nonincreasing in t.
A feature of our paper is that, first, we follow Brandwein and Strawderman (1991) proving that, for some $b>0$, the function $h = b\Delta M/m$ is subharmonic and such that $\|g\|^2/2 \le -h \prec -div(g)$ and, secondly, we adapt their approach showing that $R^{2(k+1)} \int_{B_{R,\theta}} h(x)dV_{R,\theta}(x)$ is nonincreasing in R for any $\theta \in R^p$, when $V_{R,\theta}$ is the uniform distribution on the ball $B_{R,\theta}$ of radius R and centered at θ. Our techniques allow to include sampling densities such that $\lim_{t\to\infty} F(t)/f(t) = 0$, that is, which are not restricted to the Berger class. Thus, we complement the findings of Fourdrinier, Mezoued and Strawderman (2012). Examples illustrate the theory.

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Evaluation of the Use of Multivariate Statistical Techniques in Theses and Dissertations of Some Higher Education Institutions

This paper is part of a large study to assess the adequacy of the use of multivariate statistical techniques in theses and dissertations of some higher education institutions in the area of marketing in the theme of consumer behavior from 1997 to 2006. Eleven multivariate techniques (regression analysis, discriminant analysis, logistic regression analysis, canonical correlation, multivariate analysis of variance, conjoint analysis, structural equation modeling, factor analysis, cluster analysis, correspondence analysis, multidimensional scaling) are focused on in this paper, which have presented great potential of using in marketing studies. The objective of this study was to analyze whether the employment of these techniques suits the needs of the research problem presented in these theses and dissertations as well as to evaluate the level of meeting of their assumptions. Among several interesting findings, the results suggest the need for more involvement of researchers in the verification of all the theoretical precepts of application of the multivariate techniques.

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On Generalized Gamma Convolution Distributions

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Finding the Ratio of Two Percentiles by Way of Non Parametric Methods

In the wood industry, it is common practice to compare two different strength properties for lumber of the same dimention, grade and species or the same strength property for lumber of two different dimensions, grades or species. Engineers often express a comparison in terms of the ratio of two strength properties.
For example, the ratio of mean bending strengths. Because United States lumber standards are given in terms of population fifth percentile, and strength problems arised from the weaker fifth percentile rather than the stronger mean, the ratio is often expressed in terms of the fifth percentiles of two strength distributions rather than the mean.
Exact confidence regions for the ratio of percentiles for two independent normal distributions when the ratio of variances is known are obtained. The result establishes that a certain random quantity has a non-central t distribution. The confidence region can be a bounded interval, the complement of an interval, or the whole real line. When large samples are available, confidence intervals for the ratio of percentiles are also obtained even when the ratio of variances is unknown. The confidence region is always a bounded interval, but it shows poor covergae rates when the percentile in the denominator is near zero.
When sample sizes are large, non parametric approaches are possible. If percentiles are estimated by order statistics, the resulting confidence region is always a bounded interval with poor coverage rates. An alternative large smaple approach derives confidence regions that may be intervals, complements of intervals, or sometimes even the whole real line. This paper will assume small samples to derive new non parametric method which is similar to the Wilcoxon rank-sum test, find ratio of percentiles in original measurements and in ranks, and compute confidence regions which should be intervals and hopefully can show good coverage rates.

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Markovian_Fuzzy Model for Manpower Planning

The aim of this paper is mathematical modeling for predication. The model will give much information according to title, such as teachers in university (assistant lecturers, lecturers, assistant profs., Profs.) or according to proficiently rank, such as worker in government offices (first, second, ...) or according to age. Also this model combines the fuzzy sets, markov chains and Delphi techniques as predication modern techniques.

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Semiparametric Estimation of the Link Function in Binary-Choice Single-Index Models

In this manuscript we propose a new semiparametric estimator for binary-choice single index models which uses parametric information in the form of a known link (probability) function and nonparametrically corrects it. Asymptotic properties are derived and the finite sample performance of the proposed estimator is compared to those of the parametric probit and semiparametric single index model estimator of Ichimura (1993). Results indicate that if the parametric start is correct the proposed estimator achieves significant bias reduction and efficiency gains. Interestingly, if the parametric start is not correct the proposed estimator may still achieve significant bias reduction and efficiency gains. For purposes of estimating probabilities, we find that the proposed estimator outperforms the Ichimura estimator in all simulation designs measured by both L_1 and L_2-norms.

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Introducing a Collaborative Inquiry-oriented Model for Helping Teachers Design Mathematical Inquiry Tasks

In this paper, a collaborative inquiry-oriented model is introduced, which is initiated in a professional development programme, intending for "learning inquiry through inquiring" by means of collaborations and interactions within different groups of participants and inquiring the problems occurred in practice in order to promote professional development of the participants. The professional development programme is organised for helping mathematics teachers develop the ability to implement inquiry-based teaching by means of designing mathematical inquiry tasks, which stands on the following principles: (1) providing opportunities for participants to experience inquiry as a learner, (2) teacher centered, i.e. focusing on teachers' practical needs, (3) introspecting practice, and (4) understanding students' work and thinking. The framework of task design is based on the 5E inquiry model (Bybee & Landes, 1988) which stresses students' active learning.
A study of a case participant high school teacher is presented as an example, which adopts the quasi-experimental, non-equivalent pretest-posttest design, to manifest the effect of designed mathematical inquiry tasks. The instruments of assessing students' learning achievements are the six period examinations in the whole academic year compared with all the thirteen classes of the same grade, and four self-designed tests for pretest, posttest and delayed test which are analysed and compared within the experimental and control groups by means of ANCOVA.
We deem that whether a teacher can grasp the essence of design depends on whether she/he can design her/his own tasks in the same manner. However, developing the ability to design good tasks in a certain manner is not trivial but demanding. In this paper, it seems to provide a workable model for task design by a team that cuts across various communities so as to help the participants learn how to design mathematical inquiry tasks step by step through interactions and collaborations within this' learning performances.

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Estimation of the Variance of HT Estimator of Population Total in Presence of Measurement Error: Interactive Linear Models

Considered is the set-up of simple i.e. direct response on a quantative response variable Y in the context of a finite labeled population of size N .It so happens in actual surveys, we need investigators and often supervisors also. We depict a situation wherein there are possibilities of investigator effect and/or supervisor effect on the response profile finally received by the data collecting agency .Of course these effects may be assumed to be random, having mean zero, non-interactive within and between two sets of" people" .The problem is to estimate variance of Horvitz-Thompson estimator of population Total of the response variable Y by incorporating a fixed size(n) sampling design and by administering the sampling design in a situation wherein the above two types of random effects are likely to be present.

We will denote by Y[i; (j;k)] the underlying response on the study variable Y for the responding unit labeled I ,collected by the jth investigator and supervised by the k th supervisor. WE consider two situations(1)blind supervision of the supervisors without any knowledge of the responding unit or of the investigator i,e.(i;j) combination,(2)the identity of both(i;j) is revealed to the supervisor.

In this presentation ,we discuss some salient of the features of the data analysis towards estimation of the Variance oh HT estimator of population total

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On Moment Estimators to test for a Zero-Inflated Poisson Distribution

The paper studies two simple approaches that are very powerful and computationally less intensive to test Poisson versus Zero Inflated Poisson distribution. In this paper, we present two simple tests which are very simple and at the same time very powerful. One of these tests use the idea of "distance" to perform the test. The other one is a locally most powerful test (LMP). The LMP test (also called likelihood derivative test) is due to Rao (1948). According to Moran (1970), the LMP test is very powerful for testing mixing proportions. One can describe a ZIP distribution (indeed a mixture distribution) as follows.

$$P(Y=0) = \theta + (1-\theta)\, e^{-\lambda} \tag{1}$$

$$P(Y=y) = (1-\theta)\frac{e^{-\lambda}\lambda^{y}}{y!}, \quad y>0. \tag{2}$$

where θ is the mixing proportion.

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Anomalies of the Magnitude of the Bias of the Maximum Likelihood Estimator of the Regression Slope

The slope of the best-fit line $y = h(x) = \beta_0 + \beta_1 x$ from minimizing a function of the squared vertical and horizontal errors is the root of a polynomial of degree four which has exactly two real roots, one positive and one negative, with the global minimum being the root corresponding to the sign of the correlation coefficient. We solve second order and fourth order moment equations to estimate the variances of the errors in the measurement error model. Using these solutions as an estimate of the error ratio κ in the maximum likelihood estimator, we introduce a new estimator β_1^{kap}. We create a function ψ which relates κ to the oblique parameter λ, used in the parameterization of the line from $(x, h(x))$ to $(h^{-1}(y), y)$, to introduce an oblique estimator β_1^{lam}. A Monte Carlo simulation study shows improvement in bias and mean squared error of each of these two new estimators over the ordinary least squares estimator. In O'Driscoll and Ramirez (2011), it was noted that the bias of the MLE estimator of the slope is monotone decreasing as the estimated variances error ratio $\tilde{\kappa}$ approaches the true variances error ratio $\kappa = \sigma_\tau^2/\sigma_\delta^2$. However for a fixed estimated variances error ratio $\tilde{\kappa}$, it was noted that the bias is not monotone decreasing as the true error ratio κ approaches $\tilde{\kappa}$. This paper explains this anomaly by showing that as κ approaches a fixed $\tilde{\kappa}$, the bias of the MLE estimator of the slope is also dependent on the magnitude of σ_δ^2. Other anomalies with the MLE estimator of the slope in the presence of errors in both *x* and *y* are discussed.

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Does Low Immunized Children in Slums in Mumbai are Morbid?

This paper examines utilization of immunization services available to the children the slums in Mumbai and also checks whether children suffer from ARI, Fever, Cough, Diarrhea vis-à-vis standard of living index constructed from household amenities, housing quality, drinking water, electricity. The study uses primary data collected using cluster sampling of a sample size of 433 reproductive women who have given at least one live birth prior to the survey. The findings using logistic regression reveal unimaginably low level of utilization of vaccination among the children of 12-23 months old. Primary vaccination was just 48 percent. Besides, children were found to be suffering from ARI, fever, Cough, Diarrhea who were not vaccinated. Further, children from low SLI category and of illiterate women were not availing child care services. Thus this paper suggests that vaccination programme has to stress on its coverage including its timing especially among morbid children of illiterate women.

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Neural Networks to Estimate Purity in Imidazolium-Based Ionic Liquids by Their Molecular Weight

Ionic liquids (ILs) are novel and promising compounds that are currently being vastly studied because of their usefulness in many scientific research projects and industrial processes such as organic synthesis, petrochemistry, battery production and others. The specific properties which turn ILs into such interesting products are highly dependent on the level of impurities they contain and, therefore, the determination of the purity of these compounds is vital. In order to asses this matter, a multilayer perceptron neural network was proposed due to its ability to process complex non-linear data.

The main objective of this work is to adequately estimate the refractive index of imidazolium-based ILs using neural networks. To do so, the only inputted information required were the molecular weights of the ILs anions and aliphatic chains of their imidazolium cation. The output of the network was the refractive index of the mentioned ILs, which is correlated with their purity and, in addition, is a very easy-to-measure physicochemical property. The multilayer perceptron trained and optimized offered good results. The mean prediction error after simulation with a new dataset, not used in the training database but contained in its range, was less than 0.41 %. Therefore, the attained network is suited for the estimation of the refractive index of this important group of ILs with only the prior knowledge of the molecular weights. Finally, once the network offers the estimated refractive index of the inputted IL, its purity can be easily determined by the comparison of the obtained results and experimental ones.

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indings of Planar Processes and Bougerol's Identity

This paper surveys several results concerning windings of 2-dimensional processes, including planar Brownian motion, complex-valued Ornstein-Uhlenbeck processes and planar stable processes. In particular, we present Spitzer's asymptotic Theorem for each case.

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Application of Linear Mixed Models to Routinely Collected General Practice Data: A case study in chronic kidney disease (CKD) in the UK

The field of longitudinal analysis is a rapidly developing and increasingly important area of statistical modelling. Recent research has identified a lag between the development of statistical methodologies and their applications to substantive problems. Current advances in novel longitudinal methodologies aim to redress this imbalance. The last 20 years has seen increasing availability of longitudinal data across many fields and recognition of the rich research resources such data might provide.

The Health sector is one such area where longitudinal data is routinely collected. In this study, we take data from one such resource, General Practitioner (GP) records, and investigate the natural history of chronic kidney disease (CKD), a multistage, progressive disease which currently affects between 6-10% of the population in the UK. The aim is to use the longitudinal aspects of the data to further understanding of the early indications and the nature of the progression of CKD. The methodologies should be applicable to other chronic illnesses which are primarily managed at the GP level. Data was obtained from routinely collected medical records on 876951 patients, from a random sample of 130 General Practices (GPs) in England and Wales. Information on the diagnosis of CKD for a patient was determined using the clinical standard based on estimated glomerular filtration rate (eGFR) values.

Variation in eGFR, a marker of CKD status, over time and in relation to hypothesised co-morbidities is modelled using Linear Mixed Models. These are based on a repeated measures structure within a two-level multilevel framework and allow both random and systematic effects to be studied simultaneously. Although these types of models are well established, they are only recently being applied in the medical and social sciences.

The results of our models confirm that, in general, eGFR for a patient tends to decrease over time, with both linear and quadratic coefficients of time being significant. Almost 60% of the total variation in eGFR is attributable to differences between patients with the remainder being due to within-person variation. Results also show that the rate of decline of eGFR tends to increase over time and that each of the proposed co-morbidities had a significant effect on both initial CKD status and its progression over time.