

Technology Integration into Mathematics Curriculum

*Abstracts of the Eighteenth
Asian Technology Conference in Mathematics and Sixth Conference on
Technology & Innovations in Math Education*

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***December 7-11, 2013,
Indian Institute of Technology Bombay,
Mumbai, India***

Introduction

On the behalf of the Indian Institute of Technology, Mumbai, India, members of the International Program Committee of the ATCM conference and National Advisory Committee of TIME conferences, we are honored to introduce the papers of the ATCM 2013 – “*Technology Integration into Mathematics Curriculum*” and TIME 2013.

We are fortunate to have presenters from a wide spectrum of scientists and educators, whose presentations and workshops will demonstrate the most current trends in technology for mathematics and mathematics with technology. Papers and presentations address a very wide spectrum of topics and ideas. We can find papers concentrating on using computer software in teaching mathematics, papers on using Internet, multimedia, and other tools for interactive and online mathematics courses delivery, as well as research papers from pure mathematics where technology was used to produce some new results.

Thanks to evolving technological tools, we are able to explore more interdisciplinary areas such as science, technology, and engineering with Mathematics which we could not before. Therefore, integrating technology into mathematics teaching, learning and research will definitely allow us to expand our knowledge horizon in mathematics. We encourage all authors and readers to contribute your new findings to our next ATCM or the Electronic Journal of Mathematics and Technology (eJMT: <https://php.radford.edu/~ejmt/>).

We would like to express our appreciation to the local organizers, in particular to the Indian Institute of Technology for the enormous task of planning and preparation the joint event of ATCM 2013 and TIME 2013 – one of the most enjoyable and instructive conferences in the World. We thank also the members of the International Program Committee and external reviewers for their great contribution in reviewing papers.

Editors of ATCM 2013 and TIME 2103

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ABSTRACTS FOR ATCM 2013

Abstracts for Panel Discussion

"TECHNOLOGY INTEGRATION IN MATH CURRICULUM"

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CONTRIBUTION FROM DOUGLAS BUTLER

When technology first hit schools, it was in the form of hand held calculators in the hands of the students. Then the balance shift to the teachers when increasingly powerful computer software solutions became available for the teachers to use dynamically and interactively in front of the students. Now the pendulum is swinging back to the students with tablets and smart phones offering a rapidly increasing menu of mathematical apps. There is little doubt that students can learn mathematics more securely if they do so by self-discovery. However, the need for routine drill and practice never goes away, otherwise the learning can end up very superficial.

The internet of course is the other major factor, allowing peer-to-peer discussions, instant access to dynamic resources and the flipped classroom concept. None of this has a place in the lives of busy teachers without continual professional development (CPD), and in these troubled economic times, training budgets are dangerously vulnerable to pruning.

CONTRIBUTED BY DINESH KUMAR

Indian perspective: In the present era ICT is considered to be an extremely powerful tool for teachers and students in the area of school as well as higher education. It has tremendous potential not only in providing access of education to a large number of deprived but also in enhancing the understanding of learners. Mathematics education is no exception to this. If we focus on understanding of concepts by learners then it is an established and accepted fact that teaching-learning aids have always been in use to enhance learning. ICT has provided tools for integrating all teaching aids in highly effective way and also made easily accessible to teachers and taught. It is also a fact that in the process of teaching and learning the appropriate assessment of learning, diagnosis of difficulties in understanding of concepts by taught and providing remediation for diagnosed difficulties are of paramount important. ICT tools evolved to address these issues have proved to be extremely useful nowadays. In addition, it has opened up the boundaries of space and time for students as well as teachers and it has potentials for anywhere and anytime learning. Even debates are there to switch to explore the possibilities of exploiting potentialities of M-learning by using mobile phones.

But considering the diversities of access as well as capabilities of teachers to use ICT tool, it is also equally important to build their capacity in such a way that these tools are used in a comfort zone by our teachers. In addition, uniqueness of ways of teaching by teachers and varied pace of understanding of concepts by learners is also important. This point is more important and relevant especially for teaching and learning of Mathematics. From this

perspective, available ready to use ICT resources and tools may not prove to be all effective and panacea for all problems. Therefore, the capacity building of both teachers and taught for these technology enabled learning is of paramount importance so that all ICT resources serve as building block in the process of conceptual understanding of all subjects including Mathematics and ICT tools as a medium to achieve these objectives.

CONTRIBUTED BY HE-CHAN LEW

Korean Perspective: The current Korean mathematics curriculum recommends technology in its “guideline for instruction” that “computers and calculators should be actively utilized to improve understanding of concepts and problem solving or thinking abilities in classrooms.” According to this guideline, technology is being used even within limited bound in most of all Korean textbooks. However, the problem comes from the fact that the curriculum has been developed for teachers to be able to teach without a computer. That is, its contents can be learned without the computer, although teachers and students are permitted to use in their classes. Another problem is teacher’s awareness toward technology. The use of computers depends on the interests and abilities of individual teachers, but many teachers are not rising to this challenge because they do not necessarily feel the need to use the computer. Therefore, computer should be “substantialized” in the mathematics curriculum, rather than just appeared on some pages of the textbooks. To be so done, many mathematical contents to be learned far more meaningfully than in a paper and pencil environment should be designed and invited to the curriculum. Furthermore, various mathematical activities with computers should be designed to be able to be used in the formal examination.

CONTRIBUTED BY WERNER OLIVIER

South African perspective: In South Africa a binary situation in schools exist with private and ex model C (mostly white) schools (<10% in total) are vastly better resourced and infrastructure compared to previously disadvantaged (black) schools. As a result, evolving technologies are having some effect in the former category of schools with access to internet, computer laboratories and teaching with laptops & data projectors becoming part of the T&L pedagogical mix. A small percentage of schools in this category are also beginning to experiment with Tablet technology en e-learning material to complement the predominantly textbook support for pupils.

In contrast, the balance of schools in South Africa (>90% of the total) are mostly without access to internet and physical infrastructure to integrate similar e-learning strategies. Additional challenges in this regard are the acute shortage of available Math teachers as well the lack of skills (content knowledge and ICT) amongst many practicing teachers in this – category of schools.

Abstracts for Plenary Talks and Invited Papers

ABSTRACT FOR 20128

EXACT REAL CALCULATOR FOR EVERYONE

AUTHOR: Weng Kin Ho

AFFILIATIONS: National Institute of Education

Despite its simplicity and versatility, the well-known Floating Point System (FPS) has a serious shortcoming: the finite nature of a computer makes rounding-off inevitable. Because of this, FPS can sometimes lead to serious computational errors, i.e., a small round-off error due to truncation can cause a large deviation in the output in iterations within chaotic systems. This paper bridges the gap between theory and practice of Exact Real Arithmetic (ERA), and reports on the design and implementation of a user-friendly scientific calculator ERCE using Haskell, capable of ERA. With a functional-programming slant, we use ERCE as a channel for the technology of ERA to reach out to a wider community: even a school student can use it.

ABSTRACT FOR 20140

LET'S TWIST AGAIN

AUTHOR: VLADIMIR NODELMAN

AFFILIATIONS: Holon Institute of Technology

The possibility to study such fundamental notions of modern mathematics as “space” and “spatial transformation” is almost absent in educational software. Instead, such software handles affine transformations of objects lying in 2D or 3D space: specifically, compositions of rotations, translations and scaling, all being applied to geometric shapes.

It is relatively easy to implement affine transformations of the whole space programmatically due to internal nature of computer graphics mechanism. The real challenge is to support nonlinear spatial transformations in a manner that is user-friendly and seamless.

Our noncommercial software “VisuMatica” long ago supports well nonlinear transformations of two-dimensional spaces. As result, the software became a powerful tool which helps to discover the unity of mathematics, to visualize and dynamically explore new mathematical environments and phenomena.

In our lecture we will present 2D- and new, 3D-nonlinear transformational abilities of “VisuMatica”. The spectrum of supported mathematical topics became even wider. In particular, the presentation includes discussion of some applications to vector fields, differential equations, 3D modeling, etc.

From PROMENADE (translations), through the WALTZ (rotations) we advanced to TWIST & SHAKE deformations OF THE WHOLE SPACE.

ABSTRACT FOR 20307

HOW TO MANAGE ALL THIS CHANGE (PLENARY PRESENTATION)

AUTHOR: Douglas Butler

AFFILIATIONS: iCT Training Centre, Oundle (UK), Autograph-Maths

Whatever device you are using, the quality of online material for mathematics teaching continues to evolve and challenge. In addition, the ease with which teachers, students and parents can all now communicate with each other gives us an invigorating new dynamic for learning mathematics.

Dramatic changes in hardware have forced the content providers into new touch-driven environments, and a new wave of writers has emerged who are serving up excitingly fresh ideas.

In this presentation Douglas will cherry-pick from the best of his TSM Resources website. He will remind everyone of the increasing need for continual professional development, and how important it is for the technology not to get in the way of the mathematics.

ABSTRACT FOR 20314

CONSTRUCTION OF A DOUBLY RULED SURFACE

AUTHOR: Jen-chung Chuan

AFFILIATIONS: Department of Mathematics, National Tsing Hua University, Hsinchu, Taiwan 300

A surface is called ruled if through every point there is a straight line that lies on the surface. A surface is doubly ruled if through every one of its points there are two distinct lines that lie on the surface. The hyperboloid of one sheet is an example of the doubly ruled surface. A less obvious example is the hyperbolic paraboloid. In this talk we are to demonstrate, using Cabri 3D, how such a doubly ruled surface can be constructed synthetically.

ABSTRACT FOR 20333

EXPLORING METRIC SPACES VISUALLY WITH EXCEL

AUTHOR: Deane Arganbright

AFFILIATIONS: Divine Word Univ., PNG (Emeritus)

This paper provides a novel approach for an introductory exploration of metric spaces, showing ways to use Excel creatively to discover interesting insights into mathematics. We use diverse examples of metrics to provide insights into the concept of distance, and see how it interacts with the areas of geometry, calculus, and other more familiar parts of mathematics. Along the way, we encounter inequalities and other aspects of classical mathematics, and provide new problem solving and teaching techniques, and a means of discovering patterns by employing spreadsheets to enhance the visual interpretation of a thought-provoking part of mathematics.

ABSTRACT FOR 20336

INCORPORATING CULTURE IN THE TEACHING OF MATHEMATICS

AUTHOR: Ma. Louise Antonette N. De las Penas

AFFILIATIONS: Ateneo de Manila University

The focus of this paper is to highlight teaching mathematics with the use of technology, incorporating cultural connections.

The first part of the talk focuses on geometric patterns appearing in Philippine artwork that are used as tools in understanding concepts in geometry and algebra. The Philippines is composed of 7,100 islands, home to indigenous communities of varied culture. By bringing into the mathematics classroom works of these communities, the students perceive that mathematics comes from what is done in everyday life, and that it exists in their own culture. In the second part, we discuss the role of web resources and online geometric software in facilitating a cultural dimension to the mathematics being discussed in the classroom.

ABSTRACT FOR 20348

DISCOVERING MORE MATHEMATICS AND APPLICATIONS BY INTEGRATING CAS WITH 3D DGS

AUTHOR: Wei-Chi Yang

AFFILIATIONS: Radford University

It is known that Computer Algebra Systems such as Maple, Mathematica and etc. have assisted us greatly in numeric, algebraic and symbolic computations, which are pivotal for our teaching, learning and research. We have also seen the impacts of 2D Dynamic Geometry Software (DGS) such as Geometers' SketchPad, Cabri II and etc in mathematics education. In this paper, we use examples to demonstrate, from users' point of view, how the integration of CAS with a 3D DGS provides us crucial 3D visualizations and theoretical verification needed in teaching and research in mathematics and its applicable fields.

ABSTRACT FOR 20349

ICT (I SEE IT) IN MATH EDUCATION

AUTHOR: Inder Rana

AFFILIATIONS: Department of Mathematics, Indian Institute of Technology Bombay, Mumbai, India

ICT in education has been a buzz word for about 10 years now; still the debate is on the various issues of integrating ICT in education: -what is ICT? -What role it can play? - The level at which it is suitable (primary/middle/secondary/higher education)?-how effective it is and it can be? - Issues like teachers' orientation?-outcomes versus the cost? - and some on. Each specific country has its own answers to above questions (see [1]). For some of the Indian initiatives and outcomes, one may look at [2]. The aim of this paper is to look at some suggestions for answering first two questions in the context of math education. We will illustrate with examples how ICT tools can help effectively support various pedagogical components in math education at various levels of math education.

References

[1] ICT in Education <http://www.unescobkk.org/education/ict/>

[2] UNESCO Bangkok <http://www.unescobkk.org/education/ict/countries/country-information/india/>

ABSTRACT FOR 20350

KEY FACTORS FOR SUCCESSFUL INTEGRATION OF TECHNOLOGY INTO THE CLASSROOM: TEXTBOOKS AND TEACHERS

AUTHORS: Hee-chan Lew, Seo-Young Jeong

AFFILIATIONS: Department of Mathematics Education, Korea National University of Education, South Korea, Department of Mathematics Education, Korea National University of Education South Korea

The purpose of this paper is to investigate some causes of why technology has not been integrated into mathematics teaching by teachers. We considered two aspects to examine these causes in this paper; Korean mathematics textbooks as teaching materials implementing technology, and teachers' concern on using technology and their levels of its use. First, we analyzed the role of technology in mathematics teaching and learning, especially concentrated on Korean secondary mathematics textbooks. Secondly, we surveyed Korean secondary mathematics teachers' concerns about integrating technology into their mathematics education and the teachers' level of its use in the mathematics classroom. We found that mathematics teachers need more proper information and support to integrate technology into teaching mathematics. Additionally, this paper suggests that educational researchers or administrators help teachers move toward more practical use of technology without emotional or physical barriers in mathematics classroom.

ABSTRACT FOR 20359

EXPLORING SPACE FILLING ORIGAMI

AUTHOR: Wenwu Chang

AFFILIATIONS: Shanghai Putuo Modern Educational Technology Center, China

A new tetrahedra origami model was discussed in this paper. Sommerville in 1922 found four kinds of tetrahedron could fill space. This model starts from a rectangle paper, whose shape ratio is $1:\sqrt{2}$, to produce one Sommerville's main tetrahedron. It is proved that as long as the original paper is big enough, one can produce by this origami method more and more so called Sommerville-tetrahedrons without cutting or pasting. Furthermore, these tetrahedrons fill three-dimension space in the same time. Just like Peano curve fills two-dimensional space, the original paper (two dimensional manifold) used in producing tetrahedrons fills the three-dimensional space. This paper also introduces some interesting models in the lower number cases.

CASE STUDIES IN EXPERIMENTAL MATHEMATICS

AUTHOR: Shailesh Shirali

AFFILIATIONS: Sahyadri School (KFI), Krishnamurti Foundation India, Rishi Valley School (KFI)

Experimental mathematics is now a well-accepted genre of study. It is a field in which computer-assisted experimentation – the generation of numbers, sequences, graphs and so on, using powerful software – combined with theoretical study can yield a great deal. Though this sounds revolutionary, it is not. Indeed, using numerical and graphical experimentation as a means to arrive at conjectures has been a standard mode of operation used by mathematicians for centuries. The only difference is that today vastly stronger technology is available to us.

In this talk we describe three problems in which substantial progress is accomplished when computer software is used:

1. A problem from number theory, featuring an iteration with an unusual conclusion;
2. A problem dealing with the enumeration of integer-sided triangles; and
3. A problem from geometry, in which we study the variation in a trigonometric function defined on the set of all triangles.

We also give solutions to the three problems.

DEVELOPING STUDENTS' MATHEMATICAL THINKING THROUGH TECHNOLOGY

AUTHOR: Jonaki Ghosh

AFFILIATIONS: Lady Shri Ram College, Delhi University

Research has shown that the appropriate use of technology can transform the traditional mathematics classroom into a dynamic learning environment where the student is actively engaged in constructing mathematical concepts and knowledge. There are a plethora of technological tools which can enable students to explore and discover mathematical concepts. These include Dynamic Geometry Software (DGS), graphics calculators, spreadsheets and Computer Algebra Systems (CAS). Because of these tools, the emphasis in the mathematics classroom has shifted from memorising procedures and techniques to conjecturing, meaningful problem solving and developing mathematical reasoning. These technologies provide numerous advantages. They enable the student to explore mathematical ideas graphically, symbolically and numerically. They can be used as pedagogical tools to extend student's mathematical thinking and provide possibilities in mathematical modelling activities. Their ability to effectively take over tedious calculations and algorithmic procedures reduces cognitive load on the student and enables her to focus on developing mathematical insight.

This presentation will focus on how an appropriate combination of CAS and graphics calculators along with paper-pencil tasks can be used to develop student's mathematical thinking. Some examples of technology enabled explorations by students at the higher secondary school level will be used to highlight how such tools can enhance visualization of concepts, give students access to higher level concepts and lead to a rich and motivating environment for exploring mathematical ideas. The presentation will also illustrate students'

explorations of some interesting applications of school mathematics to topics such as cryptography, genetics, estimating π (Buffon's Needle problem) and fractal patterns in the complex plane. It will be shown that the appropriate use of technology can help students in their investigations giving them control over what they are learning and also help to create a balance between conceptual and procedural knowledge.

ABSTRACT FOR 20400

TECHNOLOGY ENHANCED PROBLEM BASED LEARNING WITH APPLICATIONS TO REAL-WORLD PROBLEMS

AUTHORS: Padmanabhan Seshaiyer, Byong Kwon and Thomas Stephens

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Abstract: In this paper, we consider the application of two diverse software tools to simulate differential equation models developed for disease dynamic models. Specifically, we motivate the SIR disease epidemic model that consists of a system of differential equations that can be solved via numerical algorithms including Euler's method and Runge-Kutta method. We implement these using a MATLAB literate programming approach and show how one can obtain best fit parameters for given data from the real-world and also visualize it using a graphical user interface (GUI). We also present an alternative approach using the AMPL Optimization software to do the same problem. The purpose of introducing the latter software is its capability to handle real-world problems with big data. The results obtained from both methods are comparable yielding similar best-fit parameters for a given set of data and they suggest that the methods proposed herein are reliable and robust for solving real-world applications.

Abstracts for Full Papers

ABSTRACT FOR 20210

DIFFUSIVE MASS TRANSFER IN AN ECCENTRIC ANNULAR FLOW

AUTHORS: Uma Devi, Bathalapalli Uma Devi, Dinesh P A, Indira Rao

AFFILIATIONS: JSSATE, Bangalore, MSRIT, Bangalore, NMIT, Bangalore, Asst.Professor, Dept. of Mathematics, J.S.S.A.T.E, Bangalore, Associate Professor,, Dept. of Mathematics, MSRIT, Bangalore, HoD & Professor,, Dept. of Mathematics, NMIT, Bangalore

The dispersion in an eccentric annulus region by taking blood as a Newtonian fluid with the investigation of oxygen transfer to the tissue cells in an eccentric catheterized artery is studied. The region bounded by eccentric circles in x-y plane is conformal mapping to concentric circles in plane using a conformal mapping . The resulting governing species equations are analytically solved by using transformation for the concentration. Numerical computations are carried out to understand the simultaneous effects of absorption parameter and eccentricity on the flow with respect to time. The observation through the numerical computations reveal that, as absorption parameter and eccentricity enhances, the solute concentration diminishes.

ABSTRACT FOR 20212

KLEIN MODEL OF THE THREE-DIMENSIONAL SPHERE AND DYNAMIC CONSTRUCTION OF COMMON PERPENDICULAR

AUTHORS: yoichi maeda

AFFILIATIONS: Tokai University

In this paper, we introduce • gKlein model• h of the three-dimensional sphere derived from the stereographic projection of the sphere. In this model, geodesics look like Euclidean lines instead of Euclidean circles in the stereographic projection. With this model, we study how to make a right angle. For a pair of geodesics in the three-dimensional sphere, there are two common perpendiculars in general. We propose a simple construction of the common perpendiculars. In addition, we mention that Klein model of the three-dimensional sphere has a relation with Klein model of the three-dimensional hyperbolic space.

ABSTRACT FOR 20213

MATHEMATICS TEACHING, LEARNING AND ASSESSMENT USING LATEST ICT TEND SOCIAL MEDIA

AUTHORS: ENAGANDULA PRASAD, Dr.A.RAMAKRISHNA PRASAD

AFFILIATIONS: VIGNANA BHARATHI INSTITUTE OF TECHNOLOGY, Director of UIIC Jawaharlal Nehru Technological University Hyderabad, Andhra Pradesh, India

Abstract: ICT stands for "Information and Communication Technologies." it refers to technologies that provide access to information through telecommunications. It is similar to

Information Technology (IT), but focuses primarily on communication technologies. This includes the Internet, wireless networks, cell phones, and other communication mediums. This paper initiates advanced ICT for learning and teaching mathematics through the Social media tools such as Face book, Twitter, YouTube, Geogebra ,Blogs and etc. This paper describes how it works, where it is going, and why it matters in an emerging country-India particularly. It also supports the teaching and learning community in developing ways to gather evidence of the impact of social media tools innovations and current practices on learning mathematics. There is already evidence that teachers are using social media to teach mathematics as part of teaching strategies, with the aim of encouraging students to view social networks as less of a pleasurable distraction. With this paper we are trying to integrate social media into the classroom, and focuses on the need to carefully review existing teaching strategies and understandings of social media before making changes. This paper aims that 'With today''s computer and Information and Telecommunications technologies, every young person can have a quality and deep understanding of mathematical concepts in education regardless of his or her place of birth or wealth of parents in India.
Keywords: Mathematics, Education, ICT Social Media, Face Book and Geogebra.

ABSTRACT FOR 20217

MATHEMATICS TEACHING, LEARNING AND ASSESSMENT USING TECHNOLOGY

AUTHORS: NAGANJANEYULU V, NAGANJANEYULU V

AFFILIATIONS: AL HABEEB COLLEGE OF ENGG&TECH, Assistant Professor Al Habeeb college of engg&Tech

Abstract--This paper describes the effects of using Technology as a teaching and learning aid for engineering mathematics. Teachers feel it difficult while teaching 3D graphs to Engineering students and integration of technology into pedagogy which will improve student learning. While many engineering educators have proposed changes the way mathematics is taught to engineers, the focus has often been only on mathematical content knowledge rather than on pedagogy. Work from the mathematics education community across the world suggests that it could be beneficial to consider a broader notion of mathematics: mathematical thinking, the interdisciplinary usage of mathematics content knowledge. We would like engineering students to learn to identify the problems and problem-solving strategies, use of resources, attitudes and practices. Using technology in Teaching and learning will help the students to understand the difficult tasks easily and further technology will engage students in learning process. This article further discusses each of these aspects of mathematical thinking and others examples of mathematical thinking practices based on the authors' previous empirical studies of engineering students and practitioners uses of Technology in mathematics teaching and learning . This paper offer insights to inform the teaching of mathematics to engineering students using technology.

ABSTRACT FOR 20218

COMPUTING A PERTURBATION BOUND FOR PRESERVING THE NUMBER OF COMMON ZEROS OF A POLYNOMIAL SYSTEM

AUTHORS: Hiroshi Sekigawa, Kiyoshi Shirayanagi

AFFILIATIONS: Tokyo University of Science, Toho University

We propose a method for computing a perturbation bound that preserves the number of common zeros in T^n of a polynomial system $\{f_1, \dots, f_n\}$, where T is the set of nonzero complex numbers and f_j 's are complex coefficient polynomials in n variables, by using Bernshtein's theorem, Stetter's result on the nearest polynomial with a given zero, and minimization techniques for rational functions such as sum of squares (SOS) relaxations.

ABSTRACT FOR 20219

DEVELOPMENT OF AN ITEM BANK SYSTEM FOR THE MATHEMATICS E-LEARNING SYSTEM STACK

AUTHORS: Yasuyuki Nakamura, Tetsuya Taniguchi, Takahiro Nakahara

AFFILIATIONS: Nagoya University, Kitasato University, Sangensha LLC

System for Teaching and Assessment using a Computer algebra Kernel (STACK) is a computer-aided assessment system for mathematics, and functions as a plug-in for the Learning Management System (LMS) Moodle. With the help of STACK, Moodle can provide questions for online tests. These questions typically require a mathematical expression as a response and the responses are assessed algebraically. STACK is not only able to determine whether a student's answer is correct, but can also provide appropriate feedback for various answers. Partial scores can even be assessed for an incomplete answer. However, in order to take advantage of STACK's rich functionality, questions must be designed carefully. Well-designed questions can be valuable educational resources, especially in an e-learning environment. To promote the sharing of high-quality questions for use in online tests, we developed an Item Bank System for the mathematics e-learning system STACK. Using our system, users can submit authored questions in XML format to STACK along with additional meta data, including subject, difficulty level, targeted grade, and publicity level. Once they are uploaded and stored in the system, all users would be able to utilize any questions open to the public. We expect that sharing such questions will further promote the effective use of mathematics e-learning systems.

ABSTRACT FOR 20235

COMPUTER ALGEBRA SYSTEMS AS COGNITIVE TOOLS

AUTHORS: Tadashi Takahashi, Takeshi Sakai

AFFILIATIONS: Konan University

When computer algebra systems (CAS) were introduced, it was expected that it will develop to use effectively as a tool for mathematics education. In the 2000s, with the evolution of both software and hardware, it has become easy to use CAS in the

classroom. However, the proportion of teachers who do so is still quite low. We have to consider their effective use. Humans use strategies to plan solutions, decide procedures, and solve problems. This leads to the cognitive science concept of • htool theory• h. We consider the guideline for structuring a class using CAS and show the practice in this paper.

ABSTRACT FOR 20236

TRANSFORM TECHNIQUES FOR CRYPTOGRAPHY

AUTHORS: Anil Hiwarekar

AFFILIATIONS: Vidya Pratishthans college of Engineering Baramati

Laplace transform has many applications in various fields such as Mechanics, Electrical circuit, Beam problems, Heat conduction, Wave equation, Transmission lines, Signals and systems, Control systems, Communication systems, Hydrodynamics, Solar systems. In this paper we discuss its new application to cryptography. Cryptography is used for securing transmission of messages, protection of data which provide privacy and security for the secret information. Applications of cryptography includes in e-commerce; electronic communications such as mobile communications, sending private emails; business transactions; Pay-TV; transmitting financial information; security of ATM cards; computer passwords etc, which touches on many aspects of our daily lives.

In this paper we developed a new method of cryptography, in which we used Laplace transform of suitable function for encrypting the plain text and corresponding inverse Laplace transform for decryption.

Key words: Cryptography, Data encryption, Applications to coding theory and cryptography, Algebraic coding theory; cryptography, Laplace Transforms.

Mathematics Subject classification: [94A60, 68P25, 14G50, 11T71, 44A10]

ABSTRACT FOR 20254

UNDERSTANDING CONFIDENCE INTERVALS AND HYPOTHESIS TESTING USING EXCEL DATA TABLE SIMULATION

AUTHORS: Leslie Chandrakantha

AFFILIATIONS: John Jay College of Criminal Justice of CUNY

Keywords:

Computer simulation methods have been used in upper level statistics classes for many years. Lately, many instructors are adopting computer simulation to introduce the concepts in the introductory level. Students in introductory statistics classes struggle to understand the basic concepts. Research has shown that the use of computer simulation methods as an alternative to traditional methods of books and lecture enhance the understanding of the concepts.

Computer simulation using spreadsheets such as Excel allows students to experiment with data and to visualize the results. In this paper, we will describe how to use the simulation using Excel Data Tables facility and standard functions to teach confidence intervals and hypothesis testing in introductory statistics classes. We believe, by using this hands on approach, students get a better feel for these abstract concepts. Our preliminary assessment shows that this approach would enhance the student learning of the concepts.

ABSTRACT FOR 20267

EXPLORING NUMERICAL METHODS WITH CAS CALCULATORS

AUTHORS: Alasdair McAndrew

AFFILIATIONS: Victoria University, Melbourne Australia

We describe the use of CAS calculators in a numerical methods mathematics subject offered to third year pre-service teachers. We show that such calculators, although very low-powered compared with standard computer based numerical systems, are quite capable of handling text-book problems, and as such provide a very accessible learning environment. We show how CAS calculators can be used to implement some standard numerical procedures, and we also briefly discuss student satisfaction.

ABSTRACT FOR 20274

THE STORY OF A RESEARCH ABOUT THE NETS OF PLATONIC SOLIDS WITH CABRI 3D: CONJECTURES RELATED TO A SPECIAL NET FACTOR - A WINDOW FOR NEW RESEARCHES

AUTHORS: Jean-Jacques Dahan

AFFILIATIONS: IREM of Toulouse

In 2007, in the paper presented during ATCM, I showed some very strange results about the maximum of the volume of the convex hull of the folded net of a cube. This result found experimentally with Cabri 3D was validated with the use of the CAS of the Voyage 200 of Texas Instruments. The property states that this maximum is reached when the ratio between the volume of the convex hull and the given cube is 4.0141... We noticed that the angle corresponding to this maximum is given by $40.141\dots^\circ$. We have also proven that only the 5 first digits of these two numbers are the same. Several years later, I came back to this problem, trying to find experimentally some property more interesting about this convex hull. I began to explore a possible link between this ratio and the corresponding ratio between the area of the convex hull and the area of the initial cube when the volume is maximized. Very quickly, I pointed a possible property about the value of the ratio of these ratios that could be $\pi/2$. It was so unexpected that I wanted to confirm this conjecture. That is the beginning of this research I want to describe. Lots of conjectures will appear experimentally that we will try to corroborate experimentally. We will study this problem analytically in order to increase the accuracy of the special number we want to discover using different CAS software. Even if the conjectures for the cube and other platonic solids are wrong, it opens a window on a more general conjecture about the value of the special factor of a convex polyhedron in relation with the factors of the platonic solids. This last conjecture seems to be a very difficult problem: this is a problem for those who are interested by such properties. Last remark: most of the analytic formula have been validated with Cabri 3D.

ABSTRACT FOR 20276

PROPAGATION OF LOVE TYPE WAVE IN PIEZOELECTRIC LAYER OVERLYING NON-HOMOGENEOUS HALF-SPACE

AUTHORS: Santanu Manna, Santimoy Kundu, Shishir Gupta

AFFILIATIONS: Indian School of Mines, Dhanbad, Assistant Professor, Department of Applied Mathematics, Indian School of Mines, Dhanbad

The present paper investigates, the mathematical modelling of the existence of Love type waves in a piezoelectric layer overlying a non-homogeneous half-space. Piezoelectric layer is considered for two different cases one is electrical open circuit and another one is electrical short circuit. The general dispersion equation has been derived for both the cases. As a special case dispersion equation has been obtained when the half-space is homogeneous medium. The velocities of Love waves have been calculated numerically as a function of wave number kh . The effect of non-homogeneity and dielectric constant are illustrated by graphs in both electrically open and electrically short circuit cases. All the figures show that phase velocity decreases with the increases of wave number kh . Using MATLAB software, graphical user interface (GUI) has been developed to generalize the effect of parameters discussed. The results can be used to understand the nature of wave propagation in piezoelectric structures.

ABSTRACT FOR 20278

INTEGRATION OF SPREADSHEET INTO THE TEACHING AND LEARNING OF FINANCIAL MATHEMATICS

AUTHORS: Chee-Keong Chong, Marzita Puteh, Swee-Choo Goh

AFFILIATIONS: UTAR, Sultan Idris Education University, Malaysia

In this paper, we will study the technological integration approach of teaching and learning Financial Mathematics. A sample of 85 undergraduates taking Quantitative Techniques took part in this study. They were taught in Financial Mathematics through the traditional approach in the previous trimester. Pre-test was carried out to find out their performance. Later, they were exposed to spreadsheet approach on the same topic. Then a post-test was administered to assess their performance. Post-test results show significant improvement. A survey was carried out at the same time to determine their perceptions on (i) ease of use in spreadsheet, (ii) the use of spreadsheet template, (iii) awareness on the importance of spreadsheet, and (iv) the urgency in learning spreadsheet. Finally a conceptual model of implementing the integration of spreadsheet into the teaching and learning of Financial Mathematics is proposed.

ABSTRACT FOR 20279

INTERVAL-SYMBOL METHOD WITH CORRECT ZERO REWRITING: REDUCING EXACT COMPUTATIONS TO OBTAIN EXACT RESULTS

AUTHORS: Kiyoshi Shirayanagi, Hiroshi Sekigawa

AFFILIATIONS: Toho University, Tokyo University of Science

We propose an interval-symbol method with correct zero rewriting or ISCZ method for short, which is an extension of the so-called interval method, to obtain exact results while reducing exact computations. Namely, this method uses not only a floating-point interval but also a symbol for each real coefficient of a polynomial. Symbols are used to keep track of the execution path of the original algorithm with exact computations. Moreover, the method has the rule of zero rewriting from stabilization techniques, which rewrites an interval into the zero interval if the interval contains zero. The key point is that at each stage of zero rewriting, one checks to see if the zero rewriting is really correct; namely, an interval considered to be zero is really zero by exploiting the associated symbol. Therefore, one can expect that it mostly uses floating-point computations; exact computations are only performed at the stage of zero rewriting and in the final evaluation to get the exact coefficients. As another important merit, one does not need to check the correctness of the output.

The results of Maple experiments on convex hull construction indicate that our method is very effective for non-rational coefficients.

ABSTRACT FOR 20285

GEOGEBRA IN TEACHING AND LEARNING INTRODUCTORY STATISTICS

AUTHORS: Theodosia Prodromou

AFFILIATIONS: University of New England, Australia

This article discusses the special opportunities for teaching statistics that technology offers teachers who aim to provide rich learning experiences for their students. These opportunities involve automation of many activities such as quickly organising data, computing measures, and generating graphs. By automating the tasks of computing statistics or generating data, technology facilitates students' ability to visualise abstract concepts, affording an opportunity to focus on conceptual understandings and data analysis. This article also examines how GeoGebra can be integrated into the curriculum and learning process of introductory statistics to engage college students in cycles of investigation including (a) managing data (b) developing students' knowledge for understanding specific statistical concepts, (c) performing data analysis and inference, and (d) exploring probability models.

Recommendations are included for ways mathematics educators can engage college learners in developing their knowledge for exploring data concepts and doing statistics with GeoGebra.

ABSTRACT FOR 20286**MATHEMATICS TEACHING, LEARNING AND ASSESSMENT USING TECHNOLOGY****AUTHORS:** NAGANJANEYULU V**AFFILIATIONS:** AL HABEEB COLLEGE OF ENGG&TECH

This paper describes the effects of using Technology as a teaching and learning aid for mathematics. Teachers feel it difficult while teaching mathematics to students using technology and integration of technology into pedagogical content knowledge which will improve student learning. While many educators have proposed changes the way mathematics is taught to students, the focus has often been only on Technological Pedagogical Content Knowledge (TPCK) rather than on pedagogy. Work from the mathematics education community across the world suggests that it could be beneficial to consider a broader notion of mathematics: mathematical thinking, the interdisciplinary usage of mathematics content knowledge. We would like students to learn to identify the problems and problem-solving strategies, use of resources, attitudes and practices. Using technology in Teaching and learning will help the students to understand the difficult tasks easily and further technology will engage students in learning process. This article further discusses each of these aspects of mathematical thinking and others examples of mathematical thinking practices based on the authors' previous empirical studies of students and practitioners uses of Technology in mathematics teaching and learning. This paper offer insights to inform the teaching of mathematics and incorporate technology in the context of teaching and learning mathematics using technology.

ABSTRACT FOR 20287**MATHEMATICAL STUDY OF G-TYPE SEISMIC WAVES IN HETEROGENEOUS LAYER OVERLYING A NON-HOMOGENEOUS HALF-SPACE****AUTHORS:** Santimoy Kundu, Shishir Gupta, Santanu Manna**AFFILIATIONS:** Indian School of Mines, Dhanbad, Professor, Department of Applied Mathematics, Indian School of Mines, Dhanbad, Research Scholar, Department of Applied Mathematics, Indian School of Mines, Dhanbad

The propagation of G type seismic waves in heterogeneous layer overlying a non-homogeneous half space has been studied in this paper. We have considered the rigidity and density in upper layer is in exponential form. Both the rigidity and density in the lower non-homogeneous half-space are varying with depth. Dispersion equations have been obtained in closed form. As a special case when the medium and half-space are homogeneous then the dispersion equation coincides with classical equation of Love wave. Dispersion curves are plotted for different values of inhomogeneity parameters. It is observed that inhomogeneity parameters has dominant effect on the propagation of G type wave. We have seen that the phase velocity decreases with the increases of inhomogeneity parameters. Variation in group velocity has been shown graphically. We have also drawn surface plots of group velocity with respect to wave number and depth parameter.

ABSTRACT FOR 20288

EVALUATING IMPORTANCE OF INFORMATION ELEMENTS IN GRAPHICAL CONTENT USING GAZE POINTS

AUTHORS: Ryoji Fukuda, Junki Iwagami, Takeshi Saitoh

AFFILIATIONS: Faculty of Engineering Oita University, Kyushu Institute of Technology Japan

In this study, we evaluate the importance of information elements using gaze points of a person with normal vision. There are many information elements in a mathematical figure. It is necessary to identify important information elements in order to prevent information overload. We focus on elementary geometric figures and express them using directed graphs. non-visual communication analyze the potential of gaze points to express subconscious intentions.

ABSTRACT FOR 20289

GRAPHIC INPUT SYSTEM IN ELEMENTARY GEOMETRY FOR NON-VISUAL COMMUNICATION

AUTHORS: Ryoji Fukuda, Masato Kojo

AFFILIATIONS: Faculty of Engineering Oita University, Faculty of Engineering, Oita University Japan

In this study we developed a graphical input system of elementary geometry for non-visual communication. In this field, figures contain various information elements, that are expressed by delicate positional relations between various element pairs. These communications are done subconsciously among sighted persons using, for example, handwritten figures. We analyze these tasks and recognized their intentions based on the hand-written curves.

ABSTRACT FOR 20290

ACTIVITIES FOR CULTIVATING CREATIVITY IN STATISTICS COURSE

AUTHORS: Kyoko KAKIHANA, Mr.Takumi MAKINODAN, Miss. Atsumi Kimura

AFFILIATIONS: Tsukuba Gakuin University, Teshirogi Junior Highschool, ahij21@tkb.ed.jp

During the past ten years, the internet has spread widely and quickly into our lives. In that period of time, we have had numerous chances to extract meaningful data from massive amounts of information and make decisions or create new ideas with these data. Additionally, it has become important to know how this data, through analysis and calculation, is to be characterized. For these activities, it is necessary to develop students' statistical literacy. In math education, statistics education is one facet that is focused upon. In Japan, "Utilization of Data" at the junior high school level and "Data Analysis" at the high school level have been included in the new Courses of Study by MEXT (the Ministry of Education, Sports, Science, and Technology). Also, in Principles and Standards for School Mathematics (the National Council of Teachers of Mathematics, the U.S.) it has been stated that "Students need to know about data analysis and related aspects of probability in order to reason statistically—skills necessary to becoming informed citizens and intelligent consumers." However, many teachers appear to be at a loss as to how to teach statistics in math courses. One possible

reason is that they have been taught statistics by basic statistical expression and calculation without the use of concrete examples by paper and pencil. Therefore it is difficult for teachers to teach statistical literacy and for students to understand statistical thinking. In this paper, a new type of educational activities to cultivate statistical literacy through the collection and analysis of data are shown; through these activities students seemed to use mobile data terminals effectively.

ABSTRACT FOR 20291

THE MOVEMENT FROM BEHAVIORISTIC ORIENTATION 'COMPUTER ASSISTED INSTRUCTION' TO CONSTRUCTIVISTIC ORIENTATION 'STUDENT PROGRAMMING' IN MATHEMATICS EDUCATION

AUTHORS: Mamdouh Soliman

AFFILIATIONS: Professor, Mathematics Education, College of Education, Kuwait University

This study presents a historical background and attempts to describe the shift in the use of computers in mathematics education from behavioristic oriented CAI movement towards constructivist based on student programming movement. The purpose of this paper is to review the changes that computers have on mathematics education, and their applications on teaching and learning of mathematics. There are three broad categories of the applications of computers in that field: computer assisted instruction (CAI), student programming, and general purpose educational tools such as spreadsheets, databases and computer algebra systems (CAS).

To achieve the purpose of the paper we describe how that behaviorism is considered to be the theory underlying CAI. According to that we considered the most types used in CAI programs: drill and practice, computers as tutors, simulations, gaming. The paper also clarified the effects of CAI programs on learning and teaching mathematics. The second step is to clarify student programming and its effectiveness on teaching and learning mathematics which started from the strong connections between students own computer programs in mathematics and their thinking processes. We reviewed tow traditions: the first one is the BASIC-PASCAL tradition. The other tradition, LOGO which is rooted from the artificial intelligence and supported by Piagt's cognitive development theory. There are different uses of LOGO across mathematics curriculum. There are many examples to show the signicance use of LOGO such as : the concept of ratio, the idea of measurement: distance on a floor can be described in terms of units of natural number concepts which can be developed through guessing the number. The early findings indicated that LOGO had an effect in improving cognitive and problem solving skills more efficient than CAI in various measures of cognition, such as reflectivity and divergent thinking.

By using spreadsheets in the mathematical curriculum we can: drawing graphs comparing the graphs of $y=x^2$ and $y=x^3$ - finding the second and thirds roots of numbers through iteration. Finding for instance, length of the inside edge of cubicle box given the volume numerically - calculating the area under a curve - introducing the function concept. For example, a set of numbers in one column and another set of numbers in another column can be represented by the symbols x and y . The function can be defined as relation between two sets of data.

By the end of our paper we introduce Computer Algebra Systems (CAS) are digital devices used to manipulate symbols. The current survey indicated that various computer applications in mathematics education contributed greatly to classroom practices.

CONCEPTUAL DEVELOPMENT AND THE MODERN SCIENTIFIC CALCULATOR: USING A FORGOTTEN TECHNOLOGY

AUTHORS: Barry Kissane, Marian Kemp

AFFILIATIONS: Murdoch University

Calculators have frequently been regarded only as devices to perform calculations and thus often regarded with disapproval by mathematics teachers. With the availability of sophisticated technologies in many settings, it seems that the potential for scientific calculators has been neglected recently, and developments in this technology not adequately exploited. This is of particular significance in developing countries, where resources are limited. In this analytic paper, we highlight some opportunities created for conceptual development with regular access to a modern scientific calculator. The focus is on the development and deep understanding of mathematical concepts, widely recognized as of prime importance to student learning. The analysis is illustrated with examples related to the multiple representation of concepts and to the use of an advanced scientific calculator to provide numerical experience of important mathematical concepts.

Abstracts for Papers with Abstract Only

ABSTRACT FOR 20199

A COMPARISON OF POLYTECHNIC STUDENTS' ATTITUDES TOWARD ADVANCED SCIENTIFIC CALCULATORS

AUTHORS: Wei Ching Quek, Chew Pheng Kok-Mak

AFFILIATIONS: Singapore Polytechnic

Students from Singapore Polytechnics have wide range of mathematics background. Most of them continue with their polytechnic education with calculators approved for the primary school leaving examination. During their course of studies, they may be introduced to some functions such as SOLVE, MATRIX, VECTORS, COMPLEX that are useful for engineering mathematics, but these functions may not be available in their calculators. No previous studies had examined how students' mathematical backgrounds influenced their choice of calculators in engineering mathematics instruction. Two groups of students are selected and introduced to advanced scientific calculators in their engineering mathematics modules. The study sought to determine whether there was a difference in student's attitude towards advanced scientific calculators in engineering mathematics instructions. Do student's attitudes towards advanced scientific calculators use in mathematics instruction differ in terms of mathematical ability level? Do student's attitudes towards advanced scientific calculators use in mathematics instruction differ in terms of price range of the calculator? Do they concern about being over dependent on the calculators? Data collected from questionnaire and exam scores was analysed using both descriptive and inferential statistics. The results indicate that a significant difference in attitudes towards the use of advanced scientific calculators. The findings of this study are useful to module coordinators and module developers.

ABSTRACT FOR 20200

IMPROVING STUDENTS' CONCEPTUAL UNDERSTANDING THROUGH THE USE OF INTERACTIVE SMART BOARDS AND VIRTUAL MANIPULATIVES

AUTHORS: Beverly Ferrucci

AFFILIATIONS: Keene State College

To encourage students to develop research skills, institutions often initiate programs of faculty-student research. This presentation reports on one of several recent faculty-sponsored projects that merge mathematics education research and technology. Groups of prospective elementary school teachers received instruction in spatial visualization using either concrete 3-D tangram blocks or virtual analogues on Smart Boards. Analogues were programmed in Sketch Up by the student, who also delivered the instruction; instructional and research design were a joint, student-faculty component of the project. Results showed (1) significant gains only for the technology group; and (2) increasing student-reported levels of comfort with virtual blocks that showed evidence of approaching their comfort with the concrete blocks.

ABSTRACT FOR 20208

A BENCHMARKING APPROACH OF QUALITY ASSESSMENT FOR E- AND BLENDED LEARNING

AUTHORS: Stefan Oeyen

AFFILIATIONS: University College Limburg associated Catholic University Leuven

The increasing use of Information and Communication Technology (ICT) has a major and important influence on the education of mathematics around the world.

This evolution makes us think about the choice of media, the software usable for the set objectives, digital didactics and pedagogy... In this fascinating world of e- and blended learning it is a great opportunity to ensure and improve the quality of mathematics education. Reflecting (self and with peers) about this subject is absolutely necessary. This presentation provides tools for quality assessment in e-and blended learning. The focus will be on "course design", one of the six areas which can be assessed (strategic management, curriculum design, course design, course delivery, staff support and student support).

By focussing on specific benchmarks and criteria, teachers or multidisciplinary teams will be able to develop performance indicators which are fit for purpose in their own context. This method might form the basis for a self-evaluation about the quality of a personal course.

ABSTRACT FOR 20230

WHAT'S NEW AND EXCITING ON THE WEB FOR MATHEMATICS TEACHERS

AUTHORS: Douglas Butler

AFFILIATIONS: iCT Training Centre, Oundle (UK), Autograph-Maths

Bring your own device to this session and explore Douglas' TSM Resources website (Technology for Secondary Mathematics):

- tools for the busy teacher
- ideas for using Google Earth
- selection of great iPad apps for mathematics
- interesting images to fit graphs to
- interesting data to analyse

www.tsm-resources.com

ABSTRACT FOR 20256

VIRTUAL MANIPULATIVES AS A TOOL FOR DISCOURSE IN TEACHING CHILDREN MATHEMATICS

AUTHORS: William Speer

AFFILIATIONS: Director, Mathematics Learning Center, University of Nevada Las Vegas

For children, in fact, for all, learning mathematics is best evidenced when the ability to transfer and the ability to make connections are present. When choosing a virtual

manipulative students should not be able to quickly complete a designated activity without making connections to the underlying mathematics. One of the best ways to judge the attainment of these abilities is to engage the student in discourse. This leads to technology as a tool to further student learning, not replace or hinder it.

ABSTRACT FOR 20272

OPTIMIZATION APPROACHES IN IMRT PLANNING

AUTHORS: KISHORE S P, NARASIMHAM N V S L, RAMAKRISHNA PRASAD A

AFFILIATIONS: VARDHAMAN COLLEGE OF ENGINEERING

Keywords-intensity modulated radiotherapy (IMRT); Dose volume histogram (DVH); beam angle optimization (BAO); linear programming problem; nonlinear programming problem. Radiation is one of the most common treatments for cancer and is often a part of the main treatment for specific types of cancer, such as, lung, head and neck, Hodgkin disease. The main challenge is to quantify optimization techniques in radiation therapy. In the formation of a model a lot of emphasis is given on testing various objective functions with constraints. The challenge in therapy planning is to determine a treatment plan which would involve finding irradiation directions, beam parameters and optimize intensity profiles. In recent years IMRT has helped in the realization of conformal therapy. The main objective of conformal therapy is to deliver a lethal dose of radiation to the tumor while sparing the OARs (organs at risk). Radiation oncologists often use cumulative dose volume histogram to determine the quality of treatment plan. In this paper an attempt has been made to study radiation treatment planning using linear and nonlinear programming approaches.

ABSTRACT FOR 20282

EXPLORING TAXICAB GEOMETRY WITH EXCEL

AUTHORS: Maryanne Bagore, Jeffrey Ambelye, Deane Arganbright

AFFILIATIONS: Divine Word Univ., PNG (Emeritus), Dept. of Information Systems Divine Word University Madang, Papua New Guinea, Dept. of Mathematics and Computing Science Divine Word University Madang, Papua New Guinea

In this interactive presentation we use Microsoft Excel to investigate the geometry of the real plane that is generated by the taxicab metric $d((x_1, y_1), (x_2, y_2)) = |x_1 - x_2| + |y_1 - y_2|$. In the process we compare and contrast this geometry with Euclidean geometry, finding both similarities and many surprising differences. We use a wide range of the features of Excel not only to display our results, but also as a way for students to discover patterns, as we generalize many of the results of standard analytic geometry. We use both spreadsheet charts and the basic spreadsheet display itself to visualize illustrate our results and applications, and provide some creative Excel animations. Our material has been developed in teaching the concepts to students in both standard and online classes.

ABSTRACT FOR 20284

BIAS REDUCTION METHOD APPLIED TO REGRESSION: MODELLING COUNT DATA

AUTHORS: Ashwini Joshi, Vidyagouri Prayag, Pralay Senchaudhuri

AFFILIATIONS: Cytel Statistical Software & services Pvt. Ltd., Cytel Statistical Software & Services Pvt. Ltd., Cytel Inc.

Abstract: This paper deals with the bias reduction method for computing estimates of parameters maximizing the likelihood of Poisson regression. The method is implemented for count data such as lesions in multiple sclerosis, MRI trials etc which arise in clinical trials quite often. The penalization of likelihood is required in order to reduce bias as suggested by Firth (1993, Bias reduction of maximum likelihood estimates. *Biometrika*, 80, 27-38). Using the set up of Generalized Linear Models (GLM) Poisson regression is dealt with by computing point as well as interval estimates of parameters. Important aspects of these biased reduced estimates such as shorter confidence intervals, existence in case of degeneracy, separation or quasi separation in the data are studied. We illustrate the methodology with the help of few examples.

ABSTRACT FOR 20296

INTERACTIVE VIDEOS: ENGAGING STUDENTS IN AND OUT OF THE CLASSROOM

AUTHORS: Haitham Solh

AFFILIATIONS: American University in Dubai, Louisiana State University, University of Southern Mississippi

In a technology-oriented world, numerous tools provide help for students studying Mathematics, but few are as engaging as interactive video lessons. This paper provides a theoretical background for this approach, focusing on the differences between procedures and concepts in Mathematics. Then, the “interactive video” approach is explained in detail. Finally, advantages of this approach are highlighted in comparison with current online teaching videos.

ABSTRACT FOR 20298

ANIMATED TEACHING MATERIALS FOR STATISTICS EDUCATION IN BEGINNER-LEVEL UNIVERSITY CLASSES

AUTHORS: Shunji Ouchi, Setsuo Takato

AFFILIATIONS: Shimonoseki City University, Toho University

We will consider how animated teaching materials created with KETPic and R help novice learners understand statistical concepts and effect their visualization of statistical chance (stochastic) phenomena. KETpic is a macro package used to embed high-quality graphics in LaTeX documents which can be implemented in different Computer Algebra Systems including R. R is a popular open-source software tool used in statistical analysis and for graphic output. It provides a wide variety of statistical and graphical techniques, and is highly

extensible. Through careful utilization of both these systems, it is possible to develop animated teaching materials that contribute positive effects to statistics education. In this report, we will introduce and demonstrate the animated teaching materials (in PDF format) we have created, including graphics based on simulated data sets generated by R.

ABSTRACT FOR 20304

HANKEL DETERMINANT FOR A NEW CLASS OF CONVEX STARLIKE ANALYTIC FUNCTIONS

AUTHORS: Gurmeet Singh

AFFILIATIONS: Khalsa College, Patiala

ABSTRACT: We introduce a new class of Convex Starlike analytic functions and its subclasses and obtain sharp upper bounds of the functional $|a_2 a_4 - a_3^2|$ for the analytic function $f(z) = z + \sum_{n=2}^{\infty} a_n z^n, |z| < 1$ belonging to these classes.

ABSTRACT FOR 20306

ON THE EFFECTS OF VISUALIZING ACTIVITIES OF QUADRATIC CURVE PROBLEMS USING GEOGEBRA

AUTHORS: Minshik Cho, Sang-Je Cho, Kwang-Sang Lee

AFFILIATIONS: Department of Mathematics, Korea National University of Education, Graduate School, Korea National University of Education, Korea Institute for Curriculum and Evaluation

The quadratic curves are one of the most important contents of Korean high school mathematics courses. They are defined analytically as the locus satisfying some geometric properties. Hence students mostly learn the topic only practicing and calculating equations in the coordinate plane. Since they do not mention how quadratic curves are connected with cross section of cone in Korean textbooks, many students don't understand involved geometric meanings in analytic problems.

The purpose of this study is to investigate, through case study, how to apply Geogebra and to find out effective methods for learning quadratic curves with technological assistance. We adopted some difficult test problems from College Entrance Exam, so called - CSAT (College Scholastic Ability Test). Only a few students could solve those problems analytically. Many students could not even understand written solutions. One of the reason is that the lack of understanding on the relation between analytic expression and its geometric meaning.

Learning worksheets including GeoGebra activities were designed so that student's understanding of the quadratic curves can be improved. During the class with GeoGebra activities, students could correct their misconceptions and understand the reason why the shape of construction are quadratic curves.

Analysis of data including worksheets, Geogebra activities, and interviews showed effects of geometric understanding as a result of utilizing Geogebra. During the students had personally composed problem situations on their own through Geogebra, they had intuitively recognized

beneath geometric meaning. Moreover, they could understand geometric behavior and related concepts through the process of manipulating worksheets using some functions of GeoGebra, especially coordinate indicating function, drawing graph, dragging graph, and slider emerged.

ABSTRACT FOR 20309

THE USE OF DYNAMIC TOOLS TO DEVELOP STUDENTS' UNDERSTANDING OF THE FUNDAMENTAL IDEAS OF CALCULUS

AUTHORS: Debbie Verzosa, Angela Fatima Guzon, Ma. Louise Antonette De las Penas

AFFILIATIONS: Ateneo de Manila University

Although dynamic geometry software has been extensively used for teaching calculus concepts, few studies have documented how these dynamic tools may be used for teaching the rigorous foundations of the calculus. In this presentation, we describe lesson sequences utilising dynamic tools for teaching the epsilon-delta definition of the limit and the Fundamental Theorem of Calculus. The lessons were designed on the basis of observed student difficulties and the existing scholarly literature. We first discuss students' initial understanding of the formal definitions in calculus as well as some of their initial proof constructions. We then present ways by which teachers can design guide questions to accompany the dynamic tools so as to facilitate students' reconstruction of these calculus ideas.

ABSTRACT FOR 20310

PILOT STUDY USING CASIO MATHS TEACHING AND LEARNING TOOLS AT HIGHER SECONDARY STAGE IN DELHI NCR REGION

AUTHORS: P. K. Chaurasia

AFFILIATIONS: National Council of Educational Research and Training, CASIO

With believe that use of ICT foregrounds the ways in which teaching learning community can match in school the opportunities for learning more qualitatively. The role of ICT in the mathematics curriculum is much more than simply a technical skill or as a means of improving learning effectiveness. It shows way for transforming the goals and processes of education. It provides a real opportunity for teachers of all phases and subjects to rethink fundamental pedagogical issues alongside the approaches to learning that students need to apply in classrooms. To taste our believe that when students learn with Casio technology of teaching and learning Mathematics, they may use it as a cognitive tool that helps them to construct meaning based on their prior knowledge and conceptual framework, we planned to conduct this pilot study.

In fact, the mathematics education community is engaged in a constant quest to find out how children best learn mathematics. Due to coherence property of Mathematics, it is an enormous and constantly expanding network of interrelated facts and ideas like the fields of cognitive development and the psychology of learning. A large proportion of teachers these days try to base much of their teaching practice on constructivist ideas – that is, on the belief that the teacher's role is to create opportunities for children to build their own understandings of concepts. However, if only we could discover precisely how the child best

learns mathematics then we could work out exactly how to teach the child the subject in the most effective way. Based on these pedagogical processes of teaching and learning Mathematics, in this pilot study we will try to discover how the Casio's digital technologies will help students to best learn with.

Even though technology can influence what is taught, teachers need to be mindful of designing instruction and environments that promote these content and learning framework. To test our beliefs that Casio tools support learning requirements when it is used "as a tool for processing the concepts with investigations and problem solving", we selected fifteen CBSE based schools in Delhi NCR region. The research team has designed instructions for five selected chapters of higher secondary Mathematics curriculum. The study is still in process. In the initial interaction of teachers in their classroom, we started with the experience that these Casio based digital technologies can be seen as catalysts for a paradigm shift. In recent years, the emerging information and communication technologies (ICTs), has shifted our views on effective teaching and learning even further. Emphasis is now placed on equipping students with effective inquiry skills, including the ability to find and process new methods. The question was- up-to what extent the use of digital technologies like Casio's Mathematics teaching and learning tools supports these different learning dimensions? Can Casio digital technology create an environment, rather than just a tool, for learning and teaching? The study is still in process with a group of Mathematics teachers in 15 schools of Delhi NCR region. The initial reflections are very important and also guiding the further movement with the study.

ABSTRACT FOR 20312

ANALYSIS OF UTILIZING GSP PROCESSES IN SOLVING GEOMETRY PROBLEMS BY THE GIFTED

AUTHORS: Jaehak Lee, In Suk Choi

AFFILIATIONS: Korea National University of Education, Ulsan Science High School, Korea

The purpose of this study is to analyze the process of utilizing the GSP software program in solving geometry problems by the mathematically gifted. This study aims to provide information pertaining to the demands of teachers and students using GSP, and to find the most practical, efficient application in the geometry class. For these purposes, two research tasks were set up as follows: 1. How do the gifted utilize GSP in solving geometry problems? 2. what do the gifted think about utilizing GSP in solving geometry problems?

In order to solve these research issues, I studied the characteristics of the gifted, and I developed geometry-related teaching and learning materials for the gifted. I designed a task that required students to find original images of anamorphic images by anamorphic systems such as the mirror shape of a right circular cone and cylinder.

I observed the following results from this study. First, the gifted students utilized GSP to devise a plan for solving their problem, or to correct mistakes they had made in their solution plan. They were not satisfied with only finding a solution; they also wanted to discover the reasoning behind their solution. Using GPS, they were able to consider all of the conditions of solving the problem. Some students used all of the conditions, and others used only a few. They wanted to modify the problem using GSP. They used the software to save time and effort after using their energy to develop the larger concepts. Secondly, the gifted used the GSP program as a tool for exploring new solutions to problems. They felt that it was a great

achievement to be able to visualize the problem as a mathematical modeling of their ideas. However, they didn't use GSP to develop their solution.

We can determine the following conclusions from the results of this study. First, the gifted are able to both model and justify mathematical problems using GSP. Because the students I observed are particularly talented in mathematics, they were able to make progress toward solution strategies without the normal regressions that one would expect from another group. Secondly, these students have a strong desire not only to see a concrete representation of their ideas, but also to create formal justification for their solutions. They were quite pleased that the GPS software enabled them to do those.

ABSTRACT FOR 20317

GEOGEBRA FOR TABLETS AND ON OTHER DEVICES

AUTHORS: Zsolt Lavicza, Balazs Koren

AFFILIATIONS: University of Cambridge, Eotvos Lorand University, Budapest

The development of the GeoGebra software has been accelerated during the past years. GeoGebra 4.0 was released in September 2011 with many new functionalities, among others extended statistical features and one-click upload to GeoGebraTube. GeoGebra 4.2 has been available since September 2012, which includes the long awaited feature the Computer Algebra System (CAS) view. Meanwhile the GeoGebra Community has shared more than 40,000 examples on GeoGebraTube in less than two years.

In parallel with the improvement of the Java based GeoGebra software, the GeoGebra Team has started to develop an HTML5 version of the software to make it available on many different devices. The first step was to release GeoGebra in the Chrome WebStore and make it available running in any web browser. However, touch devices needed rethinking of the user interface as well as allowed introducing new functionalities. In September 2013, Tablet Apps for Windows 8, Android and iOS are to be released making GeoGebra available for even more students and teachers. In our talk, we will show functionalities of the new GeoGebra Tablet Apps, give an overview of software development on 3D, Statistics, STEM, GeoGebraTube and show some examples of GeoGebra use in different countries and learning environments.

ABSTRACT FOR 20324

ON THE DEVELOPMENT OF AN UBER-MODERN TECHNO-BLENDED TEACHING AND LEARNING MODEL FOR MATHEMATICS IN SOUTH AFRICA

AUTHORS: Werner Olivier

AFFILIATIONS: Nelson Mandela Metropolitan UNiversity, FirstRand Chair in Maths Education

In this talk we describe the advent of a teaching and learning model that was developed with the aim of addressing the dire mathematics education crisis in South Africa. A description will be given of innovative approaches to harness some of the latest ICT options for flexible teaching and learning support for secondary school learners and teachers. Included in the talk will be a demonstration of curriculum aligned content support for learners via Android Tablets and mobile phones. Recent implementations of a techno-blended model in learner

incubation projects and skills development programmes for teachers will be also be discussed with reference to successes and challenges that were experienced.

ABSTRACT FOR 20325

MATHDISK: AN INTERACTIVE LEARNING ENVIRONMENT

AUTHORS: Mohamed Jaffarali, Ajit Kumar

AFFILIATIONS: Mathdisk Technologies, Department of Mathematics Institute of Chemical Technology Matunga, Mumbai 400 019

In this article we look at new advances in technology for interactive teaching and learning through "MathDisk" for School and College Mathematics. MathDisk, which is designed exclusively for educational purposes, can help students and teachers to experiment and explore mathematics using web. What distinguishes MathDisk from the numerous other dynamic geometry tools currently available is its approach and philosophy. In almost all the Math tools, trying to do anything beyond graphing a simple 2D function requires writing code using the tool's native programming language. MathDisk on the other hand allows the users to express equations as they see it in their textbooks using "Natural Math Notations". The equal emphasis to both the symbolic and visual representations of Mathematics makes MathDisk an ideal tool to create online interactive mathematics textbooks. MathDisk also uses "Integrated Rigid Body Dynamics" which can help students understand the abstract nature of mathematical structures using simulated physical models. Users of MathDisk can use scripting based on the syntax of popular "processing" language to produce amazing math and physics models. "Sequencer" module of MathDisk allows users to deconstruct a given mathematical model by showing how individual steps are transformed and assembled to produce the final output. Unlike desktop based applications, MathDisk allows users to share their individual resources and their entire working space over web, a key feature in today's interconnected world.

ABSTRACT FOR 20329

EFFECTS OF HALL CURRENT ON MHD NATURAL CONVECTION FLOW WITH HEAT AND MASS TRANSFER OF A CHEMICALLY REACTING, HEAT ABSORBING AND RADIATING FLUID PAST AN ACCELERATED MOVING VERTICAL PLATE WITH RAMPED TEMPERATURE THROUGH A POROUS MEDIUM

AUTHORS: Syed Modassir Hussain, Gauri Shanker Seth

AFFILIATIONS: O. P. Jindal Institute of Technology, Indian School of Mines, Dhanbad, Jharkhand

Effects of Hall current on unsteady hydromagnetic natural convection flow with heat and mass transfer of an electrically conducting, viscous, incompressible, chemically reacting, heat absorbing and radiating fluid past an accelerated moving vertical plate with ramped temperature through a porous medium in the presence of thermal and mass diffusions is studied. The exact solutions of momentum, energy and concentration equations, under the Boussinesq approximation, are obtained in closed form by Laplace Transform technique. The expressions for skin friction, Nusselt number and Sherwood number are also derived. The

variations in fluid velocity, fluid temperature and species concentration are displayed graphically whereas numerical values of skin friction, Nusselt number and Sherwood number are presented in tabular form for various values of pertinent flow parameters.

Keywords: Hydromagnetic natural convection, ramped temperature, chemical reaction, heat absorption, Nusselt number, Sherwood number.

ABSTRACT FOR 20334

ACTIVITY THEORY: WHAT DOES IT HAVE TO OFFER TO RESEARCH AND PRACTICE WITH MATHEMATICS AND TECHNOLOGY?

AUTHORS: Kate Mackrell

AFFILIATIONS: University of London

Activity Theory, originating from Marx, Vygotsky, Leontiev and Engestrom, is a theoretical framework in which the fundamental unit of analysis is that of purposeful activity in a cultural-historical context. This paper will introduce and critique the basic concepts of Activity Theory and the ways in which it has been applied in research and practice in interaction design (which includes HCI) and mathematics education using technology.

ABSTRACT FOR 20337

TECHNOLOGY ENHANCES CLASSROOM CONTROL AND IMPROVES STUDENTS' PERFORMANCE

AUTHORS: Bikash Jain

AFFILIATIONS: Future Learning, Educomp Solutions Ltd

Education without proper assessment and gap-filling process is futile
Sharing your knowledge without understanding your audience is not effective
Concept sharing without dynamic, engaging and multiple representations is not modern
Education today has changed its shape – it has oriented itself with multi facet aspect and technology. Explanation involves multi-dimensions: Text, pictures, video, animation, technology, and rehearsal. Pupils are from different culture/background; educators have to understand them and their understanding level before speaking the first bits of curriculum. Concept teaching and deliberation should have exploration suitable to everyone. And then there has to be a proper/quick assessment followed by remedial system in place. All this revolves around two critical persons: Educator and student. Both are under tremendous pressure to achieve excellence.
Use a UNIQUE bundle of technology, off-setting the pain area and supplementing education. Won't it be interesting to enquire which quadrilateral shape would cover the maximum area with constant perimeter, taking a check on prerequisite knowledge, dynamic exploration and then quick assessment, and to close it with remedial note, if any.

Analysis points:

1. What is the magnitude of the effects of technology on schooling outcomes concerning mathematics education?

My conclusions touch on the need for a proper technology-integration, for effective strategies to stimulate deep learning, for goal-directed assessments, for addressing the needs of a

would-be mathematically literate. The evolution of students' understanding after having gone through this kind of procedure is unmatched.

ABSTRACT FOR 20343

ROLE OF TECHNOLOGY WITHIN TEACHING AND STUDYING-“CONNECT”

AUTHORS: Mujo Mesanovic, Madhu Ashok Bathija

AFFILIATIONS: American University of Sharjah

Almost all universities in the world use some kind of online learning product to support and enhance learning. In the field of mathematics there are many products such as Pearson's web based learning product, McGraw-Hill have Connect and Alex and there are many others. We would like to present our experience about McGraw-Hill product called Connect. In this paper we would like to describe firsthand experience using this educational tool for enhancement of learning and teaching of mathematics at university level. We are describing three different approaches to the Connect from faculty side, students' side and administrators' side. We show beneficial factors of the product as well as some difficulties that may happen while using Connect. At the end we present some significant results from the case study that we conducted while using the product in the pre-calculus class for architects at the American University of Sharjah.

ABSTRACT FOR 20364

EXPLORING SPACE FILLING ORIGAMI

AUTHORS: Chang Wenwu

AFFILIATIONS: PuTuo Modern Educational Technology Center of Shanghai

A new tetrahedron origami model was discussed in this paper. Sommerville in 1923 found four kinds of tetrahedron can fill space. Our model starts from a rectangle paper, whose shape ratio is $1:\sqrt{2}$, to produce one of Sommerville's main tetrahedron. We proved that as long as the original paper is big enough, one can produce by this origami method more and more so-called Sommerville-tetrahedrons without cutting or pasting. Furthermore, these tetrahedrons fill the three-dimension space in the same time. Just like Peano curve fills two-dimensional space, our original paper (two dimensional manifold) used in producing tetrahedrons fill the three-dimensional space. This article also introduces some interesting models in the lower number cases.

ABSTRACT FOR 20371

DEVELOPING NEW MODELS USING PERCENTAGE TIME SERIES

AUTHORS: Shou Hsing Shih

AFFILIATIONS: American University of Sharjah

In time series analysis, it is common to use the differencing filter to transfer a nonstationary time series into a stationary one, and normality is often assumed for such stationary time series if someone is interested in its distribution. The purpose of the present study is to look into the probability distribution of different time series, and find new simple models for

different stocks using our newly developed methodology. In this study, we chose several major companies from the New York Stock Exchange and defined a percentage series using each of their daily closing prices. Some simple new models are proposed for these percentage series. Using some recent developments, these models are shown to have closed forms and so the potential for wide applicability.

ABSTRACT FOR 20404

EXPLORING SPACE-FILLING ORIGAMI

AUTHORS: Chang Wenwu

AFFILIATIONS: PuTuo Modern Educational Technology Center of Shanghai

A new tetrahedra origami model was discussed in this paper. Sommerville in 1922 found four kinds of tetrahedron can fill space. This model starts from a rectangle paper, whose shape ratio is $1:\sqrt{2}$, to produce one Sommerville's main tetrahedron. It is proved that as long as the original paper is big enough, one can produce by this origami method more and more so-called Sommerville-tetrahedrons without cutting or pasting. Furthermore, these tetrahedrons fill three-dimension space in the same time. Just like Peano curve fills two-dimensional space, the original paper (two dimensional manifold) used in producing tetrahedrons fills the three-dimensional space. This article also introduces some interesting models in the lower number cases.

Abstracts for Hands-on Workshops

ABSTRACT FOR 20203

EXPLORE RUNGE-KUTTA METHOD WITH ADVANCED SCIENTIFIC CALCULATOR

AUTHORS: Wei Ching Quek

AFFILIATIONS: Singapore Polytechnic

Students always find solving First Order ODE numerically by Runge-Kutta method tedious and prone to errors. We will use scientific calculator to assist the learning and implementation of Runge-Kutta method

This workshop is consists of two activities:

1. Getting Started

Begin with a quick introduction to Runge-Kutta method, followed by exploring essential features of the scientific calculator CASIO fx-991es plus that to implement the procedures.

2. Problems Solving/Discussion

Examine some applications of equations in engineering. Participants will explore the solution to gain further insights to the problem.

ABSTRACT FOR 20214

LEARNING FUNCTIONS AND EQUATIONS WITH AN ADVANCED SCIENTIFIC CALCULATOR

AUTHORS: Barry Kissane, Marian Kemp

AFFILIATIONS: Murdoch University

While scientific calculators have been available since the 1970s, advanced versions have been developed recently to suit the needs of mathematics education and extend the mathematical capabilities to equations, vectors, matrices, series, complex numbers, probability and statistics, as well as elementary calculus operations of integration and differentiation. So, these calculators provide powerful learning opportunities for many aspects of mathematics treated these days in senior secondary school and university curricula, as well as giving students access to efficient calculation. This workshop will use some of the activity materials for the CASIO fx-991ES-PLUS calculator that we have recently developed to consider some of the ways in which learning functions and equations can be enhanced. Previous experience with this calculator is not assumed.

ABSTRACT FOR 20215

LEARNING CALCULUS AND SEQUENCES WITH AN ADVANCED SCIENTIFIC CALCULATOR

AUTHORS: Marian Kemp, Barry Kissane

AFFILIATIONS: Murdoch University

While scientific calculators have been available since the 1970s, advanced versions have been developed recently to suit the needs of mathematics education and extend the mathematical capabilities to equations, vectors, matrices, series, complex numbers, probability and statistics, as well as elementary calculus operations of integration and differentiation. So, these calculators provide powerful learning opportunities for many aspects of mathematics treated these days in senior secondary school and university curricula, as well as giving students access to efficient calculation. This workshop will use some of the activity materials for the CASIO fx-991ES-PLUS calculator that we have recently developed to consider some of the ways in which learning calculus and sequences can be enhanced. Previous experience with this calculator is not assumed.

ABSTRACT FOR 20216

LEARNING WITH GRAPHICS CALCULATORS

AUTHORS: Marian Kemp, Barry Kissane

AFFILIATIONS: Murdoch University

Graphics calculators provide opportunities for both students and their teachers to engage with mathematics in new ways. This workshop is intended to offer an introduction, for those new to this technology, of some of the possibilities open to classrooms in which such technology is present. A key aspect is that graphics calculators can be used to support student learning of mathematics, even in situations for which external examination rules do not permit their use in formal assessment. We will illustrate the possibilities through drawing upon a range of mathematics areas, including the study of functions, equations, differential calculus and elementary statistics. The workshop will use some of the activity materials for these calculators that we have recently developed. The focus will be on teachers of senior secondary or early undergraduate mathematics. We will use both the CASIO fx-CG20 colour graphics calculator and the Casio fx-9860GII graphics calculator, but do not expect that participants will have prior experience with these calculators.

ABSTRACT FOR 20229

AUTOGRAPH – DYNAMIC SOFTWARE FOR 2D AND 3D GRAPHING

AUTHORS: Douglas Butler

AFFILIATIONS: iCT Training Centre, Oundle (UK), Autograph-Maths

Why is Autograph different? Autograph is widely used by teachers and students in UK and many other countries of the world, and a version for IOS and Android tablets is well under way. Autograph can help to visualise key concepts through dynamic objects, and the user interface is straightforward and friendly. Autograph has been localised in 21 languages (including Arabic). There are a large number of resources online (videos, data, images,

tutorials) and files can be saved straight to HTML for viewing on the web. This workshop will cover graphing topics in 2D (from coordinate geometry to differential equations) and 3D (from transformations of shapes to surfaces, lines and planes). The interface gives users time to explore and investigate using a controllable 'slow plot' feature, and animations are particularly effective because of the ability to control the step in real time.

Delegates attending this workshop may bring a laptop, and will be provided with a free installation of Autograph 3.3.

www.tsm-resources.com/autograph

ABSTRACT FOR 20268

DEVELOPING A DEEPER UNDERSTANDING OF MATHEMATICAL CONCEPTS THROUGH HANDHELD TECHNOLOGY

AUTHORS: Wee Leng Ng

AFFILIATIONS: National Institute of Education, Nanyang Technological University

Handheld graphing technology, if used appropriately in the mathematics classroom, has the potential to enhance the teaching and learning of mathematics by empowering students to learn across different visual representations of mathematical concepts. With the aid of such technology, teachers have the means to help students develop a deeper understanding of abstract mathematical concepts and sharpen their critical thinking skills.

In this workshop, participants will explore several mathematical concepts through the TI-Nspire CX handheld.

ABSTRACT FOR 20300

EXPLORING CONCEPTS AND APPLICATIONS OF MATHEMATICS USING A GRAPHICS CALCULATOR

AUTHORS: Jonaki Ghosh

AFFILIATIONS: Lady Shri Ram College, Delhi University

Handheld technology in the form of graphics calculators has brought about a shift of paradigm in mathematics teaching and learning in many countries across the world. The last two decades has witnessed extensive research related to the pedagogical opportunities offered by these tools. Mathematics teachers and educators have been investigating various ways of integrating these devices with classroom teaching in order to enhance visualization, conceptualization and to make mathematics accessible to students of varying levels of ability. The computer-like features and easy portability of graphics calculators provide significant advantages over computer – aided software packages. These devices have proved to be extremely handy for performing mathematical modeling activities and exploring applications of mathematical concepts in the classroom.

This workshop session will illustrate the use of the CASIO fx 9860 GII graphics calculator in exploring mathematical applications from a wide range of areas which are relevant at the senior secondary school and undergraduate level. The explorations will be based on the topics of matrix theory, probability and statistics and will include

- a) Application of matrices to weather forecasting, brand switching, ranking pages on the web
- b) Cryptography
- c) Statistical Inference
- d) Simulating problems in probability, such as the Birthday Paradox and the Monty Hall Problem. Participants will be given a hands-on experience on the calculator and activity worksheets with calculator enabled explorations will be provided during the workshop.

ABSTRACT FOR 20313

RELATIONSHIP AMONG FAMILIAR POLYHEDRONS

AUTHORS: Jen-chung Chuan

AFFILIATIONS: Department of Mathematics, National Tsing Hua University, Hsinchu, Taiwan 300

With Cabri 3D as the tool, we are to guide the audience to construct

- 1) the largest cube included in a regular tetrahedron;
- 2) an animation displaying how a regular octahedron may be turned into a rhombic dodecahedron;
- 3) same as 2) for the icosahedron-rhombic triacontahedron pair;
- 4) same as 3) for the dodecahedron-rhombic triacontahedron pair;
- 5) "tight configuration" formed by a chain of five regular Platonic solids.

ABSTRACT FOR 20316

AUTOGRAPH – DYNAMIC SOFTWARE FOR PROBABILITY AND STATISTICS

AUTHORS: Douglas Butler

AFFILIATIONS: iCT Training Centre, Oundle (UK), Autograph-Maths

This workshop will cover the use of Autograph in the teaching of probability and statistics topics from High School and 1st year College courses. Many teachers find this aspect of mathematics challenging, and Autograph can really help both teachers and students to understand the basic concepts through the use of dynamic objects and real data. The use of the on-screen scribble tool can be particularly effective in questioning their understanding before the computer undertakes a simulation.

The study of discrete and continuous probability distributions is particularly effective in Autograph, including a clear treatment of Type 1 and Type 2 errors.

Delegates attending this workshop may bring a laptop, and will be provided with a free installation of Autograph 3.3.

www.tsm-resources.com/autograph

ABSTRACT FOR 20319

TRICKY CONSTRUCTIONS OF FOLDING NETS OF PLATONIC SOLID AND EXPERIMENTS WITH THEIR CONVEX HULLS WITH CABRI 3D

AUTHORS: Jean-Jacques Dahan

AFFILIATIONS: IREM of Toulouse

With Cabri 3D, we will construct different nets of a given platonic solid using transformations : these nets will be foldable. These constructions are simple even if they are tricky. We will use some of these nets to construct their convex hull when not completely folded to evaluate experimentally their Net Factor (see the definition in my paper)

ABSTRACT FOR 20326

INTERACTIVE LEARNING AND TEACHING MATHEMATICS WITH DYNAMIC SOFTWARE MATHDISK

AUTHORS: Ajit Kumar, Mohamed Jaffarali

AFFILIATIONS: Mathdisk Technologies, Department of Mathematics Institute of Chemical Technology Matunga, Mumbai 400 019

A growing number of researchers are uncovering evidence that show readers are better able to recall long-term what they have read in printed books as compared to similar materials read via an electronic screen. In the light of this evidence, the leading US textbook publisher Houghton Mifflin Harcourt conducted a study among California Students which concluded that when it comes to engaging students, format plays far more of an important role than the content. Equally well established, is how the interactive and exploratory nature of dynamic mathematical software improves the cognitive abilities of students. With an increasing number of teachers incorporating dynamic mathematical software in their teaching sessions, how can we retain the benefits of Textbooks without forgoing the interactivity offered by Dynamic Mathematical software? MathDisk (www.mathdisk.com), designed from the ground up, has striven to address this challenge by uniting the latest in educational research with advancements in technology. The features of MathDisk is specifically geared towards combining the format of the traditional book with multimedia capabilities available on Desktop apps and Tablets; so students never feel any disconnect, as they can instantly recognize and correlate the content. This workshop will demonstrate how using plain natural math notation enables users to create Mathematical models involving Vectors, Matrices and simple algebraic expressions to create an interactive MathDisk worksheet. The exercises will also demonstrate the overlapping capabilities of the equation editor, geometric transformations, graph sheets, and annotations with free form layout combining seamlessly to infuse dynamic interactivity with the look and feel of textbooks. The workshop will introduce the "Sequencer" module of MathDisk, a novel approach that allows users to deconstruct a given mathematical model by showing how individual steps are transformed and assembled to produce the final output. By the end of this session users will be familiar with the fundamental concepts of MathDisk and be able to create new 2D/3D Mathematical worksheets on their own.

ABSTRACT FOR 20328

TECHNOLOGY ENHANCES CLASSROOM CONTROL AND IMPROVES STUDENTS' PERFORMANCE

AUTHORS: Bikash Jain

AFFILIATIONS: Future Learning, Educomp Solutions Ltd

§ Education without proper assessment and gap-filling process is futile §

§ Sharing your knowledge without understanding your audience is not effective §

§ Concept sharing without dynamic, engaging and multiple representations is not modern §

Education today has changed its shape – it has oriented itself with multi facet aspect and technology. Explanation involves multi-dimensions: Text, pictures, video, animation, technology, and rehearsal. Pupils are from different culture/background; educators have to understand them and their understanding level before speaking the first bits of curriculum. Concept teaching and deliberation should have exploration suitable to everyone. And then there has to be a proper/quick assessment followed by remedial system in place. All this revolves around two critical persons: Educator and student. Both are under tremendous pressure to achieve excellence.

Use a UNIQUE bundle of technology, off-setting the pain area and supplementing education. Won't it be interesting to enquire which quadrilateral shape would cover the maximum area with constant perimeter, taking a check on prerequisite knowledge, dynamic exploration and then quick assessment, and to close it with remedial note, if any.

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1. What is the magnitude of the effects of technology on schooling outcomes concerning mathematics education?

My conclusions touch on the need for a proper technology-integration, for effective strategies to stimulate deep learning, for goal-directed assessments, for addressing the needs of a would-be mathematically literate. The evolution of students' understanding after having gone through this kind of procedure is unmatched.

ABSTRACT FOR 20330

HANDS ON WORKSHOP : TI NSPIRE CX HANDHELD

AUTHORS: PIYUSH MARU

AFFILIATIONS: IBO, CIE

This HoW (Hands on Workshop) addresses the application of the latest technologies (GDCs) in teaching and learning of Mathematics. The HoW discusses the International Standards in teaching and learning of Mathematics with respect to application of technology (GDCs).

The HoW will cover the major applications of the GDC in the international mathematics' curriculum such as IBDP and IGCSE.

By the end of the HoW the learners will be better able to apply and understand the GDCs to the pedagogy of teaching and learning mathematics at par with the international standards.

ABSTRACT FOR 20332

HANDS ON WORKSHOP : TI 84 PLUS C SE

AUTHORS: PIYUSH MARU

AFFILIATIONS: IBO, CIE

This HoW (Hands on Workshop) addresses the application of the latest technologies (GDCs) in teaching and learning of Mathematics. The HoW discusses the International Standards in teaching and learning of Mathematics with respect to application of technology (GDCs).

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ABSTRACT FOR 20335

DYNAMIC RESOURCES FOR INTERNATIONAL BACCALAUREATE MATHEMATICS

AUTHORS: Kate Mackrell

AFFILIATIONS: University of London

A resource using dynamic geometry software is being co-developed by teachers in Ontario, Canada and Oxford, England for the new International Baccalaureate Mathematics at standard and advanced level. The aim is to promote student exploration of mathematics in dynamic and visual ways. This workshop will explore some of the resources for Geometer's Sketchpad, Cabri II Plus and Cabri 3D involving sequences and series, functions, vectors, and calculus.

ABSTRACT FOR 20401

CREATIVITY DEVELOPMENT IN MATHEMATICS AND TECHNOLOGY EDUCATION

AUTHORS: Janchai YINGPRAYOON, Dr.rer.nat., Deputy Director,

AFFILIATIONS: International College, Suan Sunandha Rajabhat University, Bangkok, THAILAND, janchai.yi@ssru.ac.th

Children are curious and they love to have fun with exciting things around them. Appropriate activities can be found to stimulate them to have fun and love to learn Mathematics. The ways to develop creativity in Mathematics and Technology Education are introduced to increase intellectual curiosity, to develop problem solving and thinking skills, to promote discovery as well as to unleash creativity. This lecture will show how to make Mathematics lessons more meaningful, effective and interesting, how to cultivate intrinsic motivation for learning Mathematics, and how to develop thinking abilities, problem-solving skills and creativity. Some creative hands-on activities will also be demonstrated.

Abstracts for Poster Sessions

ABSTRACT FOR 20220

CONSIDERATION ABOUT THE POSSIBILITY OF THE TECHNOLOGY IN THE DEPARTMENT OF ELEMENTARY SCHOOL ARITHMETIC OF JAPAN

AUTHOR: Tsutomu Ishii

AFFILIATIONS: Bunkyo Univ.

Although the skill of the lesson is excellent in the elementary school in Japan, it is cowardly to introduction of new technology at it. In order to overthrow it, it is necessary to clarify power of technology in an arithmetical lesson. This consideration examines a possibility of converting a lesson about a media board. Analysis of the protocol in a lesson attains the purpose of research.

ABSTRACT FOR 20318

GEOGEBRA FOR TABLETS AND ON OTHER DEVICES

AUTHORS: Zsolt Lavicza, Balazs Koren

AFFILIATIONS: University of Cambridge, Eotvos Lorand University, Budapest

The development of the GeoGebra software has been accelerated during the past years. GeoGebra 4.0 was released in September 2011 with many new functionalities, among others extended statistical features and one-click upload to GeoGebraTube. GeoGebra 4.2 has been available since September 2012, which includes the long awaited feature the Computer Algebra System (CAS) view. Meanwhile the GeoGebra Community has shared more than 40,000 examples on GeoGebraTube in less than two years.

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ABSTRACTS FOR TIME 2013

Abstracts for TIME Invited Papers

ABSTRACT FOR 20501

VISUALIZING MATHEMATICS WITH MATHEMATICA

AUTHOR: Aravind Hanasoge, girish@gte-india.com

AFFILIATIONS: Wolfram Research, Inc., Bangalore, India

In this talk we look at Mathematica and how it can play a key role in teaching Mathematics and other related subjects such as Image Processing, Control Systems, Wavelets, Signal Processing, Statistics etc.

After briefly introducing Mathematica, the talk quickly moves on to the key capabilities of Mathematica including Symbolic & Numerical Processing, Dynamic Interactivity, Creating documents, technical papers, presentations & automatic reports, before focusing on its visualization capabilities.

Visualization capabilities of Mathematica include many routines for plotting both data and functions in 2 and 3 dimensions and also contour and density plots, parametric plots, vector & stream plots etc. We look at how numerical solutions to differential equations (ODE, PDE, DAE etc..) can be visualized and manipulated based on initial/boundary conditions and parametric values using sliders and other dynamic control objects. Several special plotting functions are available in areas such as Control Systems (Bode Plot, Nyquist Plot, Root Locus Plot ...), Statistics (2D & 3D Histograms, PDF/CDF, Charts...), Image Processing (Feature Detection, Noise removal, Segmentation ...) and many more. These would be looked at briefly.

Excerpts from a seminar given on "Engineering Mathematics using Mathematica" based on Syllabus from Pune University would be briefly looked at. We also look at how Mathematica can be very useful in preparing quizzes, reports etc.

Finally, we look at how Mathematica can be connected to other systems through links such as MathLink, JLink, .NETLink, RLink, CUDALink etc..

ABSTRACT FOR 20502

ON THE SHOULDERS OF THE TECHNOLOGY GIANT

AUTHOR: Sneha Titus, sneha.titus@gmail.com

AFFILIATIONS: Azim Premji University, Bangalore, India

Technology has become the persuasive buzzword in hard-selling educational institutions and educational packages. Yet how much thought has gone into the creation of a 'techno-classroom'? Are there institutional practices and routines through which technology is incorporated in pedagogical practice? When does technology enable the class? How do the right questions in a tech enabled investigation push the student's learning to the next level? How do teachers ensure that real learning has occurred in the tech-enabled classroom? This talk will focus on the last three questions.

A teacher who is a first time user of technology in the classroom seeks to exploit the potential of the technology. But there is a danger of shifting the focus to the technology rather than the mathematics. It is time for teachers to let the mathematics speak through the technology.

Rather than seeing technology as an attention seeking device, I propose that technology is the giant on whose shoulders students can see further in mathematics. In this paper, I will define

the concept of 'functional fixedness' and then move to the use of technology as a 'path smoother'. I will focus on the importance of Technology Pedagogy Content Knowledge and illustrate with some examples the possibilities in the use of technology in the mathematics classroom.

NCF 2005 speaks of the importance of inclusion. If teaching focuses more and more on the brilliance of technology to deliver good teaching, then spaces for discrimination will naturally arise along economic divides. If however, the focus is on the pedagogical brilliance of the tech-enabled lesson, then even the simplest and most available technology can align with the vision of NCF. In short, the clarities sought in teaching with technology should be illuminating rather than blinding. Through this paper, I show that it is time to enable the teacher rather than the technology.

ABSTRACT FOR 20503

TECHNOLOGY AS MOTIVATION FOR LEARNING

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Perhaps the most difficult problem in education is motivation: how can we make the students want to learn? Extrinsic motivation such as a prize or a promise of a job or just praise can be used, but in the long run this is stressful for the teacher and the student. Instead, if the learning produces some immediate excitement, and a feeling of accomplishment, then students will learn happily.

Following in the footsteps of Papert and others, we propose that elementary computer graphics can be a strong motivation to study trigonometry at the high school level. We report some preliminary educational experience in this area. Drawing and animating geometric objects in interesting ways requires properly understanding geometry and trigonometry. But once these subjects are mastered, fairly elegant and intriguing animations can be produced. The resulting thrill is very different from the thrill of winning a prize; it is much more direct and likely lasts longer. The thrill is orders of magnitude stronger than the traditional motivation for trigonometry: calculation of heights of buildings.

Most educational curricula do not empower students to build things that they might want to. At best they are forced to build what adults want and like. But computer graphics and programming can open a world where the student is the master. But acquiring the mastery requires learning good math and logic. Educationists must seize this opening.

ABSTRACT FOR 20504

CHANGING DYNAMICS OF MATHEMATICS CLASSROOM

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Internet and faster broadband speeds have changed the lives of today's learner. Information is available to them at their finger tips; teacher or the text books are not the only source of information for them. Traditional teaching methods struggle to captivate students or motivate them to learn. Changing the pedagogy in the classroom has been identified as a solution to developing new learning environments. The change of classroom dynamics seems to be directly related to the teaching strategies incorporated in the classroom where students find

that learning is fun. The integration of technology in education is no longer a "new" idea; this paper will illustrate how it is making a difference to the math classroom.

Use of YouTube videos which works as a 'hook' to grab attention of students or explain the concepts in an entertaining and simple ways has found its place in Math classroom. Online tutorials allow students to revisit concepts taught and assess themselves at their own pace. Almost fifty percent of the syllabus (CBSE) in class XII is based on Calculus; many of the students achieve high scores but have no understanding of the very basic concept of Derivatives. Dynamic software like Geometer's Sketchpad and GeoGebra has given life to many of the dreaded concepts of Pre-calculus and Calculus. Dynamic visualizations leading to explorations allow for meaningful discussions and the 'aha' moments. In my presentation I will share these 'aha' moments and use of other resources which have made teaching and learning fun.

ABSTRACT FOR 20505

MATH AND CITY

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Can our children's math educational experience be located in the city they live in? In their daily urban lives our children are exposed to and negotiate with patterns and happenings, shapes and proportions, measurements and calculations - all conceptual maths areas. But are we as educators able to capture their imaginations and reveal the maths in all the things they see around and in the urban experiences that shape them? Can an alternative Maths learning be fun, relevant, and full of surprises while aligning with the school curriculum and what our children are learning in the classroom?

The entrenched Maths phobia in many of us makes us look for stop-gap solutions. For example: we will enroll our children for tuitions or short courses where they will be taught how to tackle Maths – fast counting, quick problem solving, multiple tests etc. We have never allowed ourselves to imagine that our children deserve to enjoy the beauty and ideas of Maths by letting them discover that Maths animate the world around us in a playful, stimulating way.

How does a fruit vendor arrange all his fruits in different layers that never seem to fall off his cart? When we keep telling our children to have a balanced diet, what learning in proportions and percentage are we giving them? Do the traffic signals have something to do with geometry? Can license plate numbers of buses, cars, motorbikes, autos tell something about squares, cubes, or the wonderful irrational number pi? Are festivals, when shops outdo each other with their discount sales, a time for our children to learn something captivating about the infinite range of decimal numbers?

It's time to make maths learning a rich, immersive experience for our children and connect it to our cultural and social life.

To impart this unusual Maths learning, the activities have to be hands-on where the children's real life experiences play a big role in learning the Maths concepts, where the manipulatives designed are child-friendly, creative, and safe and allow them to explore Maths without any fear, where the space in which they learn Maths embodies the city they live in and triggers interesting ways of learning, where the children are encouraged to share their works in groups and listen to each other for feedback and insights on the mathematical concepts they are learning, where the teachers are enabled to be highly imaginative with the activity space and initiate activities (outside of the workbook) based on the child's experiences and learning,

where the take-home activities reinforce their new learning and connect to the child's environment.

It is indeed an unprecedented practice in Maths learning where we put the experiences of the child at the centre of the practice. It is a practice where we enable the teachers to have the time, empathy, creativity, imagination, skills and tools to engage with the child in a unique exploration of Maths. It is a practice that enriches what a child is learning in the classroom.

ABSTRACT FOR 20506

SMART BOARD & GDC INTO THE SECONDARY SCHOOL MATHEMATICS CLASS ROOM.

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Mathematics is conceived as a subject meant only for few selected scholars who needs imaginative mind and strong logic. Use of right kind of technology can simplify mathematics and appreciate mathematics by all secondary students. Smart boards, GDC along with several Software can help to appreciate mathematics by one and all. Smart boards can both guide secondary school students to deeper understanding of mathematical structure, and enable students to move away from the "tools and techniques" view of mathematics and start developing mathematical thinking. Smart boards could be an instrument whereby ideas can be explored and relationships discovered. For such goals to be fully realized, the technology needs to be successfully integrated into the mathematics classroom. A first step in achieving this is for the teacher to be motivated to learn the various manipulations available in the Smart board in planning and creating lesson plans. Quality education is essential for workforce and society and ICT are claimed to quality education. In particular GDC have gained widespread acceptance in secondary school mathematics classrooms which has an influence upon student learning. . However Use of Smart board and calculator in Indian education with some traditional teachers would look at as: a demon; servant; an idol; a partner or; as liberator. This presentation will examine the claim that Smart boards and GDC act as a "pedagogical Trojan Horse" moving teachers towards student centered learning in the secondary mathematics Classroom.

ABSTRACT FOR 20507

REASONING IN MATHEMATICS

(How deductively- inductive reasoning can be improvised)

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Mathematics is probably the only branch of knowledge that has a formal proof for a number of propositions. The strength of Mathematics is its ability to prove its propositions. Perception may change with regard to certain ideas in Science but it is not so in Mathematics. Scientific observation depends upon the condition under which the observations were recorded. Over the last few decades, perceptions of a number of ideas in Science have changed. Mathematics does not depend on observation alone. Once proved mathematically, a proposition holds good for all times to come.

There are five basic characteristics of mathematics and also known as the inviolable scientific principles in mathematics as defined below:

- Precision: Mathematical statements are clear and unambiguous. At any moment, it is clear what is known and what is not known.
- Definitions: Bedrock of the mathematical structure
- Reasoning: Lifeblood of mathematics
- Coherence: Every concept and skill builds on previous knowledge and is part of an unfolding story.
- Purposefulness: Mathematics is goal-oriented. It solves specific problems.

In this article author is focusing particularly on reasoning characteristic of Mathematics along with how technology can support us to get maximum of it during teaching learning practices. There are two kinds of reasoning that feature prominently in doing mathematics- Deductive and Inductive reasoning.

Inductive reasoning is the kind of thinking involved in recognizing patterns, similarities and equivalences, and using these to predict further results and to formulate generalizations.

Deductive reasoning is the formulation of a valid, logical argument to explain, demonstrate or convince others that a solution to a problem must be correct, or that a mathematical theorem is proved beyond doubt, or that a particular conjecture is true or false.

It is well experienced that at initial stages in learning mathematics inductive reasoning is more significant than deductive reasoning for children in that age range. For example, children in beginning will learn to 'describe patterns and relationships with numbers and shapes, make predictions and test these with examples'. In the continuation children will 'propose a general statement involving numbers or shapes and identify examples for which the statement is true or false'.

Deductive reasoning in its most powerful form is used when we provide a proof of a mathematical result or theorem. Formal mathematical proof is certainly beyond most children at upper primary stage, but this does not mean that there is no place for deductive reasoning.

In this article author is giving few examples to demonstrate how deductive flavour can be provided with in inductive reasoning even at upper primary stage. In fact, this approach has been discussed with several teachers during teachers training programme and their feedback has also been observed while interaction with them for a period of time. The approach of mixing deductive flavour while inductive reasoning has given more enthusiasm among the learners and an increase level of children's involvement and engagement with-in the concepts has also been realized. Author also emphasis how a technology based environment can be utilized to achieve the approach comfortably by a common teacher in a common classroom.

ABSTRACT FOR 20508

THINKING WITH PICTURES

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In this paper we will revisit the graphical or geometric approach for teaching mathematics. Its historic triumphs and its current state of disuse are reviewed revealing the prevailing analytical bias. Its applicability and benefits are highlighted with some examples from school level topics. Common objections to conventional graphical techniques are reviewed in light of the technological advances of today, offering Computer Aided Drafting (CAD) as a tool to overcome these shortcomings. The power of CAD and its unique advantages in modeling, analyzing and solving problems and presenting the solutions to reveal patterns/ trends is demonstrated via two case studies. These are taken from recreational mathematics and

industrial application to cover a wide range over which the graphical approach with CAD as a tool can be effectively employed.

ABSTRACT FOR 20509

TEACHING MATHEMATICS EFFECTIVELY USING TI-NSPIRE

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As Mathematics educators, teaching Mathematics effectively to our classes of students involves hard work and long hours of preparation. We want our students to understand our lessons and be able to apply the concepts, but our lesson plans do not always work out well, given that we have a multitude of different types of learners in our classes. Lesson design is an important part of any mathematics teacher's work: To prepare and deliver an effective lesson for optimal learning.

How can mathematics teachers design a lesson well? In the modern world where our students are born digital-natives, lesson packages need to be engaging and fun for the students to participate actively and be engaged in learning. Using the TI-Nspire as a teaching and learning tool, we are able to create interesting yet brain-stimulating activities to achieve that goal. Concepts can be taught through activities and exploration of concepts. It can even be self-directed, at the student's own pace. This hands-on approach encourages student participation in class and promotes critical thinking. The multi-representation and cross-apps capabilities of the TI-Nspire also facilitates students to make the connections between different concepts they have learned.

One other question mathematics teachers always get is "Why are we learning this?". Through mathematical modeling via the TI-Nspire, mathematics educators can bring the world closer to the students, and show how the physical world can be modeled mathematically using real world data. This real-world approach encourages interest in mathematics in students, as mathematics will no longer be just numbers and formulae.

With these approaches, mathematics educators can move a step closer to our common goals: Higher engagement of students in lessons, deeper understanding of Math concepts and ultimately contribute to the students' success.

Abstracts for TIME Regular Papers

ABSTRACT FOR 20601

TEACHING FRACTION USING CONSTRUCTIVIST APPROACH: AN EXPERIMENTAL STUDY

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The concept of fraction is one of the most important concepts in primary mathematics as it offers a solid foundation for learning other concepts. School students however find fractions a difficult topic. Various meanings of fraction which are relevant to students are part-whole relationship, partitioning and dividing, ratio meaning i.e. equivalent, proper, improper, mixed fractions and the measure meaning. The experimental research was carried out to develop achievement in Mathematics for the students of secondary school using constructivist approach. The achievement was measured using Mathematics Achievement Test based on topic of fraction and its components. The test was designed on the basis of revised Bloom's taxonomy of educational objectives. From the study it was found that there was a significant difference in their achievement in Mathematics. A significant difference was found in the post test scores of Mathematics achievement test among the students in the experimental group for the components of fractions the part-whole relationship and part of a group or set meaning and partitioning and dividing. But no significant difference was found in the post test scores of group for the other components of fractions like ordering, comparing, equivalence and improper fraction, mixed numbers, number line. The magnitude of the effect of treatment on variable achievement in Mathematics was 0.63. Hence as per Wolf's criterion, the treatment was found to be effective at a moderate to high extent in enhancing achievement of the students in Mathematics.

ABSTRACT FOR 20602

INNOVATIVE PRACTICES IN TEACHING MATHEMATICS

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Mathematics is one of the most important subjects and it occupies a central position in the education of a child, yet it is the most feared subject. So while teaching mathematics one should use the teaching methods, strategies and pedagogic resources that are much more fruitful in gaining adequate responses from the students. Considering the aims of teaching mathematics, it can be seen that more focus is laid to the higher level of objectives underlying the mathematics subject, like critical thinking, analytical thinking, logical reasoning, decision-making, problem-solving. Such objectives are difficult to be achieved only through verbal and mechanical methods that are usually used in the traditional mathematics classroom. The verbal methods of instruction give all importance to speech and texts, to the book and to the teacher. From an historical point of view this method was majorly used until the end of the nineteenth century. In one of these verbal methods teachers are simply satisfied with giving the

mathematical rules to pupils and having them memorize it. Their task is to transmit to their pupils the knowledge which has accumulated over the centuries, to stuff their memory while asking them to work exercises. Commenting on the prevailing situation in schools, it is observed that in the average school today instruction still confirms to a mechanical routine, continues to be dominated by the old besetting evil of verbalism and therefore remains dull and uninspiring. Innovations in teaching of mathematics can be diversified in terms of Methods, Pedagogic Resources and Mastery Learning Strategy used in teaching-learning process. This paper discusses the new understanding about the innovations in teaching Mathematics among Mathematicians.

ABSTRACT FOR 20603

TECHNOLOGY ENHANCES CLASSROOM CONTROL AND IMPROVES STUDENTS' PERFORMANCE

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Education today has changed its shape – it has oriented itself with multi facet aspect and technology. Explanation involves multi-dimensions: Text, pictures, video, field, animation, technology, and repetition. Pupils are from different culture & background and educators have to understand them and their understanding level before speaking on the first few bits of curriculum. Concept teaching and deliberation should have exploration suitable to everyone. And then there has to be a proper a quick assessment followed by remedial system in place. All this revolves around two critical people: Educator and student. Both are under tremendous pressure to achieve excellence.

Use a UNIQUE bundle of technology off-setting the pain area and supplementing education.

Won't it be interesting to enquire which quadrilateral shape would cover the maximum area when perimeter is constant, taking a check on prerequisite knowledge, dynamic exploration and then quick assessment one by one, and to close it with remedial note, if any. Wouldn't it be nice to correlate $a \sin(b \cdot x + c)$ graph with sound wave and differentiate frequency/magnitude (prerequisite knowledge!) and many more. We may start off with a quick quiz (using technology) to understand pre-requisite knowledge on quadrilateral and perimeter and then dynamic representation to explore/research and to conclude with the result. Then a quick re check on students be done using technology to understand the comprehension and quick fix, if required an where.

With the use of technology, let us analyze the following:

1. What is the magnitude of the effects of technology on schooling outcomes concerning mathematics education?
2. How does the magnitude of the effects of technology fluctuate in response to various study features (e.g., gender, age,race) and design features (e.g., randomization, sample size, instruments)?

My conclusions touch on the need for a well integration on technology, for effective strategies to stimulate deep learning, for goal-directed assessments, for addressing the needs of a would-be mathematically literate The evolution of students' understanding after having gone through this kind of procedure is unmatched.

ABSTRACT FOR 20604

MATHEMATICS ANXIETY IN ISOLATED STUDENTS

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An annual national survey in 2012 called the “Annual Status of Education Report” revealed that the students from Maharashtra are the weakest in Mathematics in the country. It was found that 77.4% of fifth standard students couldn’t do simple problems taught in third standard. Hence this study was conducted in Maharashtra to analyze the causes of poor performance in Mathematics. Functioning under severe economic and personal constraints, educational equity within a nation is improbable. In schools there are students found to be isolated with very less interaction with peers, their parents and teachers. They appear to be unhappy, tense, nervous, frustrated, operate independently, quiet, sober, easily discouraged, abandon tasks if it is difficult, do not initiate or volunteer and are mostly employed in day dreaming. Some of them are disobedient, indiscipline, poor in studies and with more anxiety towards Mathematics. Mathematics education plays a vital role in a student’s performance in his/her studies. The purpose of this study was to examine the correlation between math anxiety and math scores of isolated students. Two schools each from rural, urban and metro areas of Maharashtra were selected randomly. 910 students of eight standard participated in the survey and by sociometric method 223 were found to be socially isolated students. The isolated students were selected for this study along with their parents and Mathematics teachers. It was found that home isolation and home rejection are the major causes for mathematical anxiety. Parents need to take a proactive role in the education of their children. Mathematics teachers need to give students psychological assistance along with Mathematics learning. Computer Assisted Instruction can be a supplement to these students. With the parents’ involvement a mathematics teacher can change the behavior of isolated students and can bring them to the main stream of society.

ABSTRACT FOR 20605

TEACHING MATHEMATICAL MODELING IN SCHOOL AND STUDENTS RESPONSE

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In this paper, we studied the effect of teaching and learning Mathematics in School through Mathematical Modeling. A short term training course was organized for students in Higher Secondary Schools. The course was intended to reveal the relevance of Mathematics in real-life and understanding the concepts that students learned in their Mathematics curriculum. 36 students of Dawrpui School of Science and Technology, Aizawl, Mizoram were selected for the course. It consisted of 12 contact periods (one hour each) and was held in November/December, 2012. Mathematical Modeling was introduced to the students for the first time. Some of the models from Population dynamics were discussed with the aim of better understanding of Mathematical concepts and its real life applications. The experimental design was based on pre-questionnaire and post-questionnaire in order to find out whether and in

what ways a Mathematical modeling experience could influence student's beliefs and attitudes towards Mathematics. It was found that the course was successful in generating more interest and motivating students for learning Mathematics.

ABSTRACT FOR 20606

USE OF INNOVATIVE TEACHING AIDS

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To Thales the primary question was not what do we know, but how do we know it.- Aristotle Mathematics is a very important subject and occupies a central position in school curriculum. Except our mother tongue, there is no subject other than Mathematics which is more closely related to our daily life. Yet it is the subject which is most feared by students and their parents alike. Because its concepts are hierarchical and interconnected and unless lower-level concepts are mastered, higher-level concepts cannot be understood. Moreover, Mathematics is highly abstract. Therefore, teaching and learning math is often found challenging. To face the challenge as a teacher we need to use a variety of teaching strategies in the classroom. One of the effective strategies is using teaching aids innovatively, effectively and enthusiastically. Teaching aids ensure that your point is understood. They engage students' other senses in their learning process. It works as the support to both teacher and taught in the pursuit of knowledge and curriculum transaction. Any method that serves the purpose of teaching and learning math without destroying the objective, could be considered as innovative aids of teaching. Teaching aids can be anything that create a positive environment and enhance the fun element from manipulative to computers and mind maps etc. They could be ready made or prepared by teachers as well as by students. They need not to be costly. Teachers should look at new ways to incorporate technology and other available materials, as teaching aids, methods and strategies into teaching. Therefore, we need to find ways that can help us make better educators, and make our students better learners.

ABSTRACT FOR 20607

A MODULE EXPLAINING DEFINITION OF LIMITS AND CONTINUITY OF REAL VALUED FUNCTION USING GEOGEBRA

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Certain fundamental topics like Limits, continuity, differentiability of a function, are taught to students at the higher secondary school level. It is essential to bring out the rigour in the fundamental concepts from Calculus in order to give better insight to students. It is observed that students are not comfortable with definitions of these concepts. Thus leads to difficulties in further learning and also results in a dislike for the subject.

This paper describes a Geogebra- driven module which can be one of the tools for the teachers to build a strong base of very fundamental concepts from Calculus. In fact, many definitions can be illustrated using various examples, which is time consuming if only blackboard and chalk is used. This will also help students to build modules using this software, since it is an open source software. A study was conducted where this module was implemented among students and its effectiveness vis-à-vis traditional chalk-blackboard method was tested.

ABSTRACT FOR 20608

EXPLAINING MATHEMATICAL CONCEPTS WITH INNOVATION AND PERSONIFICATION

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Mathematics learning in a class room requires concentration and a lot of patience on part of a student as they tend to get distracted very easily. So, if initial few minutes of the class are made a little different from the usual sums and solutions, then the classroom learning can be a lot of fun and much easier. A catchy introduction to the topic with fun filled activities combined with innovative teaching strategies and 'Personification of the mathematical concepts' simplifies the understanding and leaves a long lasting impact on the students.

In this paper, I would present some interesting teaching strategies including the method of 'personification of the concept' to explain mathematical concepts to the middle school students. Introduction of a mathematical concept can be done by involving each student through puzzles, games, hands-on activities etc. so that they are excited to know further about the topic. For example, asking the students to find out the names of the polygons with sides equal to their roll numbers, made them discover about the large polygons and also generate enthusiasm and readiness to learn more about the topic.

Also, the method of 'personification of concepts' as mention above, helps the students to grasp the concepts easily by making a picture of the concept in their minds. For instance, I explained the distributive property $a(b+c) = ab+ac$ by personifying 'a' as a person who wants to go to the home of 'b' and 'c' and would obviously say hello to both.

This paper thus covers teaching strategies to suffice the understanding of the mathematical concepts and clip the attention of the students.

ABSTRACT FOR 20609

CHANGING DIMENSIONS OF MATHEMATICS EDUCATION IN 21ST CENTURY

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Technology has become a helping hand for teachers for accomplishing the goals of teaching-learning of 21st century. Since Mathematics at senior secondary level becomes more abstract so Online Tools like Prezi, screenr, toondoo, pizap, popplet etc. can also be used to make Mathematics teaching-learning interesting. Only three of the above- mentioned tools are being discussed hereunder.

TOONDOO is an online tool for creating cartoon strips. This tool can be used to introduce any topic in Mathematics in an interesting way, especially in junior classes, but can also be used for teaching Mathematics at senior secondary level. For example, it is used to teach Permutations & Combinations (Class XI) to introduce the topic, to differentiate between Permutations & Combinations & to solve problems given in the textbook. SCREENR is used to make videos which can be used as virtual classes and act as a good tool for revision of topics and also to teach under-performer students during remedial classes. It is used to teach abstract topics such as Limits, Continuity and Differentiation (Classes XI-XII). POPPLET is an online tool used for mind-mapping or concept mapping. It is an effective brainstorming tool for presentation as

entire topic can be planned sequentially and PPTs and videos can also be included in concept map. For example, it was used to teach Vectors (Class XII) and it was welcomed by students as science students do it in class XI and commerce students don't take much interest in this topic. All these online tools are free of cost. It is need of teachers to use technology for Mathematics teaching-learning to e-generation.

ABSTRACT FOR 20610

EASY LEARNING OF BASIC MATHEMATICS AT SCHOOL LEVEL

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In order to create good interest in any subject, particularly in mathematics, there should be a very logical and scientific base in the curriculum at the early stage of learning. The method of teaching basic mathematics should be done in such a manner so that an interest for mathematics is created in young learners, particularly at the primary level. With this objective, two basic concepts in mathematics have been considered. The study of natural numbers and their properties can be easily introduced in the early stage of learning mathematics. In this paper a sample of a curriculum is introduced with new approach of learning. In this approach, it is suggested that simple properties of numbers be introduced so that students can find their interest in mathematics. The paper suggests some interesting explorations with natural numbers other than those done in the conventional study of natural numbers for arithmetical operations. The paper also deals with the study of "Triangles and Angles" in an experimental manner through a project in geometry with a completely new look. Both the approaches discussed in this paper are very attractive, new and very easy to perform. These approaches have proved to be effective in the schools in remote areas and also in the open school systems.

ABSTRACT FOR 20611

USE OF GEOGEBRA SOFTWARE BY PROSPECTIVE TEACHERS' IN DEVELOPING LESSONS FOR TEACHING OF MATHEMATICS

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Mathematics is the gate and the key of all the sciences. Though the subject is very important it is always considered to be the most difficult and fearful. The dryness of the subject can be contributed to the teaching of the subject. In the pedagogical study of mathematics we mainly concern ourselves with two things; the manner in which the subject matter is arranged or the method the way in which it is presented to the pupils or the mode of presentation.

"Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning" (NCTM 2000) implies the importance of technology in mathematics education. Observing this principle the main aim of this study was to examine the effect of use of Geogebra software for teaching mathematics by prospective teachers'. Technology enables users to explore topics in more depth (e.g., interconnect mathematics topics, write programs, devise multiple proofs and solutions) and in more interactive ways (e.g., simulations, data collection with probes). There is widespread agreement that mathematics teachers, not technological tools, are the key change agents to bringing about reform in mathematics teaching with technology. Geogebra software provides

new opportunities for using technology effectively in the field of education. In this study, usage of Geogebra software by prospective mathematics teachers for teaching and learning mathematics concepts was investigated. It was for the development of prospective secondary mathematics teachers' Technological Pedagogical Content Knowledge as they worked individually and in small groups to develop and present lessons with Geogebra software. Qualitative research methodologies were used in this study. Participants first learned basic commands about GeoGebra. During lessons prospective teachers of mathematics used dynamic worksheets. Data were collected by participants' works and opinions on Geogebra software. Our results suggest that the prospective teachers' perspectives on teaching and learning mathematics with technology were enriched and according to responses of participants, prospective teachers' want to use Geogebra software for teaching mathematical concepts. Prospective teachers need to develop technology skills, enhance and extend their knowledge of mathematics with technological tools, and become critical developers and users of technology-enabled pedagogy.

ABSTRACT FOR 20612

A UNIT OF MEASUREMENT AND LEARNING

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Six weeks of intervention in a municipal primary school of Ahmedabad was enough to challenge my stereotype regarding children's attitude towards mathematics. The stereotype ripened after learning that dropout-rates due to mathematics and was more about fear and anxiety pertaining to the subject. A content based intervention was planned with an objective to develop mathematical competencies of 30 students of grade 5 and to refine my own understanding about the process of learning mathematics. The topic of "Units and measurement" was taken as a tool for the process, which came from the observation and experiences that "children often forget to write units along with the measurements". I started with a condition of uncertainty along with an urge to get a sense of clarity and a way out to make this concept and process meaningful for every stakeholder. Base line assessment of required basic competencies was done, plotted and mapped over the chart; on the basis of which mixed groups were formed to encourage team work. Each session was followed by presentations by students with some process oriented questions which worked as a catalyst to generate need of the topic. And we worked further for a month keeping some nuances of kinesthetic learning in the process. Right from beginning to the end, the study unfolded the hidden potential of children and made them acquainted with the process of reasoning.

MISCONCEPTIONS IN MATHEMATICAL CONCEPTS LEADING TO FEAR AMONG STUDENTS: POSSIBLE SOLUTIONS

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The Mathematics is used as a tool to solve various problems in engineering, science and other streams of education field. The effective utilization of these tools becomes easy due to development of computer software. The computer software will be used effectively if one understands it and knows the fundamental of mathematics utilized in it. Also mathematics develops logical thinking, critical thinking, analytical thinking, reasoning power and power of decision making. Therefore learning mathematics is essential.

Now a days understanding mathematics is a major burden for the students, as there is misconception among them that it is difficult. Therefore the role of the teacher is to develop the interest in mathematics and remove the fear of the subject among the engineering students. The real job of the teacher is to identify the weakness and try to rectify it. The weakness has been observed among the students who have scored very less marks in mathematics, this is due to lack of knowledge of basic formulas and rules they have learned during schooling. It has become implicit now that instead focusing on the good students, one can target weak students in the class, which are in mass.

In the present paper weaknesses of the students are outline and possible methods like:

Activity Technique: The common problems related to arithmetic are resolved by assigning the tasks in groups and making them realize about the reality and its significance.

Deductive Technique: This technique inculcates the proper method of solving problem and it also develops the skill like- when to move from known to unknown or visa-versa.

Memory Training Technique: This method will help the students to memories the formulas, theorems and properties by understanding the concept and logic behind it.

Heuristic Technique: This technique deals with two methods where one can explain to solve problem by using generalization method or adopting inductive approach.

The techniques mentioned here are turn up in such a way that it gives proper understanding of basic concepts of mathematics and eradicate the mistakes done by the weak students.

Appropriate examples are given to validate the above methods.

The real crux of the paper is to implement these techniques and motivate students to adopt it.

ABSTRACT FOR 20614

BRTS – (BUS RAPID TRANSIT SYSTEM)

SOLUTION TO A PROBLEM OR A PROBLEM ITSELF-I

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The persistent problem of traffic jams, increasing accidents and heavy load on roads led to the establishment of the BRTS project. But, ever since the corridor has been constructed, it is being criticized by the masses for allegedly taking up too much road space. "BRTS poses to be the solution to the above mentioned problem." Using the data obtained from the AiCTSL (Atal Indore City Transport Services Ltd.) office, we established a strong correlation between the number of days of operation and the ridership. The coefficient of correlation according to Karl Pearson's method came out to be 0.87. Further using the Scatter Diagram, we derived the equation of the best fit line and used it to estimate the ridership towards the end of the first year of the BRTS project being launched. In sync with the actual progress of the project, our result of more than 80,000 riders in less than one year clearly indicates that AiCTSL will be able to attain its Breakeven Point (BEP) in less than the expected 3 years period. We also formed various graphs to compare the time taken by each mode of transport, its capacity to carry passengers and fuel consumption to show how ibus is a better means of transport. We have also made a model that shows the continuous transition of the A.B. Road from narrow two-lane road to broad four-lane road with a separate corridor for ibus. We have also come up with our recommendations for making this BRTS project more effective and efficient.

ABSTRACT FOR 20615

BRTS : A SOLUTION TO A PROBLEM OR A PROBLEM IN ITSELF-II

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Entering the 21st century, the Indian transportation system has been rapidly expanding; still it has not been able to keep pace with the congestion in our cities which continues to grow at an alarming rate. This increased congestion is adversely impacting our quality of life and increasing the potential for accidents and long delays. To fight and mitigate congestion, transportation professionals in India are working towards increasing the productivity of existing transportation systems through the use of advanced technologies. Intelligent transportation systems (ITS) encompass a broad range of wireless and wire line communications-based information and electronics technologies. When integrated into the transportation system's infrastructure, and in vehicles themselves, these technologies relieve congestion, improve safety and enhance productivity. All this led to need of the better public transport system for balanced and proper development which should not only include all the above mentioned parameters, but should also be cost effective and time saving. Bus Rapid Transit System (BRTS) provides a very good solution for public transport.

A BRTS essentially gives priority to buses through dedicated bus lanes, and provides dedicated lanes for pedestrians and non-motorized vehicles like cycles and rickshaws. BRTS is sometimes called a High Capacity Bus System (HCBS), as in Delhi.

The capacity of the system is increased because buses have unimpeded right-of-way, which reduces the turnaround time and because more buses can operate in the dedicated bus lanes. Simplistically put, a BRTS is like a metro with the flexibility of a bus system.

Bus Rapid Transit is high-quality, customer orientated transit that delivers fast, comfortable and low-cost urban mobility. BRTS systems have some or all of the following elements; many of these can also make a valuable contribution to improving regular bus services.

Keeping the above ideas in mind, BRTS was launched in Indore, but after a period of time, Hon'ble High Court, Madhya Pradesh, Indore Bench gave a decision to open BRTS lanes for four vehicles as well.

The paper deals with the mathematical study of elements of BRTS in Indore like cost comparison, waiting time and average time calculation, total journey time comparison of BRTS and other vehicles, modal shift – which shows the willingness of passengers to shift to BRTS and also the effects of the High Court Decision on BRTS. The study can be used to analyze the BRTS systems of various cities and its scope in that particular region.

ABSTRACT FOR 20616

FACILITATING STUDENT TO LEARN GEOMETRY PRACTICALLY

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This article discusses use of a device known as “Solanki’s Multipurpose Model” to verify the validity of many theorems and Axioms of geometry taught in classes VI to VIII. The effects on different types of students' interactions while learning geometry in a particular cooperative small-group setting. Data were collected through classroom observations, students' written self-reports, and an attitude questionnaire. A group of three/four students from one of the classes was allowed to work together under the guidance of the teacher.

Analysis of classroom observations and students' self-reports focused on students' activeness, interactions, and attitudes toward the experimental method. Findings for the cooperative small-group setting indicated

- (a) an increase in students' activeness,
- (b) a shift toward students' on-task verbal interactions,
- (c) various opportunities for students to explore and learn the concept and
- (d) positive attitudes toward the cooperative experimental method.

Abstracts for Workshops

ABSTRACT FOR 20701

LATEX WORKSHOP

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The LaTeX is a mathematical typesetting tool. The workshop will include typesetting mathematical ideas, coding to write a bibliography for a thesis or a dissertation and also teach the art of presenting an article in LaTeX using LaTeX Beamer.

ABSTRACT FOR 20702

TEACHING PRE-CALCULUS AND CALCULUS WITH GEOGEBRA

AUTHOR: Sangeeta Gulati, sangeetagulati92@gmail.com

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Participants: Maximum 30 teachers teaching classes 11 &12 with some basic familiarity of GeoGebra.

Duration:2 hours

Requirements: Computer lab with 30 computers, GeoGebra software, LCD projector

Aim of the workshop:

In this two hour workshop teachers will create GeoGebra worksheets which can be used for teaching of Pre-Calculus and calculus topics in Senior Secondary school. The workshop will use basic and some advanced features of GeoGebra. The aim of the workshop is to create dynamic visualizations of certain important concepts of Pre –Calculus and Calculus, which can be used as a demonstration and exploration tool in teaching and learning of these abstract concepts.

ABSTRACT FOR 20703

THE MENTAL MATHS WORKSHOP

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Consider this:

- It is estimated that in the UK, 17 million adults have the mathematics capabilities of an 11 year old or younger. Source: The Telegraph, UK.
- 9-10 year olds and 13-14 year olds in the United States continue to lag behind several East Asian and European nations in Maths. Source: The New York Times
- In India in 2012, 46.5% of children in Class V could not solve a two-digit subtraction problem without seeking help. Source: The Pratham Report.
- South Africa ranks second last in the world for education in Mathematics. Source: World Economic Forum

Currently we are witnessing a global maths crisis where we are experiencing low numeracy levels across countries. Students and teachers are looking for alternative solutions in Mathematics.

In such a grim scenario, Mental Maths Skills can be useful to students as there is more than one way to reach a correct answer in mathematics. This workshop on Mental Mathematics will show some simple methods and proofs of mental mathematics in use globally like Chisanbop (Finger Calculation Method from Korea), The Trachtenberg method and the Indian Mental Maths Methods.

ABSTRACT FOR 20704

EXPLORING SENIOR SECONDARY LEVEL CALCULUS WITH A GRAPHIC DISPLAY CALCULATOR

AUTHOR: Jitendra Pathak, jitendrap@casiointiacompany.com

AFFILIATIONS: Casio India Pvt. Ltd., Delhi, India

This workshop intends to make mathematics educators aware about the power of graphic display calculator and utility of the same while teaching and learning calculus of senior secondary school level.

We can very efficiently introduce the concept of limit, continuity and discontinuity by using graphic section of the Casio graphics model fx-9860 G II. Apart from that we can also explore local linearity, visualize the derivative, derivative using first principle and relative maxima and minima.

ABSTRACT FOR 20705

VISUALIZING AND EXPLORING LINEAR EQUATIONS, QUADRATIC AND LINEAR INEQUALITIES USING CASIO GRAPHIC CALCULATOR.

AUTHOR: Jitendra Pathak, jitendrap@casiointiacompany.com

AFFILIATIONS: Casio India Pvt. Ltd., Delhi, India

In this workshop mathematics educators and learners will learn to plot linear equations using Casio graphic display calculator fx-9860 G II/ fx-CG 20, finding the solution of a pair of linear equations graphically and fitting straight lines to data. This workshop also intends to give an insight of the nature of quadratic functions and the significance of the coefficients of a quadratic function.

ABSTRACT FOR 20706

EXPLORING CONCEPTS AND APPLICATIONS OF MATHEMATICS USING CASIO GRAPHIC DISPLAY CALCULATOR

AUTHOR: Jitendra Pathak, jitendrap@casiointiacompany.com

AFFILIATIONS: Casio India Pvt. Ltd., Delhi, India

This workshop session will highlight the basic features of the Casio fx-9860 GII/ fx-CG 20 graphic calculator. This device as a teaching tool as well as a tool for performing investigation will be demonstrated and participants will be given a hands -on experience. The problems will be from the topics of function, calculus, matrices, simulation and probability.

ABSTRACT FOR 20707

VISUALIZING AND EXPLORING MATHEMATICS USING CASIO TEACHING TOOLS- A HANDS- ON SESSION ON FX-9860 GII /FX- CG20

AUTHOR: Jitendra Pathak, jitendrap@casioindiacompany.com

AFFILIATIONS: Casio India Pvt. Ltd., Delhi, India

This workshop session will highlight the basic features of the Casio graphic calculator fx-9860 G II/ fx-CG 20. The use of this device as a teaching tool in the classroom will be highlighted through a calculus lesson. Further the use of the calculator for performing investigations will be demonstrated through some math lab activities based on the topics of matrices and probability.

The participants will be given a hands-on experience on the calculator and emulator software of the tools would be used as whole class teaching tool.

ABSTRACT FOR 20708

LEARNING TO DO MATH WITH TI-NSPIRE CX HANDHELD

AUTHOR: Thomas Yeo, thomas.yeo@ti.com

AFFILIATIONS: Education Technology Consultant, Texas Instruments Singapore

The workshop, will have three components:

Part 1: Perform the basic keystrokes on the TI-Nspire CX handheld (15 min)

This section covers the layout of the TI-Nspire handheld. Participants will learn how basic keystrokes are performed on the handhelds to perform calculations. Participants will learn how to create new documents and save them on the handheld for future use. An introduction to some shortcut keys will be covered as well.

Part 2: Graphing on the TI-Nspire CX (25 min)

This section covers the graphing capability of the handhelds. Participants will learn how to draw graphs using equations and plot graphs using a table of values, and edit the various attributes of the graph. Various graphing techniques will be discussed here, including intersection points, graphing inequalities, graphs of absolute functions and graph transformations.

Part 3: Mathematical modeling on the TI-Nspire CX (15 min)

Participants will try out a Mathematical modeling activity created by the speaker. This activity allows participants to model a real life scenario using scatter plots and regression functions. This activity shows how the TI-Nspire CX capability to have cross-app collaborations help in better understanding and engagement of students.

ABSTRACT FOR 20709

GEOGEBRA & LATEX

Authors: Amitava Saraswati, amitava.saraswati@gmail.com; Girish Belkar, girishbelkar@gmail.com

Necessity is indeed the mother of invention. The genesis of all mathematical development stems from practical needs. But soon it transcends the confines of its immediate utility.

Mathematics has always played and will always keep playing an important role in our day – to – day life.

Gone are the days when students remained passive listeners and the teacher ruled the roost in the class. Today, the students, being more tech savvy, are far more enlightened and often a step ahead of their teachers. To keep pace with the changing scenario, teachers need to upgrade themselves, and what better way than to attend a conference like TIME. This would help them to motivate themselves, share ideas, discuss new problems, broaden their horizon and ignite the spark within.

Contrary to popular belief that mathematics is nothing but a mind game, a lot of mathematical conjectures and results were a consequence of serious mathematical doodling. Today we have enough tools to experiment with mathematical concepts.

One such popular tool is GeoGebra. Being the founding fathers of The GeoGebra Institute of India based at NCERT New Delhi, we would like to take up the cause of promoting GeoGebra, for school and college teachers for effective teaching, by conducting workshops or seminars at TIME '13 on GeoGebra.

Another mathematical tool for the researchers and for those who indulge in writing mathematical articles or books, is LaTeX. We would be happy to take up parallel sessions in GeoGebra and Latex for the uninitiated during TIME'13, much like the way it was done in TIME'11 at Indore.

This time around, we would like to conduct GeoGebra tutorials for Secondary and Senior Secondary teachers. The content would include Geometry, Calculus and optimization using Linear Programming.

The LaTeX content would include type setting mathematical ideas, coding to write a bibliography for a thesis or a dissertation and also teach the art of presenting an article in LaTeX using LaTeX Beamer.