Integration of Technology into Mathematics Education: past, present and future

Proceedings of the Sixteenth
Asian Technology Conference in Mathematics

19-23 September 2011
Bolu, Turkey
Abant İzzet Baysal University

Editors
Wei-Chi Yang, Radford University, USA
Miroslaw Majewski, New York Institute of Technology, UAE
Tilak de Alwis, Southeastern Louisiana University, USA
Erol Karakirk, Abant İzzet Baysal University

Published by Mathematics and Technology, LLC (http://mathandtech.org)
ISBN 978-0-9821164-3-2 (hard copy)
ISSN 1940-2279 (CD)
ISSN 1940-4204 (online version)

Introduction

On the behalf of the Abant İzzet Baysal University, members of the International Program Committee of the ATCM conference, Turkish Ministry of Education, and members of the honorary board, we are delighted and honored to have this opportunity to introduce the papers of the ATCM 2011 – "Integration of Technology into Mathematics Education: past, present and future".

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. It is particularly wonderful to have so many participants from many Asian countries, America, Australia, Middle East and Europe.

Presented here papers address a very wide spectrum of topics and ideas. We can find here papers concentrating on using computer software in teaching mathematics, papers on using Internet, multimedia, computer games 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. Large part of this book, as well as the conference presentations, is devoted directly to teaching mathematics with the use of Dynamic Geometry tools and Computer Algebra Systems. There is also a significant set of papers on using graphics calculators in teaching mathematics courses.

It is in particular very important to notice how fast things are changing in technology for mathematics. Integrating technology into mathematics teaching, learning and research will definitely allow us to expand our knowledge horizon in mathematics. The society is changing also very rapidly, and we are facing new challenges in the classroom every day. In this conference we will find, like in previous years, a few new developments in technology for mathematics. We will find also a few interdisciplinary papers describing connections between art and mathematics.

We welcome you to learn from the authors, get in touch with the newest technology developments and experiment with technology tools during ATCM workshops. We wish you happy hunting for new ideas, solutions, and great personal contacts.

We would like to express our appreciation to the local organizers, in particular to the Abant İzzet Baysal University for the enormous task of planning and preparation of ATCM 2011 – 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 2011

International Program Committee (IPC)

International Program Co-Chairs

Tilak de Alwis , Southeastern Louisiana University, USA
Miroslaw Majewski , New York Institute of Technology, UAE
Wei-Chi Yang, Radford University, USA

International Program Committee

Paul ABBOTT, University of Western Australia, Australia
Keng Cheng ANG, NIE/ Nanyang Technological University, Singapore
Yiming CAO, Beijing Normal University, China
Kyung Yoon CHANG, Konkuk University,South Korea
Jen-Chung CHUAN, National Tsing Hua University, Taiwan
Lenni HAAPASALO, University of Joensuu, Finland
Noraini Binti IDRIS, University of Malaya, Malaysia
Masami ISODA, University of Tsukuba, Japan
Erol KARAKIRIK, Abant İzzet Baysal University, Turkey
Matthias KAWSKI, Arizona State University, U.S.A.
Krongthong KHAIRIREE, Suan Sunandha Rajabhat University, Thailand
Barry KISSANE, Murdoch University, Australia
Ichiro KOBAYASHI, International Educational Software, Japan
Ming-Gong LEE, Chung Hua University, Taiwan
Hee-chan LEW, Korea National University of Education, South Korea
Lu YANG, Guangzhou University, China
Ma. Louise Antonette De Las Penas, Ateneo De Manila University, Philippines
Douglas Meade, The University of South Carolina, U.S.A.
Eva Milková, University of Hradec Králové, Czech Republic
Antonio R. Quesada,The University of Akron, U.S.A.
Inder K. Rana, Indian Institute of Technology, Powai, India
Katsuhiko SHIMIZU, Tokyo University of Science, Japan
Tadashi TAKAHASHI, Konan University, Japan
Yuan YUAN, Chung Yuan University, Taiwan
Bernd ZIMMERMANN, Germany

Local Organizing Committee

Erol KARAKIRIK, Abant İzzet Baysal University
Mustafa DOĞAN, Selcuk University
Emin AYDIN, Marmara University
Ali DELİCE, Marmara Üniversity
Fatih ÖZMANTAR, Gaziantep University
Samettin GÜNDÜZ, Abant İzzet Baysal University
Ahmet Ocak, Abant İzzet Baysal Üniversity
İbrahim BAYAZIT, Erciyes University
Erhan BİNGÖLBALLI, Gaziantep University
Ilyas YAVUZ, Marmara University
Servet DEMİR, Gaziantep University
Serkan ÖZEL, Bosphorus University

ATCM 2011 Ministry of Education Conference Board

Muammer GÜRBÜZ, Vice Director General of Teacher Education
İ.Halil ALTINOK, Head of Department at Directorate General of Teacher Education
Recep SEZER, Bolu Director of Education
Yaşar YENİÇERİOĞLU, Assistant Head of Department at Directorate General of Teacher Education
Selami ALBAYRAK, Assistant Head of Department at Bolu Directorate of Education

Honorary Board

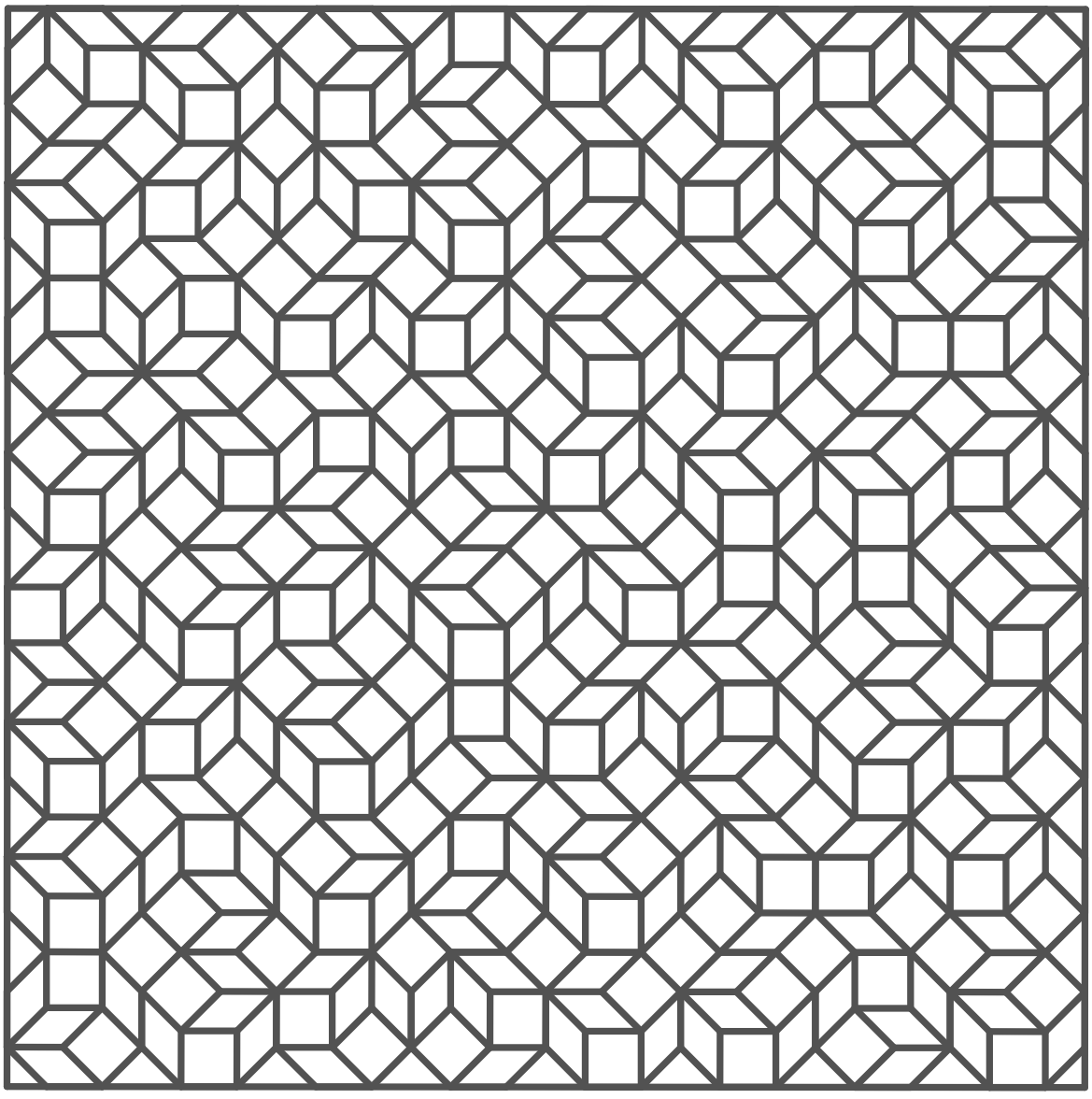
Ömer DİNÇER, Turkish Ministry of Education
İbrahim ÖZÇİMEN, Governor of Bolu
Alaaddin Yılmaz, Bolu Mayor
Prof. Dr. Hayri Coşkun, Rector of Abant İzzet Baysal University
Asst. Prof. Dr. İrfan ÇİFTÇİ, Member of the Board of Directors of Turkish Radio and Television (TRT)

Advisory Board

Ahmet Göksel AĞARGÜN, Yıldız Teknik University, Turkey
Ömer ÖZYILMAZ, Kırklareli University, Turkey
Ömer BALIBEY, Director General of Teacher Education at Turkish Ministry of Education, Turkey
Bruno BUCHBERGER, LINZ, Austria
Peng Yee LEE, NIE/ Nanyang Technological University, Singapore

External reviewers

Keng Cheng Ang
Jen-chung Chuan
Jean-Jacques Dahan
Ma.Louise Antonette De Las Penas
Tilak dealwis
Maria Ailynn Diansuy
Gary Fitz-Gerald
Hailiza Kamarulhaili
Erol KARAKIRIK
Krongthong Khairiree
Barry Kissane
Ming-Gong Lee
Leng Leng Lim
Christopher Longhurst
Zacharie M'BAITIGA
Yoichi Maeda
Miroslaw Majewski
Douglas Meade
Eva Milková
Greg Oates
Antonio R. Quesada
Inder Kumar Rana
Lila Roberts
Wei-Chi Yang
Yuan Yuan



ATCM 2011 GALLERY: Contemporary Islamic geometric ornament based on the ornaments from Masdar Institute in Abu Dhabi. Construction by Mirek Majewski using Geometer's Sketchpad.

Abstracts for Plenary Talks and Invited Papers

ABSTRACT FOR 18798

GEOMETRIC ORNAMENTS IN ISTANBUL

Authors: Miroslaw Majewski
Affiliations: New York Institute of Technology, Abu Dhabi Campus

Islamic ornaments are one of the greatest achievements of ancient geometers in the Middle East, Turkey, India, Spain, and North Africa. These ornaments are frequently used to decorate secular and civil buildings, books, and furniture. Istanbul, in particular, is a place where such ornaments were, and still are, frequently used.

In this lecture we will explore selected geometric ornaments from Istanbul. Many of these ornaments were created using very precise geometric constructions. We will analyze structure of these ornaments and show how grids used to draw these ornaments were constructed. We will use Geometer's Sketchpad to construct these grids and complete ornaments. Many of presented in this lecture examples have a serious didactical value. While creating them students can learn a number of traditional topics in geometry – constructions of regular polygons, constructions of figures circumscribed or inscribed in a circle, division of angles and segments into a given number of parts, transformations of figures, symmetry groups, topics related to coloring maps, and many other.

ABSTRACT FOR 18981

TILINGS, PATTERNS AND TECHNOLOGY

Authors: Ma.Louise Antonette De Las Penas, Angela Fatima Guzon
Affiliations: Ateneo de Manila University

Tilings and patterns theory has been an interesting field of study by mathematicians for more than 100 years. The mathematical theory of tilings includes various branches of mathematics such as geometry, algebra and number theory.

In this talk, we discuss the different roles of technology in the mathematical study of tilings and patterns. We show how colored tilings and patterns, generated through the aid of technology, can be used as tools in teaching and learning algebraic and geometric concepts, and in the development of critical thinking. In the past years we also have seen new development in tiling theory such as the emergence of non-periodic tilings (e.g. the Penrose tiling), non-Euclidean tilings, and tessellations in higher dimensions. We also present how it is possible, through technology, to understand the interesting properties of these tilings, to explore the deeper mathematical ideas presented by these tilings and to discover a wide variety of their connections to nature, architecture, art and the study of crystal structures. In addition, we illustrate how technology facilitates the solution and proof of challenging mathematical problems suggested by tilings. A focus of this talk will also be the mathematics of Islamic patterns and tilings. Part of the discussion will be technology as a means to exploring the cultural connections of these tilings; and as a bridge to linking historical tilings and modern emergence of these tilings.

ABSTRACT FOR 19017

HOW TO DOUBLE THE RATE OF DISCOVERY WITH CABRI 3D?

Authors: Jen-chung Chuan
Affiliations: National Tsing Hua University

Joseph Gergonne and Jean-Victor Poncelet independently noted that given any theorem or definition in projective geometry, substituting point for line, lie on for pass through, collinear for concurrent, intersection

for join, or vice versa, results in another theorem or valid axiom, the "dual" of the first. The principle of duality has thus doubled the rate of discovery. In this talk we are to examine what other principles are doing the same using Cabri 3D as a tool of discovery.

ABSTRACT FOR 19048

CASES IN TECHNOLOGY-ENRICHED SCHOOL MATHEMATICS

Authors: Beverly Ferrucci, Ngan Hoe Lee
Affiliations: Keene State College, National Institute of Education Singapore Nanyang Technological University

This presentation is a report of three case studies intended to advance the integration of technology into school mathematics. The first study used interactive computer software and visual manipulatives to enhance primary school students' understanding of equivalent fractions and comparing fractions in Singapore. The second study reviews the performance of pre-service secondary school teachers on proportional reasoning lessons that incorporated various technologies. The third study reports on the mathematics lessons presented by pre-service secondary school teachers using Smart Board technology.

Analysis of these case studies included performance data and video assessments of students' presentations. Results showed that (1) technologies provided an excellent platform for primary school students to build their understanding of mathematical concepts, principles, and applications; (2) pre-service secondary teachers used a variety of appropriate technologies in proportional reasoning lessons; and (3) future mathematics teachers were quick to develop expertise in using the Smart Board to design and implement lessons in secondary school mathematics.

Presentation of these cases includes samples of student computer interactions and video clips of students' lessons. We conclude the presentation with suggestions for further research involving the integration of technology with school mathematics.

ABSTRACT FOR 19054

NEW CONTENT, METHODS, AND APPROACHES PROMOTED BY THE INTEGRATION OF TECHNOLOGY IN SECONDARY MATHEMATICS

Authors: Antonio R. Quesada
Affiliations: The University of Akron, Department of Mathematics

In this presentation we review relevant changes that the integration of technology in general and of hand-held graphing technology (HHGT) in particular, facilitates at the secondary and basic college mathematics levels. We will show how numerous topics and concepts, traditionally reserved for upper level mathematics courses, are now accessible at lower levels. Likewise, the different representations and data types that HHGT provides, and lately the possibility of recognizing in one platform a variable defined in any other, makes possible the introduction of different approaches to solve a variety of problems, as well as some new approaches inherent to the new technology. Finally, more than ever, technology makes it possible to implement the use of the "explore-discover-test-conjecture-prove" model at every level, providing the possibility of increasing the inquiry-based approach in the way we teach and learn mathematics. This approach may help students become independent learners, in a time when it is becoming increasingly important to do so, since new discoveries and the access to data is increasing exponentially. The implications of these potential changes in content, approaches to problem solving, and methods affect most aspects of the teaching and learning process. The curriculum in secondary mathematics is already full; however, given the importance and scope of the applications now accessible, it is important to ask: does our curriculum responds to these new topics at this level? What criteria can be used to decide what topics should be added and which ones should be removed? Does the preparation of our future mathematics teachers respond to these new realities? Do our current textbooks take into consideration these possible changes? If time allows, we will provide some initial research results to how these questions can be answered in the USA.

ABSTRACT FOR 19113

INTERACTIVITY IN DYNAMIC MATHEMATICS ENVIRONMENTS: WHAT DOES THAT MEAN?

Authors: Colette Laborde, Jean-Marie Laborde
Affiliations: University Joseph Fourier, Cabrilog, France

It is commonly accepted that an important feature of technology and technology based tasks lies in their interactivity and in the possibility of providing feedback to students' actions. The talk will address the notion of interactivity and feedback from a twofold perspective, on the one hand the design of the features of a dynamic mathematics environment and on the other hand the design of tasks based on this environment and of different types of feedback provided to students. It will be shown that the degree of interactivity may greatly vary and that interactivity affects many aspects of the use of such environments. The discussion will be illustrated by the various Cabri technologies.

ABSTRACT FOR 19140

IMAGERY AND THE GEOMETRIC IMAGINATION

Authors: Nicholas Jackiw
Affiliations: KCP Technologies, Inc., Simon Fraser University

Ubiquitous digital cameras enrich discussion in the math classroom by providing both handy images of relevant applications, and the opportunity for motivating connections between students'' personal lives and their mathematical activity. At a deeper level, geometry is our best language for thinking about shape and space, and in turn helps us construct, transform, dissect, and analyze images. Technology is the vehicle that brings these ideas together accessibly and affordably. In this talk, I'll use The Geometer's Sketchpad Version 5 to describe some of the geometric and algebraic possibilities that arise, up and down the curricular ladder, as one begins to explore mathematical ideas using digital pictures. In the accompanying paper, I investigate in more detail some of the software functionality and design decisions that permit these explorations in Sketchpad.

ABSTRACT FOR 19186

REDEFINING SCHOOL AS A PIT STOP: IT IS THE FREE TIME THAT COUNTS

Authors: Lenni Haapasalo
Affiliations: University of Eastern Finland

Instrumental genesis in a modern society together with a redefined conception of teaching and learning have caused that mathematics appears more learner (community) centered, and more distributive (i.e. free from time, location and formal modes). On the other hand, it has been recognized that the general lack of enjoyment of institutional mathematics teaching is one of the basic reasons behind the bad reputation of mathematics in society. Increasing students' motivation to make mathematics through enjoyment and playing, especially in their free time, might therefore be a relevant research focus. This contribution discusses with concrete examples how instrumental genesis pushes educators on all levels to adapt a thorough shift in their views as regards where the optimal learning of mathematics is allocating and which kind of assessment would fit this new paradigm. It also discusses reasons why the school institution might encounter stalemate in assessment, and severe problems to orchestrate especially technology-based investigation spaces which allow students to explore the facility of real and virtual environments which are both meaningful to them and their society and which naturally motivate a greater use of mathematical language in its different forms. The value of these environments is assessed from the perspective of the challenges of instrumental orchestration, represented by the author in his plenary in ATCM 2008.

ABSTRACT FOR 19189

PERSPECTIVES OF INTERACTIVE GEOMETRY SOFTWARE

Authors: Ulrich Kortenkamp
Affiliations: Pädagogische Hochschule Karlsruhe, CERMAT, Cinderella

Interactive (or dynamic) geometry software seems to be well-established by now. Being invented more than 20 years ago, with roots in the sixties of the last century already, we might be tempted to say that "the problem has been solved" and move on. There might be some innovation, bringing IGS to more devices, improving the presentation of sketches, integration with other mathematics software - but all these are rather evolutionary and not revolutionary. The great impact of the first real geometry software systems - Geometer''s Sketchpad and Cabri Geometry - does not seem to happen again.

On the other hand, even that impact did not really change the situation in schools. In my talk I want to point out some of the real challenges we face. How can we substantially change the way teachers and students use the computer for teaching and learning? What methodology will help us to find best practices? What are the chances for research in mathematics education? I may raise more questions than I will be able to answer, but as the ubiquity of computers cannot be stopped, it is time to ask them.

ABSTRACT FOR 19335

TECHNOLOGY HAS SHAPED UP MATHEMATICS COMMUNITIES

Authors: Wei-Chi Yang
Affiliations: Radford University

There is no doubt that technological tools have greatly impacted our mathematics teaching, learning and research in recent years. The exciting innovative ways of presenting learning, teaching and research materials on the internet have prompted educators and researchers to rethink the importance of taking global views to solve local problems. In this paper, we use several examples to demonstrate some abstract mathematical concepts can be conveyed to students graphically, and the needs to conduct collaborative research because the existence of a solution is simply not adequate when computational tools are available nowadays. Furthermore, we emphasize that technology can be implemented effectively to enhance pre-service teachers' content knowledge. Finally, we urge all software and hardware developers to work together to make the learning tools more uniformly accessible; after all, beginners should be concentrating in how mathematics content is learned instead of worrying about what software syntax or hardware keystrokes they should be using. When interests in math and science are genuinely cultivated, one can truly appreciate mathematics and discover exciting mathematical theories.

ABSTRACT FOR 19339

CONSTRUCTIVIST IN MATHEMATICS IN VIRTUAL CLASS WITH MOODLE AND THE GEOMETER'S SKETCHPAD

Authors: Krongthong Khairiree
Affiliations: International College, Suan Sunandha Rajabhat University Bangkok Thailand

This paper is a report of research explored how Moodle and the Geometer's Sketchpad can enhance students construct their mathematics knowledge. The samples of this research were students of International College, Suan Sunadha Rajabhat University. Moodle website of mathematics course was designed. The components of the Moodle website were course description, mathematics contents and topics, worksheets, assignment, and chat room. Mathematics activities using the Geometer's Sketchpad were designed and embedded in this Moodle website. Research finding showed that students were able to construct their mathematics knowledge through Moodle in virtual classes or on-line learning environment by communicating and receiving helping from peers. The students explored their mathematics activities with the Geometer's Sketchpad; they interacted by dragging and animating as many as they wanted. Through Moodle, the shy students who never asked questions in normal class were able to ask and received feedback from lecturer and their friends. The

students reflect their thinking by chats, write answers, informal talk and discuss with their friends. The students had positive attitude toward mathematics.

ABSTRACT FOR 19352

MY JOURNY FROM LOGO TO GEOGEBRA

Authors: Adnan Baki
Affiliations: Karadeniz Technical University, Turkey

This presentation deals with my journey within the world of educational computing. This journey started with Logo in 80''s and continues with Cabri and Geogebra. At the beginning of the journey I came up with the book titled "New horizons in educational computing". In this book Saymor Papert enthusiastically says that computers as powerful learning tools will change tomorrow's classrooms. In 80''s and 90''s, I actually had difficulty to see this potential of computers in changing teacher's role and practice. I tried to compromise my teaching approach based on telling and showing with the approach based on Papert's constructivist ideas. It was not easy for me to shift from traditional notions of teacher to constructivist teacher using Logo, Cabri and Geogebra as primary tools for doing and exploring mathematics in classrooms. In this presentation, I illustrate how I linked Logo with Piaget's assimilation-accommodation process. Then I give examples showing how we as mathematics teachers can initiate problem solving and exploration experiences though Cabri and Geogebra in mathematics classrooms together with our students. So, our journey does not finish, we continue to run towards new educational horizons.

ABSTRACT FOR 19425

GRAPHING CALCULATORS IN SECONDARY MATHEMATICS TEACHING AND LEARNING

Authors: Chang Pei Wang, GT Springer
Affiliations: Hewlett-Packard, China

The teaching of mathematics is by necessity mediated by representations of mathematical objects. In some sense, this makes mathematics unique among the academic subjects. Indeed, the U.S. National Council of Teachers of Mathematics (NCTM) clearly recognized the central role of representations when they included a representation strand in their Principles and Standards for School Mathematics. U.S. secondary mathematics teachers have long acknowledged the graphing calculator for its ability to quickly create, manipulate, and switch between various representations of mathematical objects. Chinese mathematics teachers share similar ideas about representation; indeed, the expression of "shu xing jie he" (combine number with graph) has already been widely accepted as a golden principle for mathematics teaching since the 1960's. A recent project in China, Integration of Handheld Technology with the New Mathematics Curriculum, gives us an opportunity to compare and contrast the ways Chinese teachers and students use the graphing calculator with the ways of their American counterparts. The similarities are as interesting and informative as the differences. Come join us to hear about our preliminary findings and hypotheses.

ABSTRACT FOR 19553

DERIVING GEOMETRY THEOREMS BY AUTOMATED TOOLS

Authors: Pavel Pech
Affiliations: University of South Bohemia

Derivation of geometry theorems belongs to mighty tools of automated geometry theorem proving. By elimination of suitable variables in the system of algebraic equations describing a geometric situation we get required formulas. The power of derivation is presented on computation of the area of planar polygons given by their lengths of sides and diagonals. This part we conclude with derivation of a formula of Robbins for the area of a cyclic pentagon given by its side lengths. Searching for loci of points of given properties is a special case of derivation. This topic belongs to the most difficult parts of school mathematics all over the world. New technologies DGS and CAS enable to overcome this problem. We demonstrate it in a few examples from elementary geometry.

ABSTRACT FOR 19557

STUDENT-FRIENDLY TECHNOLOGY-AIDED CALCULUS APPLICATIONS WITH MINIMAL OVERHEAD

Authors: Douglas Meade
Affiliations: Department of Mathematics, University of South Carolina, Industrial Mathematics Institute, USC

Many students do not appreciate or relate to the theoretical basis of the mathematics that they are learning. Instead, they are motivated by applications that can be analyzed with the mathematics that they are learning. Because of the diversity of our students, and limited time, the applications should not require too much additional background from another discipline. Unfortunately, many of the classical calculus applications do not meet these requirements.

The speaker has assembled a collection of applications that have proven to be accessible and appealing to students. This talk will highlight a few of these that benefit from the use of various modes of technology, including computer algebra, dynamic geometry, and graphical visualization. Examples include designing a roller coaster, an exploration of fractal curves that are continuous everywhere but differentiable nowhere (Koch snowflakes), a model for a parachute jump that is physically realistic and meets safety guidelines, and a model for the trajectory of the rear wheel of a scooter

Each of these applications involves no mathematics beyond what is found in traditional single-variable calculus. The use of technology allows these applications both to be introduced earlier in the curriculum and to reach mathematically-interesting conclusions than otherwise possible. As a result, more students are attracted to study more mathematics - both theoretical and applied.

Abstracts for Full Papers

ABSTRACT FOR 18834

DYNAMIC CONSTRUCTION OF THE COMMON PERPENDICULARS IN THE THREE-SPHERE

Authors: Yoichi Maeda
Affiliations: Tokai University

Construction problems are good exercises to understand geometry deeply. Using dynamic geometry software, we can easily check whether some conjecture is true or false. In this paper, we introduce a construction of the common perpendiculars to two great circles in the three-dimensional sphere. We will see that the foci of some hyperbola play an important role in the construction.

ABSTRACT FOR 18933

THE DEVELOPMENT OF MULTIMEDIA COURSEWARE OF LINES AND PLANES IN 3DIMENSIONS: AN APPLICATION OF VAN HIELE'S LEVELS

Authors: Wan Fatimah Wan Ahmad, Syazwan Noordin
Affiliations: Universiti Teknologi PETRONAS, Computer & Information Sciences Department Universiti Teknologi PETRONAS, 31750 Tronoh, Perak, Malaysia

The role of visualization in Mathematics has been a subject of current research. This paper is inspired by and utilizes the van Hiele's levels for teaching and learning Lines and Planes in 3 Dimensions. Based on an early study, students have identified of having problems in visualizing the figures. Therefore, a multimedia courseware was developed and applied the van Hiele's levels on the visualizing the 3D models. This paper also points out features of van Hiele's Levels and shows that they are also characteristics of the proposed levels of Lines and Planes in 3D. The tools used in the development were 3DS Max 7 and Macromedia Director MX. The results of the courseware development will be discussed. This paper concludes that, the development of multimedia courseware with 3D models is mainly based on van Hiele theory which is believed to solve the students' problems in visualization.

ABSTRACT FOR 18953

DEVELOPMENT OF CREATIVITY USING 3D DYNAMIC GEOMETRY SYSTEM INMA

Authors: Shelomovskiy Vladimir
Affiliations: Deoma, Murmansk State University

Experience of teaching mathematics with Interactive Mathematical Art (InMA) software is described in this article. InMA project has been used for teaching mathematics in Russian schools with in-depth study of mathematics since 2005. Courses in algebra and geometry have been developed for secondary school based on the traditional textbooks. Now about 1500 students and 60 teachers use InMA software, 20 teachers act as experts, i.e., periodically make suggestions to improve certain topics. Teachers have a special interest in interdisciplinary methodical sets, examples of which are demonstrated in this article. InMA project includes computer algebra system (CAS), single-stepping system (SSS), graphing tools for all kinds of functions and two kinds of dynamic geometry systems (DGS). That allows creating interactive 2D and 3D geometric images, interactive graphics and text with changeable parameters. InMA is a tool for creating electronic textbooks and methodical sets. All the constructions in the geometric part of InMA project are carried out on the screen. However, teachers prefer to use ready-made teaching packages on the topics, only adding some more lines if it is need to answer questions of curious students. Many complex geometric problems can be represented as logical chains and a process of constructing of such a logical chain helps to develop student`s creativity. Dynamic geometry systems help to build logic chain, allowing step-by-step to provide a common part of

overlapping solids. In this paper we consider the samples of methodical sets created using dynamic geometry system GInMA, the part of InMA project.

ABSTRACT FOR 18969

THE GAMBLER'S RUIN--ANALYSIS BY SPREADSHEET

Authors: Thomas McMillan, James Fulmer
Affiliations: University of Arkansas at Little Rock

The "Gambler's Ruin" problem is stated as follows. Two players have a total of N coins, they win or lose a coin based on the outcome of a coin toss, and they continue to flip a coin until one or the other player has won all N coins. We use this problem to illustrate how the spreadsheet can be used to give a detailed analysis of this game, giving numerical answers to the following questions: (1) What is p(n,t), the probability that a game ends in t coin tosses given that one of the players has n coins? (2) What is q(n,t), the probability that a player with n coins loses the game in t coin tosses? (3) What is p(t), the probability that a game will last t coin tosses? We illustrate using the spreadsheet to check our models for internal consistency and for consistency with known results. Our examples illustrate how using the spreadsheet motivates the study of recurrence relations and the advantages of this approach in an introductory discrete mathematics class.

ABSTRACT FOR 18977

SELF LEARNING LABORATORY SESSIONS FOR ENGINEERING MATHEMATICS

Authors: Pee Choon Toh
Affiliations: National Institute of Education, Nanyang Technological University

In this paper, we will discuss the implementation of self learning computer laboratory sessions for a first year mathematics course designed for students from the Faculty of Engineering. Computer laboratory sessions have been part of this course for several years. It typically consists of allocating students into small groups to be taught by instructors. The self learning model significantly reduced the amount of resources required and introduced flexibility and was well received by the students. This was made possible by the availability of free open source software.

ABSTRACT FOR 19019

DEVELOPING MATHEMATICAL TEACHING MATERIALS OF FUNDAMENTAL ANALYTIC GEOMETRY AND CONIC SECTIONS USING THE GEOMETER'S SKETCHPAD (GSP) ON STUDENTS IN GRADE 10

Authors: Ubol Klongkratoke
Affiliations: Department Informatics Mathematics. Faculty Science & Technology.University Rajabhat Suan Sunundha, Bangkok ,Thailand.

This research aims to develop Mathematical teaching materials on the topic of the introduction to Analytic Geometry and Conic Section using the Geometer's Sketchpad (GSP) on the students in grade 10 in order to have the performance efficiency of 75/75 by the comparison on the student achievement before and after these useful teaching materials are used in classes and to study the attitude of students on Mathematics after taking classes with the application of these materials. The sample group in the research is 33 students studying in grade 10 at the Demonstration School of Suan Sunandha Rajabhat University by simple random sampling. Tools used in this study include lesson learning plans on the introduction to Analytic Geometry and Conic Section using the Geometer's Sketchpad (GSP), a 30-question achievement test on Analytic Geometry and Conic Section and a 20-question attitude test on Mathematics. The collected data are statistically analyzed in terms of mean, standard deviation and coefficient of variation. The results reveal that (1) the effectiveness in using the Geometer's Sketchpad (GSP) on the introduction to Geometry and Conic Section on 10th grade students is at the level of 76.40/76.50 (2) students' academic achievement on the post test is higher than that on the pre test at the significant level of 0.05 (3) students' attitude toward Mathematics after the use of these Mathematical teaching materials is at a good level.

ABSTRACT FOR 19022

REVISITING THE TEACHING OF PERIMETER, AREA AND VOLUME AT A MIDDLE SCHOOL LEVEL WITH CABRI ENVIRONMENTS

Authors: Jean-Jacques Dahan
Affiliations: IREM of Toulouse

Two years ago a joint research project between my Institute of research and a french middle school in Casablanca had been started. The aim of this project was to combine my skills as an expert in dynamic geometry and experimental math with the skills of a colleague of this middle school as a teacher and a technology user. We aimed to respond to her needs for resources involving using Cabri environments to teach some contents of the French middle school syllabus: perimeter, area and volume. This paper describes the files created by the expert, how they were designed with the teacher and how they were used to enhance the more experimental practice of mathematics in the classroom. The theoretical background of this work generated the results I have obtained concerning the experimental process of discovery using Cabri.

ABSTRACT FOR 19026

ON SOME ADVANTAGES OF USING MATHEMATICS SOFTWARE

Authors: Tuncay Kör, Ali Hikmet Deger, Murat Beþenk, Bahadýr Ö. Güler
Affiliations: Karadeniz Technical University Faculty of Science

Department of Mathematics, Karadeniz Technical University Science Faculty Department of Mathematics, Rize University Arts & Science Faculty Department of Mathematics Keywords: In this paper,we want to share our observations in some courses. We give some example about that how increase students'' interest in the case of giving an opportunity to use some mathematics software exploring some concepts in the content. For studying group action which one of the standard mathematical subject in algebra, we give some data to students and want to produce their conjectures. Results show us that our students are more willing to prove their own conjecture and try to explain eagerly.

ABSTRACT FOR 19028

INTRODUCING ALGEBRA WITH INTERACTIVE GEOMETRY SOFTWARE

Authors: Kate Mackrell
Affiliations: Institute of Education, University of London, UK

In order to consider the ways in which interactive geometry software might facilitate the expression of generality, an exploratory inspection using a series of tasks related to finding a connection between the radius and area of a circle was performed using Cabri II Plus, Casyopée, Cinderella, GeoGebra, Geometer's Sketchpad and TI-Nspire (CAS). It was found that the programs specifically designed to include algebraic functionality had less potential for enabling students to develop the concept of variable and to generate symbolic representations between variables than did the programs with less overt algebraic functionality. An implication is that more attention needs to be paid to the needs of learners in the early stages of algebraic thinking when incorporating algebra within IGS.

ABSTRACT FOR 19051

MOBILE CALCULATING LAB (MCL) BASED MATHEMATICS APPLICATION

Authors: Ling Yiguo
Affiliations: Beijing No. 15 high school

Since 2007, Beijing Education carried out curriculum reform. Mathematics education was performed according to newly revised curriculum standards and adopted new text books. In our fresh curriculum standards, we emphasize "Develop the students" mathematics application consciousness and propose. The connection between mathematics application and practice need in our senior school mathematics education needs to be strengthened, and try to turn mathematics application teaching into practical operating process.

Mobile Calculating Lab is one of many various mathematics application approaches. While I was teaching mathematics application, I adopted this teaching model and got some experiences. I summarized the general formula of this teaching model should contain the following four parts: question raising; experiment designing and data collecting; data analysis; data obtaining. The value behind this teaching model is that it helps the students foster their abilities on data collecting, data sorting and data processing; enhance their consciousness of mathematics application; deepen their understanding of the intrinsic side of the mathematics knowledge.

ABSTRACT FOR 19058

MCL IS?

Authors: Yapin Tian
Affiliations: Weishanlu Middle School

After two years use of graphing calculators Hp39gs, MCL gradually has stimulated the students' interest in learning, enriched students learning methods and improved their capability of learning. This paper aims to argue that MCL does promote the overall development of students at all levels through typical and specific cases from the three aspects under the new curriculum, and mainly reflects in how: (1) MCL makes those advanced math learners find a helping hand. (2) MCL helps those who are weak in math to find self-confidence; (3) MCL helps those who have no interest in mathematics students to find a starting point.

ABSTRACT FOR 19060

A PRELIMINARY STUDY ON THE USE OF ONLINE RESOURCES IN QUANTITATIVE TECHNIQUES FOR FIRST YEAR BUSINESS STUDENTS IN A MALAYSIAN PRIVATE UNIVERSITY

Authors: Chee-Keong Chong, You-How Go, Ying-Yin Koay, Chee-Heong Lee
Affiliations: UTAR, Universiti Tunku Abdul Rahman, Malaysia

Keywords: In this paper we intend to find out the awareness of students and the use of online resources provided by text book publisher. The online resources identified are PowerPoint slides (plain and narrated), audio lectures, Excel templates and Java applets on statistical concepts. The usage level of these was found to be low except plain PowerPoint slides which are common among students. On the other hand after the demonstration by the lecturer, most of students considered these to be useful in their Quantitative Techniques studies. Recommendations were made to integrate Excel and Java applets for the study of Quantitative Techniques.

ABSTRACT FOR 19081

CREATING COMPUTER GRAPHICS AND ANIMATIONS BASED ON PARAMETRIC EQUATIONS OF LINES AND CURVES – PROPOSALS FOR MATHEMATICS EDUCATION AT UPPER SECONDARY LEVEL

Authors: Andreas Filler
Affiliations: Humboldt-Universitaet zu Berlin, Gesellschaft fuer Didaktik der Mathematik

Creating computer visualizations, especially animations, can help students to understand geometric objects (especially straight lines and curves), which are described by parametric equations, as point sets and to discover functional relationships and dynamic aspects. Because creating computer animations is very attractive for students it can help to motivate them to figure out features of parametric descriptions. This paper makes proposals for creating graphics and animations on lines, circles, spirals, parabolas and other curves by describing these curves with parametric equations and shows some examples created by students at upper secondary level. As a prerequisite the students should have basic knowledge in trigonometry and elementary analytic geometry. Computer animations based on parametric equations of lines and curves can be created using computer algebra systems or photorealistic 3d graphics software (like POV-Ray). Examples using both kinds of software will be shown and described.

ABSTRACT FOR 19082

TO MAKE APLET ACCORDING TO ACTUAL CONDITION

Authors: Chengyang Liu, Jianyi Yang, Zhenping Rao
Affiliations: Quanzhou No.7 High School

When we use APPLET program carried by HP39GS itself, we feel it compact, convenient and considerate. These classical programs are thought over and refined again and again then developed basing on plentiful teaching experience and they are consummated after being launched into the market. But teaching content and test of math all over the country are different, for example, there is no division for Art and Science in Jiangsu Province, what more, dihedral angel is a point in the College Entrance Examination in Sichuan Province but is not required in Fujian. On the other hand, HP39GS has not programs like Vector Applet and solid geometry which are needed but not available. We therefore have to develop the Applets that suit local education according to the actual situation so as to ensure the students use it frequently and correctly. In Fujian Quanzhou No. 7 Middle School, we use Applet as often as possible even create the possibility to use while there is no. Complying with ¡°Fujian College Entrance Exam Illustration¡± writer integrate study situation in the class and develop independently several Applet program along with accumulating in normal teaching. With many revision and improvement in teaching practices, it leads to a good effect.

ABSTRACT FOR 19084

DEVELOPING CONCEPTS IN LINEAR ALGEBRA AND ANALYTIC GEOMETRY BY THE INTEGRATION OF DGS AND CAS

Authors: Ana Donevska Todorova
Affiliations: Humboldt Universität zu Berlin, Deutschland, MIT

University Skopje, Macedonia Keywords: Facilitation of the Computer Algebra Systems (CAS) in pedagogic purposes is an incentive for any mathematics researcher, yet integration of the Dynamic Geometry Software (DGS) with CAS in teaching mathematics is even a greater challenge. This paper, throughout created applets in the DGS GeoGebra and the CAS wxMaxima, sustained by additional materials, refers accurately to implementation of the integrated DGS and CAS in obtaining new teaching approaches in the course Linear Algebra and Analytic Geometry. Created teaching/ learning resources aim to facilitate the transition period from the upper- secondary to lower- tertiary level of this course. For this reason two- and three- dimensional, dynamic worksheets have been designed and furthermore, they have been implemented in the mathematics classroom. The goal of creating these interactive dynamic worksheets is to develop important concepts in Linear Algebra and Analytic Geometry, about which students have no previous knowledge. Thus, the paper presents an in-depth research in discovering new concepts for teaching and learning this essential mathematics discipline.

ABSTRACT FOR 19085

SIMILARITY MEASURE FOR FUZZY NUMBERS

Authors: TAYEBEH HAJJARI
Affiliations: Department of Mathematics, IAU, Firuz Kuh, Iran

Ranking of fuzzy numbers plays a very important role in linguistic decision-making and some other fuzzy application sys- terms. Several strategies have been proposed for ranking of fuzzy numbers. Each of these techniques has been shown to produce non-intuitive results in certain case. This paper proposes a new similarity measure to calculate the degree of similarity of generalized fuzzy numbers. The similarity measure is developed by integrating the concept of centre of gravity points and fuzzy difference of distance of points of fuzzy numbers. A fuzzy description for difference of distances between fuzzy numbers in its turn exploits appropriate similarity measure between the pattern sets when compared with other measures available. It greatly reduces the influence of inaccurate measures and provides a very intuitive quantification. Several sets of pattern recognition problems and a fingerprint-matching problem are taken to compare the proposed method with the existing similarity measures. Our approach gives a better and more robust similarity measure.

ABSTRACT FOR 19088

THE EFFECTIVENESS OF ICT-ASSISTED APPROACH IN LEARNING 3D LINEAR ALGEBRA

Authors: Hitoshi Nishizawa, Yoshihiro Yamada, Takayoshi Yoshioka
Affiliations: Toyota National College of Technology

Keywords: Linear algebra was one of underachieved fields of mathematics for the students of colleges of technology in Japan. The low scores at achievement tests were partially because, in the former lessons, the procedures of symbolic manipulation were taught separately from the features of associated graphical objects or how they were used in real world applications. The isolated procedural knowledge was easily forgot just after the examinations. To compensate this situation and deepen the students' conceptual understanding, we redesigned our lesson-plan to be directed from actual applications towards Abstract mathematical ideas; from handling graphic objects and observing their characteristics towards building vector equations and manipulating them symbolically. In the new lessons, several software programs are used to demonstrate the close relation of graphic objects and vector equations interactively. This paper reports how the new lessons are changing our students' learning styles from black-box approach and deepening their conceptual understanding of vector equations. Their written answers have richer explanations than their former students who learnt in traditional lessons. Their scores in annual INCT achievement test, which stayed low for previous four years, also increased significantly in 2011.

ABSTRACT FOR 19089

THE EFFECTIVENESS OF USING SCIENTIFIC CALCULATOR IN SOLVING NON-LINEAR EQUATIONS BY NEWTON-RAPHSON METHOD

Authors: Kian Boon Lim, Grace Joy Yong, Tau Han Cheong, Kim Gaik Tay
Affiliations: Universiti Pendidikan Sultan Idris, Universiti

Teknologi Mara, Universiti Tun Hussein Onn Malaysia In this paper, we will report the result of the study on the effectiveness of using scientific calculator in solving non-linear equation by Newton- Raphson method from the aspect of students'' marks and duration taken in solving question. A total of 38 mathematics students who enrolled for numerical analysis course in the second semester session 2008/2009 in the Sultan Idris Education University are involved in this research. The data taken from the pre test and post test were analyzed using the Statistical Package for Social Science (SPSS).The findings show that using scientific calculator gives positive effect on students'' ability to obtain the correct solution as well as reduces time to solve the problems.

ABSTRACT FOR 19090

AN ANCHORED INSTRUCTION CASE STUDY: DEVELOPING FIFTEENS PUZZLE AS A GRAPHICAL CALCULATOR CLASS TASK

Authors: Chang Wenwu, Xinsheng Lu
Affiliations: Shanghai Putuo Modern Educational Technology Center,

Master teacher of Intel TTF & TEO Program, Mathematics Science Department Shanghai Normal University P.R.China Keywords: In this paper we lead a class of 20 to rebuild a classical mathematics game called Fifteens in HP39gs graphical calculator. This task covers 4 class-periods when high school students of grade 11 work in team solving every kind of real problems. This practice is guided under the theory of anchored instruction first raised by John Bransford. We find this design has rich mathematics connotation and suitable for high school students.

ABSTRACT FOR 19091

SOLVING NON-LINEAR EQUATION BY NEWTON RAPHSON METHOD USING BUILT IN DERIVATIVE FUNCTION IN CASIO FX-570ES CALCULATOR

Authors: TAU HAN CHEONG, KIAN BOON LIM, Tay Kim Gaik
Affiliations: UNIVERSITI TEKNOLOGI MARA, Universiti Pendidikan

Sultan Idris, Universiti Tun Hussein Onn Malaysia Keywords: This paper studied the difference between the used of built in derivative function of scientific calculator and self derivative function in solving non-linear equation by means of Newton-Raphson method. Since this method requires the derivative of the function, some basic differentiation skills are needed. However, functions especially highly non-linear functions are hardly to be differentiated. Students may find it is difficult and thus quit from it. Now, with the help of the built in derivative function in scientific calculator, the problem can be easily solved regardless of the analytical expression. Results obtained using built-in derivative function and exact derivative are compared and discussed. A total of 350 engineering students (2009) from School of Technology in Kolej Tunku Abdul Rahman who enrolled in subject ATGE3083 Mathematics V have been taught using this method to solve non-linear equations. Analyses were done using Statistical Package for Social Science (SPSS) and the finding shows there is a great improvement where students more confident in solving non-linear problem using lesser time. Casio fx-570ES was used in this study as this model of calculator is widely used in Malaysia.

ABSTRACT FOR 19097

AN EXPERIMENT IN MATHEMATICS

Authors: Li Qiuxia
Affiliations: Gaolu

This paper is mainly about: During the teaching process in middle school mathematics, a case of inquiry learning, on the student's learning interests and creativity cultivation. Use HP39gs graphic calculators and MCL sensor, for a sound intensity certain sound source, measure the sound intensity in different distance, analysis and fitting the data collected, explore the relationship between attenuation of sound intensity with and distance. Use the fitting function got to analysis problems. It's important that we saw the students'' learning enthusiasm and discovery spirit after this small experiment, they explore the relevant knowledge of sound spontaneously, such as Language spectra and it''s usage. Application is the ultimate goal of learning mathematics. In the mathematics learning, using MCL, to carries on the observation, analysis and exploration of life phenomenon, enthusiastic the motivation of students to learn mathematics, and cultivate students' creativity.

ABSTRACT FOR 19098

INFLUENCE OF USING KETPIC GRAPHICS ON THE DEVELOPMENT OF COLLEGIATE STUDENTS'' PROOF SCHEMES

Authors: Masataka Kaneko, Setsuo Takato
Affiliations: Kisarazu National College of technology, Toho University

The influence of using graphics on mathematics education is a complicated and delicate theme, because the effect of using graphics depends on not only the quality of figures used but also many other factors such as teachers'' classroom design or students'' mathematical ability. In case of proof, this theme is especially difficult to analyze, since proof is entirely subjective and can vary from person to person according to their attitude to mathematics. In this paper, the authors will illustrate how geometric models could be effective in students'' shaping the conception of proof through some examples. Their approach is based on the classification of students'' proof schemes proposed by G. Harel, and their considerations indicate that Harel's classification should be improved. The graphical device to produce figures in this paper is KETpic, which is a macro package designed for computer algebra system to generate high-quality graphical images in high-quality mathematical documents edited by LaTeX .

ABSTRACT FOR 19102

WE WELCOMED M.C. ESCHER IN TURKEY'S NEW GEOMETRY PROGRAMME

Authors: BURCU AKAYDIN, MUJDE UYSAL
Affiliations: ISTEK OZEL ACIBADEM ANADOLU LISESI/ ISTANBUL, ISTEK OZEL ACIBADEM ANADOLU LISESI / ISTANBUL

Studying mathematics through patterns is an opportunity for students of all levels to develop mathematical knowledge connecting different subjects like geometry/geometric transformations and algebra. Considered mathematics as the science of patterns (Biggs e Shaw, 1985; Devlin, 2002; Goldenberg, 1998; Mottershead, 1985; Orton, 1999) it was the start point for our work. Patterns gave many opportunities for the study of mathematical concepts and the development of mathematical process as problem solving, communication, reasoning and proof. We propose a new method of teaching the principles of geometry to tenth grade students. The students focus on a field of design in which geometry is the design: tessellation. The students define their tessellations using the GEOGEBRA software. This procedure enables them to understand the mathematical principles on which graphical tools are built upon. It moves the Abstract concepts of math into the real world, so that the students can experience them directly, which provides a tremendous reward to them.

ABSTRACT FOR 19107

THE ROLE OF THE GRAPHING CALCULATOR IN THE QUALITATIVE ANALYSIS OF FUNCTION

Authors: Li Hong
Affiliations: NO.22 High School

This paper focuses on several cases of student's qualitative analysis of function under the support of graphing calculator and other forms of technology. This paper proposed the following points. With graphing calculator, students can get abundant material for qualitative analysis, a process of revealing the essence of the research object. Since study of function has very important effects on students' understanding of the characteristics of mathematics and the mathematical research methods and the qualitative analysis is to emphasize the holistic understanding of the pattern of variation expressed by the dependency between the two variables of function, graphing calculator as a technology indeed helps students understand the essence of mathematics, apply mathematics in a better way and even has a great impact on students' development.

ABSTRACT FOR 19109

ON THE CHANGES OF MIDDLE SCHOOL MATHEMATICS TEACHING UNDER THE CONDITIONS OF MCL

Authors: Wu Shaobin
Affiliations: Suqian College

The experiments show that the integration of MCL and middle school mathematics new curriculum brings some profound changes in many aspects, namely, the change of teaching content --- modern mathematics comes into student's domain of study, the change of teaching target aims of emotion are realized, the change of teaching methodologies the active self study under the teachers' guidance becomes common pattern, the change of the users of information technology students become the subject users of information technology.

ABSTRACT FOR 19110

ON CONSTRUCTION OF TEACHING MODE OF MATHEMATICS EXPERIMENT BASED ON MCL

Authors: Lu Mingming
Affiliations: Suqian Highschool

MCL is a new instrument to teach and study mathematics. Its primary characteristics are its portability, low price, easy operation and various functions. A student can get or use it at any time or in any place, so that he/she may be pleased to spend more time in exploratory mathematical activities. Mathematics is not just

involved logic reasoning, but is also related to experimenting. Therefore, in a mathematics teaching class, the teacher should fully represent these two sides. Studying mathematics is not just about to learn the deduction or to complete a formal verification, but also involved to learn a mathematical process, or to conduct a series of experimental and conjectural thinking and exploratory activities prior to the formal verification. Besides, the best way to conduct a mathematical exploratory activity is to do Mathematics Experiments. With MCL, the students may construct the teaching mode of a Mathematics Experiment through experimental validation, experimental exploration or experimental construction. While using MCL, the following principles need to be obeyed: grasping appropriate opportunities, adopting appropriate modes, and achieving appropriate goals.

ABSTRACT FOR 19143

INTERACTIVE ESTIMATOR FOR STOCHASTIC DIFFERENTIAL EQUATION

Authors: Tatsumune Abe, Ryoji Fukuda
Affiliations: Kyushu Institute of Technology, Faculty of Engineering Oita University

Stochastic differential equations (SDE) are being applied widely; however, theory behind the concept is difficult to understand. Therefore, we designed an educational system for simple SDEs. The SDEs used in this system are determined by two linear functions with constant coefficients. Then, four real numbers are used to define this equation. In our system, a graph of a sample path with respect to an SDE is given, and the purpose is to estimate the four real numbers. The system suggests these values and some provides a few graphs of sample paths for an SDE corresponding to the given parameters. Using our system, a user should be able to understand the role of these SDE parameters.

ABSTRACT FOR 19146

UBIQUITOUS MATHEMATICAL GRAPHIC VIEWER FOR VISUALLY IMPAIRED STUDENTS

Authors: Ryoji Fukuda, Akihiro Miura
Affiliations: Faculty of Engineering Oita University, Faculty of Engineering, Oita University

In a science class, a teacher may provide some temporal graphical information, which cannot be understood by visually impaired students. We have assumed the availability of support staffs for visually impaired students, such as note-takers for aurally impaired students, and we have designed a graphic input system for them. In this system, drawn curves are recognized and corresponding curve types and parameters as well as compensation curves are displayed. This system also has learning functions to improve the evaluating functions for recognition and reference points for compensation.

ABSTRACT FOR 19179

TRANSVERSAL MATHEMATICAL TEACHING FOCUS ACROSS OTHER SCIENCES

Authors: Horacio E. Bosch, Noemi Geromini, Mercedes Bergero, Leonor Carvajal, Mario Di Blasi Regner
Affiliations: Universidad Tecnológica Nacional, Fundación FUNPRECIT, Academia de ciencias aeronáuticas y espaciales, Council of Industrial Research Associations of the Americas

Engineering is very important to solve Society problems. Students, in general, do not feel attraction for engineering careers, as they find them very difficult and bored. In order students feel more interested, the current teaching habits and procedures must be changed, particularly for mathematics teaching. New focus related to experiments and models of real - life problems must be introduced. In order to turn over the present situation, the authors propose a new methodology to teach mathematics as transversal subject with other sciences. In this work the authors show how to experiment with new technical resources and solve a real-life problem through a model presentation and its predictions. The example is the study of a light falling body (coffee filter) within the atmospheric air. Ultrasonic radar coupled to an interface records both the body displacement and velocity. The limit speed is registered. Two physical models are presented, one, the friction force acting on the body is proportional to velocity, and the other, proportional to the velocity squared. The corresponding algorithm's solutions are obtained using a Computer Algebra System. The corresponding"

models" predictions are displayed in the same graphics and compared with the experimental velocity. The conclusion is that the first assumption is the correct one.

ABSTRACT FOR 19182

A MATHEMATICS RESEARCH OF A PROJECT CASE UNDER THE CONDITIONS OF MCL

Authors: Zhao Tao, Yuanxun Sun, Xiaoling Yang
Affiliations: Hainan Overseas Chinese Middle School

This paper expounds the process of setting foot on a chemistry problem to reflect the application value of mathematics research project by deliberation under the conditions of MCL. It also shows the process of students' applying mathematics thoughts to solve problems under the conditions of MCL. This paper indicates the handheld technology great effect in cultivating students' application awareness and creative consciousness in teaching. The change from mathematics learning to practicing has come out in the new curriculum.

ABSTRACT FOR 19185

ON THE EFFECTIVE USE OF GEOGEBRACAS IN MATHEMATICS EDUCATION

Authors: Hirono Naotoshi, Takahashi Tadashi
Affiliations: Kobe University, Nagata Senior High School, Konan University, JAPAN

The computer-based mathematics education was studied enthusiastically and the effective use of Computer Algebra System was a part of this attempt in Japan. The incorporation of Computer Algebra System in mathematics education in Japan, however, has not become able to become an indispensable tool in teaching mathematics. On the other hand, we have seen that the use of Dynamic Geometry Software in mathematics education has got many results in recent years. GeoGebraCAS is interactive geometry software that includes Computer Algebra System functions. In this paper, we show the effective use of GeoGebraCAS and consider how the incorporation of Dynamic Geometry Software in addition to Computer Algebra System can make positive impacts in mathematics education.

ABSTRACT FOR 19191

INTEGRATION OF INTERACTIVE RESOURCES INTO THE TEACHING OF MATHEMATICS IN PRIMARY EDUCATION IN MEXICO

Authors: Ivonne Sandoval, Edda Jimenez
Affiliations: Universidad Pedagógica Nacional, México, International Group for the Psychology of Mathematics Education, National Pedagogical University

This article reviews an interactive resource used in a national project in Mexico. The intention of its design is analyzed, as is the use to which teachers put it in math class. International research has shown that learning opportunities offered by Digital Technologies (DT) depend on the teacher's mediation supported by knowledge of the content to be taught and its technique which, together with the characteristics of the students, permit generation of new knowledge and mathematically useful learning activities, rather than mere adaptations of paper and pencil situations. We understand technological tools as an active part of the construction of mathematical knowledge. Instruments are not mere auxiliary components or neutral elements to the teaching of mathematics; they shape student actions. Every tool generates a space for action, while at the same time posing on users certain restrictions. Such limitations make it possible for of new kinds of action to emerge. The results of this study demonstrate that integration of technology into the classroom demands of the teacher not only knowledge of the tool, but also mathematical knowledge for teaching: pedagogical content knowledge, subject matter knowledge and the use of didactic teaching methods.

ABSTRACT FOR 19192

INNOVATIVE USES OF EXCEL IN LINEAR ALGEBRA

Authors: Deane Arganbright
Affiliations: currently retired

Over the years many new mathematical applications have been developed for spreadsheets such as Microsoft Excel. This paper examines some new illustrations of the use of Excel in linear algebra. Here Excel is used to reinforce definitions and concepts, as well as to carry out computations and to produce eye-catching interactive graphics. Three categories of interest are highlighted – solving systems of linear equations, creating illustrations of lines and planes, and investigating eigenvalues and eigenvectors.

ABSTRACT FOR 19193

DEVELOP STUDENTS' VISUALIZATION AND UNDERSTANDING OF FUNCTIONS THROUGH GEOMETRY AND PICTURES WITH SKETCHPAD 5

Authors: Scott Steketee, Steven Rasmussen
Affiliations: KCP Technologies, University of Pennsylvania Graduate School of Education

Students understand the concept of function more deeply by using dynamic mathematics software to manipulate an independent point and observe the behavior of the dependent point. This approach gives students an important visual window on the behavior of functions, on domain and range, and especially on relative rate of change and on composition of functions. An important Abstraction in students'' understanding occurs when they realize that they can use a function to map an entire set of input values to a corresponding set of output values. By working with geometric rather than numeric functions, students can see this process as one of mapping a shape to a corresponding transformed shape, or mapping a picture to a corresponding transformed picture. By considering shapes or pictures not only as collections of points, but also as recognizable visual objects, students can more easily understand the important duality that functions can operate both atomically (transforming a single input value or point) and collectively (transforming an entire set of input variables). Students can use Sketchpad 5 to define such transformations using isometries, similarity transformations, affine transformations, or arbitrary geometric constructions. Two particular classes of functions that interest them are transformations that remind them of those they see in popular media, and the transformations that artists use to paint a realistic 3D scene on a flat surface (anamorphic street art).

ABSTRACT FOR 19194

THE STRATEGIC THINKING OF MATHEMATICALLY GIFTED ELEMENTARY STUDENTS IN LOGO PROJECT LEARNING

Authors: In-Ok Jang, Hee-Chan Lew
Affiliations: Korea National University of Education

In this study, LOGO is incorporated in the dynamic project-based learning that provides students with opportunities to apply and advance their knowledge and engage in diverse creative activities beyond understanding geometric or arithmetic concepts through the integration of several disciplines not only mathematics but also art and others as a positive way to foster higher levels of thinking for gifted students. This study will investigate what strategic thinking the mathematically gifted elementary students use to plan, implement and debug in the programming process as a problem solving process.

ABSTRACT FOR 19554

A TECHNOLOGY FRIENDLY MATHEMATICS TEACHING METHODOLOGY

Authors: Mohamed Watfa, Diana Audi
Affiliations: University of Wollongong in Dubai, American University of Sharjah

Mathematics fear is an unaddressed reason that has a great effect on the unexploited capacity of young students. All over the world, the problem is so vast that huge amounts of money are being pumped into research grants to find out why competent students are terrified of Mathematics even when they get good grades in other subjects. In this research, we demonstrate and rigorously analyze a number of innovative and new teaching methodologies that incorporate the use of modern technology to encourage freshman students to participate and take an active role in Mathematics courses More precisely, we introduce for the first time two innovative teaching methodologies: 1) Dynamic Lecture Notes: A lecturing technique that automatically changes the next lecture slide based on the live student response to in class questions using wireless voting systems and 2) 24/7 Student-Teacher Portal: A Mobile Social Networking (MSN) application that attempts to bridge the gap between the students and the teachers outside the walls of a classroom. Both methodologies were researched thoroughly in a number of local university class rooms and the results were collected to investigate whether they would lead to a dramatic increase in the overall performance and therefore successfully enhance the learning experience of the students.

ABSTRACT FOR 19600

FOCUSING LEARNING ON CONCEPTS OF INTRODUCTORY LINEAR ALGEBRA USING MAPLE INTERACTIVE TUTORS

Author: Leonard Louis Raj, leonard.raj@zu.ac.ae
Affiliation: Department of Mathematics and Statistics, Zayed University, United Arab Emirates.

This paper describes the author's experiences on the application of MAPLE's built-in interactive tutors to explore and reinforce fundamental concepts in an introductory Linear Algebra course with students at Zayed University in the United Arab Emirates. Students are allowed to work interactively step-by-step through standard problems, and become engaged in their learning without getting caught up in the arithmetic. The basics of the functionality of interactive tutors for Gaussian Elimination, Gauss-Jordan Elimination, Matrix Inverse, Eigenvalues and Eigenvectors are discussed.

ABSTRACT FOR 19602

TRAINEE TEACHERS' ATTITUDES ABOUTMATERIALS AND TECHNOLOGY USE INMATHEMATICS EDUCATION

Mustafa Doğan, mudogan@selcuk.edu.tr
University of Selcuk, Faculty of Education, Konya, TURKEY

This study is planned to determine mathematics trainee teachers' attitudes about technology and material use in mathematics education. The study is conducted with a self-developed questionnaire as a survey. The second part of the survey is a Likert Type Attitude Scale which contains 31 items. Sample is a total of 125 students from a primary teacher training department. This paper includes findings from the scale. Descriptive statistical techniques (f, %,) were used to analyze collected data for the sample. The results show that the trainee teachers' attitudes are quite positive about materials and technology use in mathematics education. They stated that they are going to use the technology and materials in their professional mathematics teaching as well.

Abstracts for Papers with Abstract Only

ABSTRACT FOR 18790

SPREADSHEET AS AN INNOVATIVE TOOL FOR TRADITIONAL COUNTING

Authors: Thadreina Abady
Affiliations: Divine Word University

This paper seeks to highlight Excel spreadsheet as a mathematical tool in the creative teaching and learning of traditional counting systems in Papua New Guinea (PNG). PNG is known for its diversity in culture and tradition and so this paper wants to take advantage of the available technology such as spreadsheet to express the sort of diversity that exists in our traditional counting systems. In this paper 3 different types of traditional counting systems in certain parts of PNG are being discussed. The first traditional counting system from Mikarep village in the Madang Province, uses base 2 approach and is taught in the native language call "Aruamu" or "Big Man". The second one uses a base 5 counting system and comes from Manam in the Madang Province. And finally from East New Brititan Province, the traditional counting system is taught in the native language call 'Kuanua' and uses a base 10 approach. Each of this traditional counting system has been taught in the past and at present but without the use of computer-based learning technologies. It is our intention however, that with the current expansion of the One Laptop Per Child project (OLPC) in Primary schools around the country, spreadsheet can be better utilized as a dynamic tool for mathematics education especially in this area of traditional counting. The paper concludes that the way forward for mathematics education in Papua New Guinea, is to embrace technological tools like spreadsheet and use it creatively.

ABSTRACT FOR 18791

USING SPREADSHEET TO CREATE DIFFERENT RUG DESIGN

Authors: Maryanne Bagore
Affiliations: Divine Word University

A spreadsheet is a powerful mathematical tool that is widely used by math educators and learners to comprehend and solve many mathematical problems. This paper will illustrate an inventive way on how Excel can used to create different artistic rug designs or patterns using the concepts of Geometry, Algebra and Calculus in a Spreadsheet Application. Mathematical models are created to show how a particular rug patterns or designs can be created in Excel. My examples of rug patterns or designs would be taken from the traditional Papua New Guinean mats or rugs which are made mostly from the pandanas plant and also other examples will include rug patterns or designs from different countries and cultures such as the kilim from Turkey. Through my examples, the main point is on how Excel can be seen as an application that can used to create interesting, creative or odd things and not just for the fun of doing mathematics. The concept of this paper can be used in both the classroom teaching and teacher development.

ABSTRACT FOR 18940

THE EFFECTIVENESS OF ICT-ASSISTED APPROACH IN LEARNING 3D LINEAR ALGEBRA

Authors: Hitoshi Nishizawa, Takayoshi Yoshioka, Yoshihiro Yamada
Affiliations: Toyota National College of Technology

Linear algebra was one of underachieved fields of mathematics for the students of colleges of technology in Japan. The low scores at achievement tests were partially because, in the former lessons, the procedures of symbolic manipulation were taught separately from the features of associated graphical objects or how they were used in real world applications. The isolated procedural knowledge was easily forgotten just after the examinations.

To compensate this situation and deepen the students' conceptual understanding, we redesigned our lesson-plan to be directed from actual applications towards abstract mathematical ideas; from handling graphic objects and observing their characteristics towards building vector equations and manipulating them symbolically. In the new lessons, several software programs are used to demonstrate the close relation of graphic objects and vector equations interactively.

This paper reports how the new lessons are changing our students' learning styles from black-box approach and deepening their conceptual understanding of vector equations. Their written answers have richer explanations than their former students who learnt in traditional lessons. Their scores in annual INCT achievement test, which stayed low for previous four years, also increased significantly in 2010.

ABSTRACT FOR 18946

THE GENERALIZATION OF THE AREA OF AN INTERNAL POLYGON FOR THE USE OF MATHEMATICALLY GIFTED STUDENTS

Authors: Kwangho Lee, Heon Soo Lee
Affiliations: Korea National University of Education, Graduate School of Chonnam National University

This study investigates how the GSP helps gifted and talented students understand geometric principles and concepts during the inquiry process in the generalization of the internal polygon, and how the students logically proceeded to visualize the content during the process of generalization. Four mathematically gifted students were chosen for the study. They investigated the pattern between the area of the original triangle and quadrilateral and the area of the internal triangle and quadrilateral, with the ratio of each sides on m:n respectively. Digital audio, video and written data were collected and analyzed. From the analysis the researcher found four results. First, visualizing using GSP helps the students to understand the geometric principles and concepts intuitively. It also helps in verifying the various triangle and quadrilateral cases and analyzes the geometric structure, as well as reveals the synthesizing insight. Second, GSP helps the students to develop their inductive reasoning skills by proving the various cases. Third, lessons using GSP increases interest in apathetic students and improves their mathematical communication and self-efficiency. However, the measurement function of the GSP, which cannot express fraction, gives the students had difficulties on transforming a decimal to a fraction for the generalization of the area.

Internal polygon is defined as any polygon which is formed by connecting any points on another polygon''s perimeter.

ABSTRACT FOR 18950

INTEGRATING MAPLETS AND OTHER TECHNOLOGY INTO AN ONLINE CALCULUS COURSE

Authors: Denise LeGrand, Thomas McMillan
Affiliations: University of Arkansas at Little Rock, University of Arkansas at Little Rpck

Teaching mathematics online has offered many challenges. We meet these challenges head-on with the appropriate use of technology to help our students develop a deeper understanding of Calculus, through active learning and communication, visualization, reflection and motivation. A major factor in the success of our online Calculus courses is the use of Maplets developed by Dr. Douglas Meade and Dr. Philip Yasskin. A Maplet is an exercise or guided tutorial with a graphical user interface. A Maplet may include graphs as well as formulas and equations. Although in the beginning we were hesitant to introduce more materials into an already overfilled course, we quickly recognized that Maplets contribute to the understanding and appreciation of Calculus. Using them as required tutorials thoroughly engaged our students. Students voluntarily included Maplet examples to illustrate their explanations in the required discussion postings. We will present how we and our students use the Maplets for our online Calculus courses, and how they are graded. We will also talk about other technological resources for mathematics readily available on the internet (at little or no cost). We will concentrate on the Maplets but will also discuss other internet tools in relation to different student learning styles. It is exciting to see our students' participation and enthusiasm increase mainly as a result of the Maplets, but also through the integration of other online resources such as Webassign, Wimba chat and Webquests.

ABSTRACT FOR 18956

AMICABLE TRIANGLES AND PERFECT CIRCLES

Authors: Michael Sejfried
Affiliations: METAL UNION

Perfect circles in the triangle ABC have unusual properties. Their family spreads from the Fermat-Point across the incircle of the triangle ABC, until the circumcircle of the same triangle. Into perfect circles one can inscribe amicable triangles and then we will receive the construction with dozens of additional properties, which can be described with equations. Most important however in it is that using perfect circles we can generalize the problems related to Soddy-Circles, with the Soddy-Line and with the Gergonne-Line. We can also generalize Gergonne-Point and Eppstein-Points, Rigby-Points, Griffith-Points and Nobbs-Points.

Vertex-Circles of Soddy are tangent to themselves on the sides of the reference triangle ABC in the points A1, B1 and C1. The cevians based on these points intersect in the Gergonne-Point. The straight line connecting Gergonne-Point with the incenter of the triangle ABC is called Soddy-Line. On this line lie several important centres in the triangle such, as two Soddy-Points, two Eppstein-Points, two Griffith-Points and two Rigby-Points. These centres generalized by perfect circles as before lie on the generalized Soddy-Line. After the generalization we receive however four Eppstein-Points instead of two. Perfect circles are strictly connected with Nobbs-Points, which for these circles become the kind of focal points. The special attention deserves some curve which in certain sense is connected with the Pascal Theorem, but also with perfect circles and amicable triangles. This curve exists exclusively for the circles, but appends to the Pascal Theorem the equality of sums of some angles. I mentioned earlier about the amicable triangles and also I would like to devote them the moment of the time. There are triangles formed by 2 triplets of cevians so, that each of these triplets creates the single triangle inscribed into the same circle situated inside the triangle ABC. I'd like to present also the new interesting theorem concerning of the amicable triangles.

The lecture will be demonstrated using Geometer's Sketchpad. The names "amicable triangles" and "perfect circles" are an original nomenclature used by the author.

ABSTRACT FOR 18971

USING CLICKERS TO REVIEW PREREQUISITE MATERIAL AND READING ASSIGNMENTS

Authors: Thomas McMillan, James Fulmer
Affiliations: University of Arkansas at Little Rock

It is almost a universal complaint among mathematics faculty that students in an advanced class have an inadequate understanding of material that was covered in a prerequisite course. In this discussion, we will describe how individual response systems (clickers) were used in a differential equations class (1) to test students' recall of required material from calculus, and (2) to encourage discussion among students about concepts in calculus. The activity took from five to ten minutes at the beginning of each 75-minute class. We will discuss student reactions to this activity and its affect on the conduct of the class as a whole. We will also discuss a similar activity in a discrete mathematics class in which clickers were used to test students' understanding of assigned reading and to encourage discussions of questions raised.

ABSTRACT FOR 18972

VISUALIZATION OF RATIONAL NUMBERS COMMENSURABILITY BY USING DYNAMIC GEOMETRY SOFTWARE

Authors: In-Sun Shin, Ji-Eon Kim
Affiliations: Dept. of Mathematics Education Korea National University of Education

This study investigated middle school students' understanding of rational numbers and irrational numbers. We developed teaching and learning materials to visualize rational numbers commensurability by using dynamic geometry software (the Geometers Sketchpad). It is expected that the developed materials enhance students to understand irrational numbers incommensurability. Models based on the area, the ratio of the length,

overlapping and the similarity were developed and applied to students. We observed and analyzed the change of students perception about rational numbers and irrational numbers.

ABSTRACT FOR 18973

AN INNOVATIVE APPROACH TO LEARNING PROCESS: EFFECTS OF DYNAMIC MODELING ON TEACHING OF MATHEMATICS

Authors: Halil ARDAHAN
Affiliations: Selcuk University

The purpose of this study was to examine prospective teachers' views on dynamic modeling activities for the renewed curricula. Data collection was done with the Dynamic Modeling Activities Scale (DMAS) developed by the researcher in the year 2008. The survey is a 5-point likert type scale. One-way analysis of variance was used to test differences between first and last tests. Paired Samples and Wilcoxon test were used to examine further significant differences. Results were discussed in accordance with the research questions being addressed. Discussion and implications of the results were articulated. This study focuses on the prospective teachers' qualified learning and teaching mathematics and effects of dynamic modeling on learning process of them. The sample included 77 secondary mathematics prospective teachers, 48 of them are female and 29 are male attending the Pedagogical Formation Programs in Secondary Mathematics Education in Selcuk University in 2011. To collect data Dynamic Modeling Activity Scale (DMAS), including five- point Likert type ten items, developed by the author was used. Reliability coefficients of the scale is 0,84 and 0,78 respectfully by the pretest and post test. Descriptive statistics and Wilcoxon signed rank test for paired samples revealed that dynamic modeling has more positive effects on qualified learning and teaching (QLT) than our expectations. The degree of positive effects of quality factors on QLT outcomes was studied and ordered as follows; thinking mathematically and expressing with the mathematics language have the first degree positive effect on qualified learning via dynamic modeling. Meaningful and anchored learning have second degree, constructing reliable knowledge has third and constructing and discovering relations among the concepts and content with the real life situations have forth degree positive effect on qualified learning which the desired result all over the world is. Also, you will see an innovative approach on designing the learning process and interactive instructional materials which enable our meta-cognitive skills. We are glad to announce that mathematics modeling designed dynamically have very positive effects on inquiry learning process.

ABSTRACT FOR 18984

DEVELOPMENT OF ONLINE LEARNING SOURCES ON APPLIED STATISTICS

Authors: Somruay Apichatibutarapong, Mr. Chookait Pudprommart
Affiliations: Applied Statistics Department, Faculty of Sciences & Technologies, Suan Sunandha Rajabhat University, Bangkok, Thailand, Applied Statistics Department Faculty of Sciences & Technology Suan Sunandha Rajabhat University Bangkok Thailand

In recent years there have been rapid social changes and globalization in the fields of Economics, mass transportation, Information Technology (IT) and the environment. To prepare graduates who can take advantage of these developments and contribute further to them, we want to train them to have skills in computers, media technology and critical thinking, emphasizing life-long, cooperative and flexible learning. Web technologies and Internet provide opportunities for such a global education.

The purpose of this study was to develop online learning sources on Applied Statistics. The researchers used Visual Basic.Net with ASP.Net for applying on Web and used Microsoft Access for managing database system with 207 of the statistical vocabularies consisted of meaning, formulae, examples and usage in researches and the 40 statisticians. The research was conducted to study online learning to normal class. The quantitative and qualitative approach was used to investigate the quality of online learning sources and the opinions in using them.

This study was intended to be the beginning step for new strategies in learning Statistics by using the Web technology. It would be beneficial to those looking for alternative strategies in learning Statistics.

ABSTRACT FOR 18985

UNDERSTANDING AND APPLYING PARAMETRIC EQUATIONS OF LINES AND CURVES IN COMPUTER GRAPHICS AND ANIMATIONS

Authors: Andreas Filler
Affiliations: Humboldt-Universitaet zu Berlin, Gesellschaft fuer Didaktik der Mathematik

Parametric equations of lines and planes are parts of higher mathematics education in a lot of countries. According to the most curricula the students only get to know parametric equations of these linear objects and use it mainly for calculating intersections. As a result they see lines and planes basically from a static point of view although parametric equations include functional relationships between values of parameter(s) and points in plane or space. To understand these relationships is a relevant objective because functions and functional relationships are main ideas in mathematics education. They can especially show students connections between analytic geometry, trigonometry, pre-calculus and calculus.

Creating computer visualizations, especially animations, can help students to understand geometric objects, which are described by parametric equations, as point sets and to discover functional relationships and dynamic aspects of lines and also of some interesting curves. Creating computer animations is very attractive for students; therefore it can help to motivate them to figure out features of parametric descriptions and to discover functional aspects, which are essential for interesting animations.

Interpreting the parameter in equations of lines or curves as time makes it possible to create computer animations using graphics software (e.g. POV-Ray or Maxon Cinema 4D) or computer algebra systems (e.g. Mathematica, Maple or MuPAD). Changing positions of objects can be explored depending on the variation of the time-parameter in animations created this way. The conference paper will include proposals for how graphics and animations on lines, circles, spirals, trajectory parabolas and other curves can be created by describing these curves with parametric equations. The paper will also show some examples created by students at upper secondary level.

ABSTRACT FOR 18994

SECONDARY SCHOOL PRESERVICE MATHEMATICS TEACHERS' EXPERIENCES OF GEOGEBRA FOR GEOMETRY TEACHING

Authors: FATMA ASLAN-TUTAK, GUNEY HACIOMEROGLU
Affiliations: BOGAZICI UNIVERSITY, Canakkale Onsekiz Mart University, Turkey

The technological development in society is developing rapidly. New technologies also play an important role in teaching and learning (e.g. Cabri, GeoGebra, and Geometry Sketchpad). Among the technological tools the ones for geometry stands out because of the difficulties in learning geometry. Duval (1998) identified three categories of cognitive processes of geometric thinking: visualization, construction and reasoning. All three of these components should be addressed during the geometry instruction in order to enhance spatial reasoning. In that sense, dynamic geometry software (DGS) provides a rich environment for development of all three components of the geometric thinking (Goos, Stillman, & Vale, 2007). On the other hand, teachers tend to teach the way they have been taught. When in-service or preservice teachers were students at K-12 schools, they were not introduced to DGS for their geometry learning. Also, teachers have limited experience in geometry as K-12 students or even as preservice teachers (Aslan-Tutak, 2009, Jones, 2000). Therefore, the role of teacher education in implementation of technological tools for instruction is important. The implementation of DGS in teacher education may be viewed from two aspects; training of teachers (preservice or in-service) on use of the tools and on implementation in the instruction (Kokol-Vojc, 2007). Both of these aspects would provide information about not only how teachers perceive DGS but also how they enact their content knowledge and pedagogical content knowledge of mathematics (Niess, 2005).

The purpose of this study is to investigate preservice teachers' perception of GeoGebra for geometry teaching and their use of it. This study took place in a geometry course designed for secondary school mathematics teachers at a north-eastern public university in Turkey. The data collection consists of artifact collection of preservice teachers enrolled in the course. First students were asked to explore GeoGebra before any training on using it. The purpose of this practice was to emphasize the GeoGebra as being open-source and to improve

preservice teachers' skills to initiate using GeoGebra which is vital for long-term learning of a DGS. Participants were asked to write their first impression on the program. They were also asked about their previous experiences with using DGS. Later, the preservice teachers participated in training on using GeoGebra. Throughout the semester, learning activities for GeoGebra was used during the instruction to provide examples. At the end of the semester participants were asked to prepare a learning activity for a geometry topic from two perspectives; with dynamic geometry software and without any dynamic tool. Preservice teachers presented their work to other participants and received peer-review on their presentation. Furthermore, the preservice teachers were asked to write a reflection paper on using GeoGebra for instruction by comparing using a dynamic software vs non-dynamic environment.

The finding of this study reveals that preservice teachers have limited experience with DGS when compared to their experiences with other technological tools. Using an open-source DGS was helpful for them for two reasons; availability out of university and transfer of their GeoGebra knowledge for their teaching practice where they may have limited resources. Furthermore, participants were able to identify the difference between using dynamic environment for using geometry and non-dynamic environment. They reported that they would prefer to use GeoGebra for their instruction.

ABSTRACT FOR 18996

PRESERVICE TEACHERS' REFLECTIONS ON CREATION OF GEOGEBRA MATERIALS AND LESSON PLANS

Authors: Guney Haciomeroglu, Fatma Aslan–Tutak
Affiliations: Canakkale Onsekiz Mart University, Bogazici University

Challenge for teacher education programs is to prepare preservice teachers to integrate technology into their teaching as they are educated to become effective teachers of mathematics. Since technology has become an integral part of learning, use of educational software has changed the nature of classroom. Integrating technology into lessons also alter how the teachers utilize their knowledge for teaching mathematics (Mishra & Koehler, 2006) as well as how they create instructional materials to design a lesson. Correspondingly, teacher education programs put great emphasis on integrating technology into teaching of mathematics with using educational softwares (e.g., GeoGebra, Cabri, and Geometer Sketchpad). However, several factors impact on one's implementation of technology into their teaching such as skills and previous experiences, time and opportunities to learn, and knowledge of how to integrate technology into mathematics teaching. As preservice teachers plan to teach lessons and develop instructional materials, they utilize their content knowledge for teaching and begin to understand what it means to teach with technology (Niess, 2005). This new compression leads to development of Technological Pedagogical Content Knowledge (TPCK) defined as connection of content, pedagogy and technology (Mishra & Koehler, 2006; Niess, 2005; Niess, 2008).

This study examined preservice secondary teachers' views of learning and teaching mathematics as they create instructional materials to design a lesson plan with use of GeoGebra.

Forty preservice teachers who were enrolled in secondary teacher education program at a university in the northeastern Turkey participated in the study. Data were collected through the preservice teachers' written reflections, lesson plans, class discussions, and observations in a semester–long study. Due to the lack of experience in designing a lesson plan, the preservice teachers were asked to use a lesson plan from Ministry of Education as a guideline. Preservice teachers created GeoGebra materials for their lesson plans. They wrote pre-and post-reflections about their lesson plans. These reflections provided perspectives about what factors influenced preservice teachers' planning as well as whether or not their views about teaching and learning of mathematics with use of GeoGebra changed as a result of their participation in this study.

Results of the study revealed that most of the preservice teachers claimed that use of technology should be incorporated into lessons for teaching and learning of mathematics. However, they claimed that students first master basic skills and procedures with traditional teaching before using Geogebra. Some of them considered that technology should be incorporated into lessons to make learning more enjoyable for students rather than making learning of mathematics meaningful. Findings from this study suggested that methods courses should emphasize appropriate use of technology to support use of mathematical knowledge for teaching and learning (Goos, 2005; Kokol-Voljc, 2007) in teacher education since it may lead to development of technological pedagogical content knowledge (TPCK).

ABSTRACT FOR 18999

INTEGRATING WEBLOG IN TEACHING OF HIGHER-ORDER THINKING

Authors: Rossukhon Makaramani
Affiliations: Suan Sunandha Rajabhat University

Weblog has been widely used as one of viable tools in social networks and learning society. It can enhance student learning experiences when applying for instructional purposes. This paper describes a well-designed instruction that integrates a weblog system aiming to teach higher-order thinking to 198 undergraduate students in a pedagogy course entitled Innovation of Learning. The designed instructional model consists of six themes: I am, Intellect-Virtue-Happiness, Problems are Wonderful, Knowing Death, Save the world, and Human Rights. Data includes analysis of student works and reflection essays. The evaluation uses an interpretive methodology to investigate 4 research areas: Higher-order thinking, metacognitive awareness/knowledge, team work/collaboration, and ownership of learning. Examples of student and teacher blogs are provided to illustrate how such technology can effectively promote higher-order thinking.

ABSTRACT FOR 19019

DEVELOPING MATHEMATICAL TEACHING MATERIALS OF FUNDAMENTAL ANALYTIC GEOMETRY AND CONIC SECTIONS USING THE GEOMETER'S SKETCHPAD (GSP) ON STUDENTS IN GRADE 10

Author: Ubol Klongkratoke
Affiliations: Department Informatics Mathematics. Faculty Science & Technology, University Rajabhat Suan Sunundha, Bangkok ,Thailand.

This research aims to develop Mathematical teaching materials on the topic of the introduction to Analytic Geometry and Conic Section using the Geometer's Sketchpad (GSP) on the students in grade 10 in order to have the performance efficiency of 75/75 by the comparison on the student achievement before and after these useful teaching materials are used in classes and to study the attitude of students on Mathematics after taking classes with the application of these materials. The sample group in the research is 33 students studying in grade 10 at the Demonstration School of Suan Sunandha Rajabhat University by simple random sampling. Tools used in this study include lesson learning plans on the introduction to Analytic Geometry and Conic Section using the Geometer's Sketchpad (GSP), a 30-question achievement test on Analytic Geometry and Conic Section and a 20-question attitude test on Mathematics. The collected data are statistically analyzed in terms of mean, standard deviation and coefficient of variation. The results reveal that (1) the effectiveness in using the Geometer's Sketchpad (GSP) on the introduction to Geometry and Conic Section on 10th grade students is at the level of 76.40/76.50 (2) students' academic achievement on the post test is higher than that on the pre test at the significant level of 0.05 (3) students' attitude toward Mathematics after the use of these Mathematical teaching materials is at a good level.

ABSTRACT FOR 19029

CURIOSITY KILLED THE CAT. CREATIVITY HAVE MATHEMATICS CLASSROOMS KILLED IT?

Authors: Christopher Longhurst
Affiliations: Hewlett Packard

Is creativity lost in education, particularly in mathematics education? I'll start with some IDs from the famous educationalist Sir Ken Robinson. Then, we'll look at creating problem-solving, visualization using technology. The MCL (mobile classroom laboratory) and the graphing calculator tools available to us to use to allow students to enhance their creativity and visualize problems in mathematics. Too often we concentrate on the final product that is passing the exam without understanding or thinking on the half of the student. Using examples I will stretch your creativity and give it some activities that may be able to be used in your classrooms.

ABSTRACT FOR 19036

TEACHING DESIGN BASED ON INQUIRY LEARNING— —FIND THE WAY TO MAKE ACCEPTABLE "STATISTIC"

Authors: Yiming Cao
Affiliations: School of Mathematical Sciences Beijing Normal University; Pengju Chen School of Education Beijing Normal University
E-mail: pengjuchen2010@gmail.com

As for the purpose of statistical teaching is to develop the statistical literacy of the students but not to impart existing knowledge experience, the teacher may do more afford to let the students seek the knowledge source through the experience of data processing and statistical regularities'' discovering based on the problem situation. Information Technology（IT）gives a great support in data processing and statistical characteristics description, which make the experience process available. This paper tries to use modern information technology on designing new statistical teaching. Through the process of making, contrasting and correcting "statistic", students will learn the practical significance of statistical law though the discovering experience. As for students in different study levels, we may deepening the statistical concepts and applications. Information Technology not only makes the classroom research activities available, but also increases the students'' learning interests.

ABSTRACT FOR 19038

CASE ANALYSES OF "USE MCL TO PROMOTE THE STUDENTS' PRACTICABLE ABILITY OF MATHEMATICS"

Authors: Guangming Wang Guanghui Li
Affiliations: Tianjin Normal University;
email:bd690310@163.com

MCL（Mobile Calculator Lab）is a kind of portable and digital lab, which can be used to promote the students, practicable ability of mathematics. In this article, we introduced the use of MCL in promoting the students' practicable ability of mathematics by showing some specific examples, like collecting data and dealing with data, plotting graphics and fitting, establishing and solving mathematical model, using and generalizing the conclusion of the model etc.

ABSTRACT FOR 19046

APPLICATIONS USING GRAPHICS CALCULATORS

Authors: Tom Button
Affiliations: The Further Mathematics Support Programme (UK)

Title: Tasks for using multiple representations to improve students' mathematical understanding.

This workshop will focus on how dynamic multiple representations can improve students' understanding of mathematics. A series of tasks will be presented that utilize the facility of a HP40gs graphical calculator to represent objects algebraically, graphically and numerically. The tasks used will be drawn mainly from the UK curriculum for year 12 and 13 (pre-university). There will be an opportunity to trial some tasks and a general discussion of the opportunities for using technology featuring dynamic multiple representations.

ABSTRACT FOR 19073

THE FIRST STEPS OF AN ONLINE FORUM PROJECT TO HELP STUDENTS IN MATHEMATICS

Authors: Abdulkadir Erdogan
Affiliations: Anadolu University

Internet infrastructures have largely developed throughout the world. Its speed of data transfer has increased and its cost has decreased. These evolutions have made possible the emergence of various online teaching

tools and resources. Online forums, which make part of these tools, have some specific potentialities for the teaching and learning. They are especially characterized by the written interaction that can be used in order to satisfy a particular request related to the school matters. For such potentialities, nowadays one can find numerous online forums from mathematics to philosophy courses. However, as the majority of these forums do not adopt specific approaches and relevant teaching methods, their positive effects on students' learning have become questionable.

On the basis of this report, we have carried out an online forum project - supported by Anadolu University - to help students in mathematics, especially in properly doing homework and other school work such as revising lessons and preparing for exams. The project addresses to the students of 6th, 7th and 8th grades (12-15 years old) and 15 preservice teachers are involved in the project with the responsibility of answering to the students' questions. In this communication, the first steps of the project will be presented and the theoretical and methodological questions will be discussed.

ABSTRACT FOR 19077

IMPLEMENTATION OF WEBQUESTS IN MIDDLE SCHOOL MATHEMATICS COURSES

Authors: Aytaç Kurtuluþ, Tuba Ada, H. Bahadýr Yanýk
Affiliations: Eskiþehir Osmangazi Üniversitesi, Anadolu University

The purpose of this study was to explore how two mathematics teachers who participated in a Professional development project regarding the use of web-based projects (WebQuests) in middle schools implemented WebQuests in their own classrooms. Teachers designed two separate Webquests. One of the teachers used the WebQuest for performance task and the other teacher implemented it as project task. While performance task was completed in the computer laboratory under the guidance of the teacher, Project task was completed by the groups of students out of the classroom. Both teachers thought that WebQuests drew students' attention and helped them focus on the learning goals of the mathematics course. Moreover, the teachers thought that students used Internet effectively for problem solving purposes. The data further suggest that Webquests provided a learning environment in which students worked cooperatively, and shared and discussed mathematical ideas. At the end of the study, both teachers thought that WebQuests should be initially introduced to the students as a performance tasks with the limited number of learning goals and later it could be used for Project tasks. This presentation will focus on the issues emerged from the implementation of WebQuests.

ABSTRACT FOR 19101

INTERACTIVE MATHEMATICS ON MULTI-TOUCH TABLET PCS

Authors: Alfred Wassermann, Matthias Ehmann, Michael Gerhaeuser
Affiliations: University of Bayreuth, University of Bayreuth, Bayreuth, Germany

The availability of tablet PCs are a great opportunity for a better integration of technology into mathematics education. But most existing Dynamic Geometry Systems will not run on these computer architectures. In 2008 the authors started the project JSXGraph. This open-source software library makes Dynamic Geometry available on practically every computing device that supports a state-of-the-art web browser. Up to now, JSXGraph lacks a user interface. Here, we show first results on realizing a minimalistic user interface for tablet PCs. It is heavily based on gesture recognition. This allows simplifying the traditional structure of user interfaces based on nested menus and icons enormously.

ABSTRACT FOR 19103

EFFECTS OF TECHNOLOGY USE ON GEOMETRICAL CONSTRUCTION

Authors: Nilüfer Y. Köse, Emel Ozdemir Erdogan, Tuba Yuzugullu Ada, Dilek Tanýslý
Affiliations: Anadolu University

Geometry is particularly well placed for helping people develop several ways of thinking and also ideally placed for helping to expand a student's conception of mathematics (Goldenberg, Cuoco & Mark, 1998). Geometrical

thinking consists of three processes: Visualization, construction and reasoning (Duval, 1998). The primary and high school geometry curriculum in Turkey highlight these processes. However, for many reasons such as the influence of the national selective exams and the lack of the time, the construction process does not have important place in geometry classes. The aim of this paper is to study the effects of technology use on students' ability of geometrical construction in paper and pencil environment.

The students' ability of geometrical construction was identified before and after geometry lessons supported by the use of TI-Nspire CAS handheld. In this paper, findings about the effects of technology use on students' geometrical construction ability will be discussed. The study will be illustrated through examples from students' work and implications for teaching geometry will be drawn.

ABSTRACT FOR 19155

MATHEMATICS CURRICULUM CONSEQUENCES OF CALCULATOR CHOICE

Authors: Barry Kissane, Marian Kemp
Affiliations: Murdoch University

Developers of mathematics curricula make choices regarding the kinds of technology that are to be used by students, which in turn influences the work of both students and teachers to learn and teach mathematics. This paper analyses the choices made in mathematics curricula regarding calculators, and examines their implications for what can be learned. Three different levels of calculators are considered in the paper: basic scientific calculators, advanced scientific calculators and graphics calculators. An additional level involves a choice to allow no calculators at all. Significant consequences of these choices are described and exemplified through a consideration of a number of mathematical topics that are commonly taught in many curricula in Asian countries.

ABSTRACT FOR 19196

THE ROLE OF INSPIRATION SOFTWARE IN TEACHER CANDIDATES' PREPARATION OF CONCEPT MAPPING

Authors: Mevhibe Kobak, Sevinç MERT UYANGÖR
Affiliations: Balikesir University Necatibey Educational Faculty Secondary Mathematics Education

: The importance of information increases rapidly, thus the concept "information" and the understanding of "science" change, and the technology advances globally. Novel information and technologies affect education process. Accordingly, this study aims to define the effect of "Inspiration" software on computers and concept maps preparation studies. The study carried out with 71 pre-service teachers who study at third grade at the faculty. Experimental group were 35 students and the control group were 36 students. First, the software was introduced to the students in the study experimental group and examples of concept maps prepared by the programme on various subjects were shown. Then, the students were asked to prepare a concept map on "Prisms", an 8th –grade Geometry Learning Domain.

After assessment of the student's concept maps, according to the findings can be said that "Inspiration" software does not make a difference to create concept maps. In addition, the students reported positive opinions about the program.

ABSTRACT FOR 19303

A COMPARATIVE STUDY TOWARDS BYPASSING OF QUADRILATERAL PAIRS IN THE DYNAMIC GEOMETRY ENVIRONMENTS

Authors: Samet OKUMUÞ, Bülent GÜVEN
Affiliations: Rize University, Karadeniz Technical University

Elementary second level students (6-8th grade) generally show a series of behaviors like creating basic definitions for geometric shapes, knowing the mathematical properties of the shapes and distinguishing them with their properties and thinking them independently with the logic of exclusive definitions, etc. But, to

express any geometrical shapes with its minimum properties and also to create inclusive definitions for geometrical shapes rather than exclusive definitions by taking hierarchical relationships between geometrical shapes into consideration, will be more advantageous for students before starting their high school educations. In particular, the topic of quadrilaterals is very popular to test students' logical deduction abilities and classification preferences, to examine their definition type, etc. But first off all, to determine how students could best bypass quadrilateral pairs has a key role. In this context, we designed two different structured geometry courses at 7th grade level. In the first learning environment the students used the dynamic geometry software of Cabri Geometry while the second used the tangible materials (geo-stripes, geo-boards and dot paper). In the two different learning environments, the students explored the quadrilaterals' length, angle and diagonal properties in pairs with the worksheets designed for each quadrilateral type. The treatments took 8 class hours. Before and after the treatment, the clinical interviews were conducted to 1 high level, 1 middle level and 1 low level student, who were identified in each group, to compare the learning environments in terms of the students' bypassing of quadrilateral pairs. At the end of the study the clinical interviews analysis indicated that the students used the dynamic geometry software identified better hierarchical relationships between the quadrilateral pairs and outperformed the students used the tangible materials in terms of bypassing of the quadrilateral pairs. On the other hand, while the first group students used 3 different approaches to the quadrilateral pairs, the second group showed four different approaches.

ABSTRACT FOR 19325

DEVELOPING PRESERVICE TEACHERS'CREATIVITY IN THE GEOMETER'S SKETCHPAD ENVIRONMENT

Authors: Jale ÝPEK BÝNTAÞ
Affiliations: Ege University

A research study was conducted in the fall semester 2010-2011 within the course "Special Teaching Method II " for 3th grade students in computer and instructional technology department at Ege University. The sample of the study is 55 pre-service teachers. The researcher is also lecturer of this course. The aim of the study is to teach to pre-service teachers how to use a new computer program, to see the course affect to geometry course, to discover the different uses of this program and to develop students' own creativity that they can realize the impact of this program and work environment. This study was conducted in 7 weeks including 3 hours in each week and totally was completed in 21 hours in the computer laboratory. The students use the books prepared by the researcher during the study. Students also use their own learning speed and discuss with each other. They listened to classical music every lesson. Both students' homework and theirs thoughts about GSP was gathered regularly every week. The researcher observed the students during the study. At the end of the study, students were asked to prepare the final project. This study shows that all pre-service teachers can make a better sense of the geometric descriptions, specifications and proofs through GSP than through classical methods that they had learned earlier. They also stated that they are encouraged against mathematic courses. Besides, almost all pre-service teachers stated that they could make very beautiful shapes, motives, wall ornaments, frames, prints etc. through "Transform" tool menu features in GSP. In addition, they explained that they could obtain new several shapes through program dynamics that help them to develop their creativity and imagination and students state that they cannot notice how time passed during the study.

ABSTRACT FOR 19330

INTEGRATION OF TECHNOLOGY INTO TEACHING MATHEMATICS: LEVELS OF TECHNOLOGY USE AND ROLE OF PARTICIPANTS

Authors: Mehmet Fatih Ozmantar, Servet Demir, Erhan Bingolbali, Ali Bozkurt
Affiliations: University of Gaziantep

In this study we present excerpts obtained from mathematics teachers' classroom practices of teaching mathematics in technology rich environments. The excerpts are analyzed with regard to Hughes' (2005) three levels of technology use: replacement, amplification and transformation. Replacement refers to the use of technology in terms of changing the teaching medium without changing the learners' routine. Use of technology at an amplification level indicates the utilization of technological tools to perform actions faster

and easier such as doing an algebraic calculation quickly and correctly with a calculator. At transformation level, technology is used in such a manner that brings changes in students' learning routines via establishing links among different mathematical structures. In this study we focus on two cases for comparative purposes in terms of levels of technology use. In the first case, the teacher is able to reach the transformation level while using technology. The second teacher was not able to go beyond replacement level. The role that the teachers attributed to the students was seemingly the same: getting them to answer questions directed by the teachers. However, management of students' attention stands out as a critical feature to achieve a high level of technology use. During the presentation, the classroom practices of two teachers will be compared in terms of selection of particular technologies, the manner in which technology is used with regard to Hughes' levels and teachers' management of student attention. Following this, several questions will be raised and discussed with the participants, including: what are the roles given to technology in achieving a transformative level of technology use? What roles should be given to the students at this level of technology use? What is the role of teachers in increasing the level of technology use? To what extent does the level of technology use depend on the roles given to the students?

ABSTRACT FOR 19334

WHAT KNOWLEDGE TEACHERS NEED FOR EFFICIENT TECHNOLOGY INTEGRATION INTO MATHEMATICS TEACHING – AN EXAMINATION THROUGH TPCK FRAMEWORK

Authors: Erhan Bingolbali, Servet Demir, Fatih Ozmantar, Ali Bozkurt
Affiliations: Gaziantep University, Gaziantep University, Turkey

Technology integration into teaching mathematics is a complex issue and requires a great deal of competencies and different types of knowledge on the parts of the teachers. Technological Pedagogical Content Knowledge (TPCK) framework is utilized in this study to first identify what types of knowledge teachers need to know for technology integration and then utilized to reveal teachers' views regarding the types of knowledge that they think that they need to know for efficient technology integration into teaching mathematics. According to TPCK framework, for efficient technology integration, teachers need to have the knowledge of pedagogy, content and technology as well as the intersections of them namely; Pedagogical Content Knowledge (PCK), Technological Pedagogical Knowledge (TPK) and Technological Content Knowledge (TCK) (Koehler and Mishra, 2008). The intersection of PCK, TPK and TCK constitutes TPCK and it is, to us, an operational knowledge which can be usefully employed to evaluate the effectiveness of technology integration. For the purpose of the study, approximately 120 elementary classroom and mathematics teachers are applied a questionnaire including an item asking them to respond to the question of 'what knowledge a teacher needs to have for efficient technology integration into teaching mathematics?' The data analysis reveals that the majority of the teachers refer to the pure technological knowledge such as 'being able to use computers', 'projectors' and 'internet'. The other knowledge components receive little citation from the teachers. Of course, basic technological knowledge is a prerequisite for any technology integration. Nevertheless, as the TPCK framework reveals technology integration is rather complex and requires such knowledge as TPK, TCK, PCK on the parts of the teachers for an effective integration as well. The data hence demonstrate that teachers' views of technology integration are rather simplistic and superficial. During the presentation, some other themes that the findings raise as well as the implications of these findings will be discussed with the participants. Especially the issue of teacher training and professional development with regard to technology integration will be one of the foci.

ABSTRACT FOR 19346

ANALYSIS OF TURKISH WEB PLATFORMS OF VIRTUAL MATHEMATICS MANIPULATIVES

Authors: Emin Aydin
Affiliations: Marmara University, Mathematics Education Dept.

The developments in the computer technologies provide opportunities for enhancing students' conceptual understanding. It is imperative to concretize abstract concepts and relationships especially in the teaching of

mathematics. For that reason, the use of concrete objects is encouraged by the 2005 Ministry of Education program document. Encouraged by this, there have been efforts by some educational technologists to develop platforms (with the support either from the national or from university research funds) that aims to develop virtual mathematics manipulatives and share them with the practitioners. Although these platforms have not been reached to a wide audience, they carry potential in the near future for the circulation of such materials. The aim of this paper is to analyze these virtual manipulatives that exist in different platforms in terms of their mathematical content and the type of reasoning they aim to develop. In doing so, we intend to compare the Turkish platforms with each other and with universally known platforms such as NVLM and WisWeb.

ABSTRACT FOR 19347

A TECHNOLOGICAL APPROACH TO PROVIDE PROFESSIONAL DEVELOPMENTS TO TEACHERS ON USING TECHNOLOGY

Authors: Serkan Ozel, Zeynep Ebrar Ozel, Tufan Adiguzel
Affiliations: Bogazici University, Fatih University, Bahcesehir University

Over the last few decades, collaborations between schools, universities, and community partners on the Science, Technology, Engineering, and Mathematics (STEM) pipeline are driven by funding initiatives from federal, state and private agencies. These programs have increased the communication between university faculty, K-12 teachers and students; resulted in innovative science and math curricula; and provided K-12 teachers workshops to enhance their pedagogy and content knowledge. However, there is need to improve the effectiveness of these university-school collaborations.

Clift, Veal, Johnson, and Holland (1991) defined collaboration as the explicit agreement among two or more persons to meet and accomplish a particular goal or goals (p. 54). The common goal of STEM collaborations is to improve science, technology, engineering, and math education of all students. However, models of collaborations toward this goal are not well established yet.

The key factor found in successful university-school collaborations is recognizing and utilizing the expertise of both parties since one-sided partnerships where the flow of instruction is from university faculty to K12 teachers were found unsuccessful (Moreno, 2005; Sternheim, 2003; Tomanek, 2005). University faculty are the content experts, and K-12 teachers know the school culture, pedagogy, and students (Sternheim, 2003). Ultimately, teachers are the ones who will decide if and how the products will be used. Therefore, teachers need to be involved in both the planning and the implementation of the collaboration. Beneficial partnerships arise out of honest and supportive environments for the benefit of students.

Teachers should continually be improving their pedagogical practices to insure students learn. However, teachers often only experience significant pedagogical growth through sound professional development. There is an emerging consensus among researchers on features of quality professional development (Elmore, 2002). Explicitly, one of those features involves developing, sustaining, and reinforcing group work. Yet, it is not simply forming a group, but creating a professional learning community (e.g., Koellner-Clark & Borko, 2004) to address other features of quality professional development (PD) (Elmore, 2002).

This study illustrates and discusses the new approach in dissemination of PDs and the schools' needs. First, PDs on learning to operate technology (e.g., interactive white boards, graphing calculators, and clickers) and creating effective learning tasks for students will be provided to the teachers. Second, an online portal will be developed to offer PDs, which will eliminate travel difficulties and limitations. Third, teachers will find opportunities to enhance their technology integrations in collaboration with university faculty. The focus will be the STEM activities to create an inter-disciplinary learning community.

ABSTRACT FOR 19348

PROGRAMMING USING SSP

Authors: RAO Yongsheng, WANG Ying
Affiliations: School of Computer Science and Educational Software, Guangzhou Universiy, China, School of Information of Science and Technology, Sun Yat-sen University, Guangzhou, China, South China Institute of Software Engineering, Guangzhou, China(510990)

SSP (Super Smart Platform) is an excellent dynamic geometry system. In China, it is the most popular mathematic educational software, many teachers and students use it in class. Programming is one of its most unique features compared to other dynamic geometry system. The special function is very powerful, which can be used to draw dynamic geometric graph, realize algorithm, do numeric and symbolic computation, load courseware, and define custom functions. With programming, teachers can draw repetitive, mechanical graphics easily and quickly, e.g. draw hundreds of curves in one second; we can save a courseware as text code, and then reload it anytime, anywhere, just like drinking instant coffee. It can be also used as a platform for teaching students programming. In this talk, we will show how to write and run programs on SSP.

ABSTRACT FOR 19357

DYNAMIC GEOMETRY SYSTEM FOR MOBILE DEVICES

Authors: WANG Ying, RAO Yongsheng
Affiliations: School of Computer Science and Educational Software, Guangzhou Universiy, China, School of Information of Science and Technology, Sun Yat-sen University, Guangzhou, China, South China Institute of Software Engineering, Guangzhou, China, 510990

Now, smart mobile devices, e.g. smart phone, tablet PC, are becoming more and more popular, and become an integral part of life as information processing platform. Although there are more than 40 kinds of dynamic geometry system in the world, there is still no one for mobile devices. In this session, we will introduce our system MDGS for mobile device, which is developed based on Flash AS 3.0. MDGS is cross-OS, not only supports the desktop operating system as Windows, Linux, also supports the mobile operating systems such as Windows Phone, android, iOS with special plug-in. We can use the system by Web Browse without any plug-in except Apple OS, and store data in cloud. So, we can enjoy dynamic geometry anytime, anywhere.

ABSTRACT FOR 19362

CREATIVITY IN THE MATHEMATICS EDUCATION

Authors: NAHID MOAYERI, Mohsen Mohammadizadeh
Affiliations: Teacher of Mathematical at Fatemiyeh High School Educational Management of Sirjan –Educational Organisation of Kerman- IRAN, Faculty Member of Islamic Azad University Sirjan-Branch,IRAN, Member of Faculty Islamic Azad University Sirjan-Branch

Interesting and controversial topic of creativity is that its effect on the success and advancement of people has been proven. But whether creativity can be paid to education and training people gave it up by its own educational programs on inducing most experts have confirmed the possibility of such training. Most of what educational psychologists in schools and in schools of cognitive behavioral believe that creativity can be taught and creativeness are. Below are the creative learning process. Many math teachers are faced with the question of why, despite having some of the students educational and welfare facilities in math lessons are failed? math classroom experience in 14 years me that according to several factors affects their academic achievement. The example with the words easier to express acceptance by the audience is so successful in this paper to the field of education theories about creativity in math achievement are discussed. Method which has been offered ways that are willingly students to study more math and makes them more curious. Society today requires that people think the prevailing wisdom of his actions and thoughts are being so innovative and problems of their own way they are.

ABSTRACT FOR 19363

PERIODIC FUNCTIONS AND THEIR APPLICATIONS

Authors: Ferhat Öztürk, Ahmet Iþýk, Tuba Kaplan
Affiliations: Atatürk University, Atatürk University

Periodic functions have started to be frequently used in the field of mathematics, in application areas of mathematics and in other applied sciences such as physics, physics engineering, electrical and electronic engineering and statistics. Periodic functions are a topic on which many scientific studies and researches are conducted. If we define technology, which is different from science, as 'form of offering science to the public service', we can say that periodic functions have a great part in formation and application of technology. In this context, it is a fact that mathematics closely affects the human life, particularly periodic functions are an important factor in formation of technology, and application areas of periodic functions extend in accordance with theoretical bases of mathematics. This study aims to examine periodic functions, which has a large application area in applied mathematics, especially in physics, engineering and computer systems, from a different perspective.

Within the scope of the study, national and international literature was reviewed, and survey model was used. As a conclusion, in Fourier analysis, it was found that there are many application areas which are formed by extensive use of periodic functions and which make daily life easy (medical imaging systems, image processing, material processing technology, machine failure detection, design of modern musical instruments and talking computers etc.).

ABSTRACT FOR 19364

SYSTEMS OF LINEAR EQUATIONS AND THEIR APLICATIONS

Authors: Tuba Kaplan, Ahmet Işık, Ferhat Öztürk
Affiliations: Atatürk University

Mathematics is closely associated with other disciplines although it is a discipline which has its own facts. It is seen that mathematics is used as a means in other disciplines. Linear algebra course, which is covered in mathematics curricula, becomes more and more important for engineering, physics, social and behavioral sciences. In addition, linear algebra has undeniable contributions to the fields such as aviation and aerospace industry, electrical circuits, communication networks, archeology, weather forecasts, population change and trade. When one deals with a problem about applied sciences, linear equation systems generally come into mind. In the course of historical development of linear equation systems, studies were conducted on various methods for solution of these systems besides general theory of them. It is known that these methods are important for formation of various current models in parallel with development of computer and technology. Nature of current models is generally based on many factors. However, solutions of problems emerging out of the field of mathematics require the interaction of other branches of mathematics and linear algebra.

This study focused on linear algebra systems and their theoretical bases, pointed out solution methods, and offered examples from different applications available in engineering, physics, chemistry, economics and many other disciplines. Within the scope of the study, national and international literature was reviewed, and survey model was used. As a conclusion, it was found that, in almost all disciplines, especially in engineering, there are many application areas which are formed by extensive use of linear equation systems and which make daily life easy.

ABSTRACT FOR 19366

REPRESENT OF MATHEMATIC MODEL FOR FORMING OF OPTIMIZING THE CONCRETE DOMES

Authors: MOHSEN MOHAMMADIZADEH, Mohsen Mohammadizadeh, Nahid Moayeri
Affiliations: Faculty Member of Islamic Azad University Sirjan-Branch,IRAN, Teacher of Mathematical at Fatemiyeh High School Educational Management of Sirjan –Educational Organisation of Kerman- IRAN

In this article , a forming model for performing of concrete domes presented and by required of accuracy can do this dome. For this means, as the radius of dome be determined and Y=F(X) be related to top of dome to be

huge the floor of circle .So rotation of this function around Z axis , the shape of dome will be handed ,which for forming of dome in " n " times , If more number''s n , nearer to dome .In here , the mathematic model for accounting the height of each form will be give. however , if the height of all forms be equal , the shape of dome will be in conical form and for performing the main shape , it''s essential the height of each form will be count in a particular method .

ABSTRACT FOR 19367

A GEOMETRIC EYE FOR DYNAMIC GEOMETRY

Authors: Zlatan Magajna
Affiliations: Faculty of Education, University of Ljubljana

We present a technology supported approach that helps students to understand the concept of proof and to prove geometric theorems. The approach is implemented in a software program called OK Geometry (Observing and Knowing in Geometry, available at htpp://www.z-maga.si) and is based on Toulmin's model of argumentation. According to this model, the process of proof construction consists of conjecture production and of finding warrants (or rebuttals) for the conjectures. The aim of the software is thus to help students in conjecture production, in organizing the conjectures into a proof, and also in producing possible warrants (and, indirectly, also rebuttals) to conjectures.

Using dynamic geometry software (e.g. Cabri or GeoGebra) the students are, in general, able to visualise geometric propositions and check their correctness. But proving them is a different story. In such situations OK Geometry may be used as a geometric eye. OK Geometry reads a dynamic construction and produces a list of geometric properties of the construction. As an extremely sensitive geometric eye (that observes constructions and not drawings) OK Geometry detects and visualizes several geometric properties one may not be aware of (e.g. congruent angles, collinear points, harmonic quadruples). In the proof generation process students, using OK Geometry as a geometric eye, look among the detected properties for conjectures and for warrants for the chosen conjectures and gradually construct a proof. There are obstacles that are immanent to this approach, but they can be relieved and overcome by technological means.

ABSTRACT FOR 19369

PROMOTING INVESTIGATIVE MATH CLASSROOMS THROUGH SAMAP MANIPULATIVES

Authors: Erol KARAKIRIK
Affiliations: ATCM 2011

SAMAP is Turkish acronym for a nation-wide Turkish Science Foundation, TUBÝTAK, project that aimed to develop a comprehensive set of computer manipulatives for primary and secondary school mathematics. SAMAP manipulatives consist of around 100 small java applets specifically developed to highlight certain mathematics concepts and relations and are combined within a single graphical user interface. They have been used for a few years in Turkish math classrooms by many teachers throughout Turkey. They aim to promote higher order thinking skills by providing an environment for investigating mathematical concepts and relations rather than focusing on simple calculations and mathematical operations. However, many teachers and students are uncertain how to make use of SAMAP manipulatives since they are used to make repetitive calculations instead of investigating mathematical concepts. Furthermore, many teachers only make use of them as extra-curricular activities. In this paper, we aim to demonstrate how SAMAP could be used to promote discussions, to increase students' participation and enhance their conceptual understanding in math classrooms. Author will exemplify, by the help of a few selected SAMAP manipulatives, how they could be used to ask students concept-specific interpretive and estimation questions not requiring any calculations and verify their answers immediately by manipulating certain variables and how one could solve the same problem in different ways by the help of built-in expert systems.

ABSTRACT FOR 19379

TOUCH2LEARN - USING MULTI-TOUCH TECHNOLOGY ON CONTENT FOCUSED LEARNING IN MATHEMATICS

Authors: Christian Dohrmann
Affiliations: University of Education Karlsruhe, CERMAT (http://cermat.org)

There is the long-term trend in mathematics education to pay more attention to the understanding of concepts instead of building up a large repertoire of knowledge and skills. According to this trend, the stated requirements have to be considered for ICT-based teaching.

Traditional computer input/output devices are technically restricted to single point interactions. Therefore, the user interface of a computer tool is restricted to a single-point interaction. There is only one mouse for every computer. Even if students work in pairs only one student is in charge.

In general, discussion and arguments are indispensable elements of teaching and learning. Hence, it is important to support group work, not only to develop social skills, but also to be able to discuss on mathematical problems. In ICT supported environments these important interactions are often neglected.

With Multi-Touch technology, several users can work simultaneously on the same screen. It is even possible to develop cooperative exercises that can only be solved by two or more students helping each other. User studies have shown: Multi-Touch enabled learning environments provoke task-focused discussions with emphasis on content rather than turn-taking agreements. Thus, Multi-Touch has the potential to enhance communication skills.

The presentation will include first results of research activities with students using MT-enabled environments as well as the introduction of a theoretical framework for the development of MT-enabled computer tools in mathematics (DGS).

Abstracts for Hands-on Workshops

ABSTRACT FOR 18937

DYNAMIC GEOMETRY, DYNAMIC ART

Authors: Kate Mackrell
Affiliations: Institute of Education, University of London, UK

The connections between art and static geometry are rich, diverse, and well known. Dynamic geometry software enables us to explore some of the additional possibilities that arise when representations of geometric objects are set in motion; beautiful objects emerge, evolve, and transform, sometimes in quite unexpected situations. In this session we will create a variety of simple, beautiful objects using Cabri II Plus, Cabri 3D, Cinderella, and Geometer's Sketchpad 5, and discuss some of the mathematics behind these objects.

ABSTRACT FOR 18961

EXPLORING MATHEMATICS WITH THE GEOMETER'S SKETCHPAD VERSION 5

Authors: Krongthong Khairiree
Affiliations: International College, Suan Sunandha Rajabhat University Bangkok Thailand

The workshop is designed for participants to experience in using the Geometer's Sketchpad Version 5 (GSP V.5) with constructivist approach in mathematics lessons. The workshop will be a hands-on activity and the workshop will be conducted in such a way as to simulate a mathematics class.

Prior experience with GSP V.5 is not necessary. The knowledge on how to use GSP V.5 and the news tools of GSP V.5 will be introduced in this workshop. Primary emphasis will be on learning how to use GSP V.5 effectively in integrating geometry and algebra. The workshop also provides participants learn how to use GSP V.5 for classroom demonstrations and explanations.

ABSTRACT FOR 18967

GRAPHING SURFACES Z = F(X,Y) WITH CABRI 3D

Authors: Jean-Jacques Dahan
Affiliations: IREM of Toulouse

Even Cabri 3D does not contain a 3D grapher, we will during this workshop achieve very realistic representations of surfaces z = f(x,y) in using cleverly the tools "trajectory" and "animation". We will also show how to create macros (even this tool is not available in Cabri 3D) to improve the previous representations.

ABSTRACT FOR 18968

THE 3D GRAPHER OF TI N'SPIRE

Authors: Jean-Jacques Dahan
Affiliations: IREM of Toulouse

The last improvement of TI N'Spire contains a 3D grapher using coloured representations. We will discover this new tool during the workshop after a short presentation of the modelling of folding and unforlding cylinders and cones in military perspective with the geometry application of TI N'Spire.

ABSTRACT FOR 18970

SURFACES WITH AUTOGRAPH

Authors: Jean-Jacques Dahan
Affiliations: IREM of Toulouse

During this workshop we will discover the 3D application of Autograph to represent surfaces z = f(x,y) and z = f(x,y,m) and others. The very special “Content controller” tool will allow us to link analytic and geometric understanding of surfaces.

ABSTRACT FOR 18993

CREATING INTERACTIVE MATHEMATICS WITH CINDERELLA AND CINDYSCRIPT

Authors: Ulrich Kortenkamp
Affiliations: Pädagogische Hochschule Karlsruhe, CERMAT, Cinderella

In this workshop we will explore the new facilities of the Interactive Geometry Software Cinderella 2 and work with physics simulations and custom scripts. For a sampler of what is possible see http://www.mathe-vital.de

A basic knowledge of any geometry software is required. Participants will receive a temporary license for the software and can use their own laptops or the lab facilities at the conference.

ABSTRACT FOR 19006

HOW TO TURN A POLYHEDRON INSIDE OUT?

Authors: Jen-chung Chuan
Affiliations: National Tsing Hua University

In this workshop we will guide the participants to construct an animation displaying the inside out process for the cube, the regular tetrahedron and the regular dodecahedron. To prepare for the workshop, the participant is invited to contemplate on these problems: what happens to a solid cube when turned inside out completely? Is it possible to have the components remain connected during the process?

ABSTRACT FOR 19007

HOW TO DISSECT A POLYHEDRON INTO CONGRUENT PIECES IN INFINITELY MANY WAYS?

Authors: Jen-chung Chuan
Affiliations: National Tsing Hua University

1) Can a solid cube be cut into six congruent pieces, other than the "obvious" symmetric ones?

2) Can a solid regular tetrahedron be cut into four congruent pieces, other than the "obvious" symmetric ones?

In this tutorial we are to construct animations with Cabri 3D showing there are infinitely many such possibilities to construct the dissections for each of 1) and 2).

ABSTRACT FOR 19075

THE EDUCATIONAL USE OF SCIENTIFIC CALCULATORS

Authors: Kian Boon Lim, Tau Han Cheong
Affiliations: Universiti Pendidikan Sultan Idris, Universiti Teknologi Mara

Casio fx570ES scientific calculator is widely used in Malaysia’s secondary school. This scientific calculator is equipped with 403 functions. Many functions of the scientific calculator are very useful to the students in learning mathematics but few of them know how to apply it. This workshop will show how teacher can use fx570ES scientific calculator for the classroom effectively in teaching mathematics, some features of Casio fx570ES scientific calculator that can be used in teaching and learning of mathematics will be shared, which will include the following: (1) Trigonometric function and solution of triangles (2) Rectangular – Polar

Coordinate conversion (3) Quadratic Equations and Simultaneous Equations (4) Statistics and Normal Distribution (5)Matrix Calculation (6) Calculation involving specific number systems (binary, octal, decimal, hexadecimal) (7) Integration and differentiation (8) Complex number (9) Numerical Integration (10) Roots of nonlinear equation.

ABSTRACT FOR 19119

EXPERIENCING THE INTERACTIVE DIGITAL RESOURCES "1 2 3… CABRI" FOR MIDDLE SCHOOL

Authors: Colette Laborde, Jean-Marie Laborde
Affiliations: University Joseph Fourier, Cabrilog, Grenoble, France

The collection of multimedia interactive activity books "1 2 3 … Cabri" meant for middle school students will be presented. An activity book comprises several pages proposing a sequence of tasks to students with various feedback.

The collection covers the key notions of mathematics curriculum of middle school from numbers and arithmetic to geometry through measurement. Participants will explore different activity books in order to analyze the tools and the various types of feedback offered to students

ABSTRACT FOR 19176

ADVANCED SKETCHPAD VERSION 5 WORKSHOP: FOCUS ON TRANSFORMATIONS

Authors: Nicholas Jackiw, Steven Rasmussen
Affiliations: KCP Technologies, Key Curriculum Press

This workshop will continue Sketchpad learning (see Workshop: "Introduction to Sketchpad") by focusing on the topic of transformations across the curriculum, while emphasizing new functionality of Sketchpad Version 5. Topics will include transforming shapes, functions, and digital pictures through basic isometries and more advanced or unusual geometric transformations such as inversion and morphing. Prior Sketchpad exposure (such as completing the "Introduction to Sketchpad Version 5" Workshop) desirable. Participants will receive a 60-day preview edition of Sketchpad Version 5 in English or Turkish.

(ORGANIZERS: If no computer lab will be certainly available for this workshop, please add "Bring your own laptop!" to the Workshop.)

ABSTRACT FOR 19177

INTRODUCTION TO TINKERPLOTS VERSION 2

Authors: Steven Rasmussen
Affiliations: KCP Technologies, Key Curriculum Press

This workshop will focus on teaching concepts in data and chance using TinkerPlots, a dynamic data software for middle school students. Topics will include analyzing data, simulating data to observe variability in samples, and concepts in probability. No prior experience with TinkerPlots is needed. Participants will receive a 60-day preview edition of TinkerPlots Version 2 in English.

(ORGANIZERS: If no computer lab will be certainly available for this workshop, please add "Bring your own laptop!" to the Workshop description.)

ABSTRACT FOR 19178

INTRODUCTION TO SKETCHPAD VERSION 5

Authors: Nicholas Jackiw, Steven Rasmussen
Affiliations: KCP Technologies, Key Curriculum Press

This workshop will introduce teachers to the rich mathematical feature set of The Geometer''s Sketchpad 5, including Dynamic Geometry construction tools and analytic and algebraic modeling tools. Workshop content will focus on basic software functionality and support resources. No prior Sketchpad experience is necessary. Participants will receive a 60-day preview edition of Sketchpad Version 5 in English or Turkish.

(ORGANIZERS: If no computer lab will be certainly available for this workshop, please add "Bring your own laptop!" to the Workshop description.)

ABSTRACT FOR 19326

TECHNOLOGY-RICH LEARNING EXPERIENCES FROM THE WEB FOR THE MATHEMATICS CLASSROOM

Authors: Ngan Hoe Lee, Beverly Ferrucci
Affiliations: National Institute of Education, Nanyang Technological University, Keene State College

This workshop will share some ways in which technology can be incorporated into mathematics classes. Resource ideas and examples will range from whole class activities and interactive projects to digital libraries. The first part of the workshop will focus on examples for the primary levels while the second part will draw on examples for the secondary levels.

ABSTRACT FOR 19344

GETTING BEYOND THE VISUAL HURDLES OF CALCULUS IN THREE DIMENSIONS

Authors: Drew Ishii
Affiliations: Sage Hill School, California Mathematics Council

Visualizing three-dimensional objects and surfaces can be difficult for students especially if they are not visual learners or artistically-inclined. Many of those students are accustomed to doing two-dimensional graphs by hand, but that process breaks down when it comes to doing calculus in three-dimensions. Students should not be constrained or stifled in their learning of advanced calculus topics because they either lack visualization skills that have never been required of them in previous courses or do not have programming knowledge. I present a session that explores the three-dimensional coordinate system, quadratic surfaces, vector functions, the TNB frame, and multiple integrals with the user-friendly software Grapher by Apple that does not require any knowledge of programming. Participants will see how intuitively students can investigate these multi-variable calculus topics by experimenting with equations and their graphs.

ABSTRACT FOR 19353

LEARNING MATHEMATICS 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 extend the mathematical capabilities to equations, vectors, matrices, series, complex numbers, probability and statistics, as well as elementary calculus operations of integration and differentiation. Consequently, 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. In this workshop a variety of examples will be used to consider ways in which sophisticated mathematical and statistical concepts can be developed, through student use of these modern calculators. We will use Casio fx-991ES PLUS calculators, but do not expect that participants will have prior experience with this calculator.

ABSTRACT FOR 19354

FIRST STEPS IN LEARNING MATHEMATICS WITH A GRAPHICS CALCULATOR

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, elementary statistics, probability, trigonometry and differential calculus. The focus will be on teachers of senior secondary or early undergraduate mathematics. We will use the Casio fx-9860GII calculator, but do not expect that participants will have prior experience with this calculator.

ABSTRACT FOR 19355

LEARNING MATHEMATICS WITH A SCIENTIFIC CALCULATOR

Authors: Barry Kissane, Marian Kemp
Affiliations: Murdoch University

For about forty years teachers and students have used scientific calculators for simple and more complex arithmetic calculations and for tasks involving logarithmic, exponential and trigonometric functions. More recently, modern scientific calculators have been developed to become more user-friendly and to extend their mathematical capabilities to suit modern curricula. While calculators are sometimes regarded as merely devices to produce numerical answers, in this workshop we will also consider instead some ways in which the development of mathematical ideas can be supported with such a calculator, focusing on the secondary school. We will use the Casio fx-82 ES PLUS calculators, but do not expect that participants will have prior experience with this calculator.

ABSTRACT FOR 19356

APPLICATIONS OF TRIGONOMETRY AND POLAR FUNCTIONS IN GRADE 10-11 MATH

Authors: Tonguc Ozdas, Seda Eren
Affiliations: ENKA Schools, Enka Schools

Technology integrated classes help students to be aware of real life applications of mathematics and make sense of the world that we live in by means of mathematics. Most of the time mathematics is considered to be an abstract sequence of operations by a large student body rather than a science that helps us understand the world that we live in. With the activities designed, we aim at changing the perspective of our students and appreciate mathematics and think out of the box. The importance of technology as an interactive teaching tool will be emphasized.

Turkish and International Curriculum will be compared in the light of these activities.

ABSTRACT FOR 19358

INVESTIGATING INVESTIGATIONS

Authors: Christopher Longhurst
Affiliations: Hewlett Packard

- What is a mathematical investigation?
- How do you put an investigation together?
- What should we investigate?
- Are investigations a good learning tool?

In this workshop I will attempt to answer the above questions by starting at the beginning and developing an investigation using tools such as the internet, and graphing calculators. The steps to producing a good, meaningful mathematics investigation will be taken and the group will perform the investigation. I will also add a couple of mathematics magic tricks into the presentation that can be used in the classroom which provide motivation and fun learning experiences for the students.

ABSTRACT FOR 19359

DEVELOPING OPEN TEACHING SUPPORTED BY THE IMPLEMENTATION OF GRAPHING CALCULATORS IN THE UAE

Authors: Pat Tunnicliffe, Chris Olley
Affiliations: King's College, London, ADEC (Abu Dhabi Education Council) CfBT (Centre for British Teachers)

This workshop will present the early findings of a project to develop open and exploratory approaches to the teaching of mathematics in secondary schools in Abu Dhabi, UAE. Two schools (one boys only, the other girls only) have been working with advisory teachers to expand the range of teaching styles. Graphing calculators with a computer algebra system (HP40GS) were introduced through a three day workshop to the teachers, with the principal orientation on investigative modes of learning. The teachers had different personal orientations to this pedagogy and to the technology. The workshop will discuss the extent to which teachers have been able to take up the technology as a pedagogic tool and use it to support a more investigative approach to their teaching. Delegates will be able to try out activities designed by the teachers using this technology to help frame discussion.

ABSTRACT FOR 19361

USING GRAPHICAL SOFTWARE IN MATHEMATICAL MODELING TASKS.

Authors: PINAR ÖZKUL SEZGÝN
Affiliations: MARMARA PRIVATE HIGH SCHOOL

This is a hands on workshop, which will show participants how to draw graphs using graphical software like Logger Pro, Graph 4.3. It will focus on one mathematical modeling task. Data contains National CO2 Emissions from Fossil-Fuel Burning in Turkey which is taken from The Carbon Dioxide Information Analysis Center will be given. Finding a model function for this given data will be shown step by step. Scopes and limitations will be discussed. Multiple graphs will be drawn that contains the given data, model function and the function found by regression tools. Comparison of the data with data produced by the developed model will be shown. After finding the best model function, future predictions will be made in the context of the task. Hence attendees would be able to learn how to find properties of graphs such as extremum points, zeros, y-intercepts, horizontal asymptotes, vertical asymptotes etc. Teachers will be encouraged to design mathematical modeling tasks in which technology is used to enhance the development of the task.

ABSTRACT FOR 19556

INTRODUCTION TO MAPLE 15

Authors: Douglas Meade
Affiliations: Department of Mathematics, University of South Carolina, Industrial Mathematics Institute, USC

Receive a hands-on introduction to Maple 15 that will demonstrate its abilities to work with symbolic, numeric, and graphic information. The focus will be on interactive use of Maple 15 to explore a variety of mathematical topics chose from precalculus, calculus, linear algebra, and differential equations. There will be specific instruction in the creation of customized student-friendly user interfaces that minimize the amount of syntax students need to know. Participants are encouraged to think about specific types of problems they would like to learn how to use Maple to solve. No prior experience with Maple or another CAS will be assumed.

ABSTRACT FOR 19561

HANDHELD TECHNOLOGY AND CALCULUS

Authors: Christopher Longhurst
Affiliations: Hewlett Packard

Calculus is often one of the most interesting strands of mathematics for students. The reasons are varied but they include the fact that it is a combination of algebra, number, dynamics as well as often it appears to be a practical side of mathematics which brings real meaning to real world problems. In this workshop I will take many of the aspects of calculus including introduction, theory and practical aspects and show how I us the graphing and CAS calculator to consolidate the students learning and understanding of calculus.

ABSTRACT FOR 19569

MATHEMATICAL MODELING: A PEDAGOGIC CONTEXT OR A BOUNDARY?

Authors: Chris Olley
Affiliations: King's College, London

This session will present existing work using handheld data streaming technology, investigating the cooling of pizzas. The basic activity comes from materials developed by the presenter and others at King's College, London for the Bowland Trust, whose purpose was to develop open extended tasks in mathematical problem solving. The activity has developed as having a focus on engaging learners with the practice of mathematical modelling in itself. The emphasis being on critique and reformulation. Much of what appears as modelling in English school's curricula, present mythogised versions of ''real-world'' problems validated only within the school mathematics context. The session will explore the principles of evaluation deployed in the school mathematic setting and the ''real-world'' setting and consider whether the activity of mathematical modelling can be constructed as a separate pedagogic context, or act as a boundary between the two. The session will contain live data streaming on HP40GS graphing calculators and modelling by the participants to engage with the issues.

Abstracts for Poster Sessions

ABSTRACT FOR 18938

DESIGN DECISIONS IN INTERACTIVE GEOMETRY SOFTWARE

Authors: Kate Mackrell
Affiliations: Institute of Education, University of London, UK

NOTE 1: This poster is based on a paper to appear in ZDM in summer 2011. The poster will present these results schematically and also incorporate two further softwares (Casyopee and TI'Nspire) and calculation operations, not mentioned in the paper.

NOTE 2: I will be submitting a paper as well, looking at the algebraic affordances of the IGS programs mentioned here: the poster complements this paper.

Problem Definition and Objectives:

There is an increasing awareness that the details of the design of pedagogical tools are significant and should be researched (Butler, Jackiw, Laborde, Lagrange, & Yerushalmy (2009)). An analysis of seven interactive geometry programmes (Cabri II Plus, Cabri 3D, Casyopee, Cinderella, GeoGebra, Geometer's Sketchpad and TI'Nspire was hence performed in order to identify some of the design decisions necessary to enable basic geometrical constructions, measurement, and calculation.

Strategy, methods, theory: The possible interactions in a visual mathematics representation identified by Sedig and Sumner (2006) were used to develop a categorization of the operations that can take place in an IGS program. An exploration of the design decisions involved in several fundamental operations was then undertaken with each software by performing a task involving creating a circle and exploring its area.

Results: The main part of the poster will show schematically the types of design decisions necessary (such as how a tool is used), the different decisions made (such as the order in which objects need to be chosen in using a tool), and the potential impact of decisions on the affordances of the programs. A number of tensions (such as between user choice and default behaviour) will also be shown.

Conclusions: There is an extraordinary diversity in both the type of decisions that need to be made and in the decisions possible. For the most part, the effect of these decisions upon student learning is currently unknown: the poster hopefully provides a framework within which future research may be situated.

ABSTRACT FOR 18980

THE TECHNOLOGY IN THE TEACHING OF CALCULUS. AN EXPERIENCE WITH SOCIAL SCIENCE STUDENTS

Authors: Jose Ortiz
Affiliations: University of Carabobo

The mathematical training of future graduates in economics and social sciences should help strengthen the relationship between mathematics and reality, with the expectation of providing students and conceptual tools for understanding and addressing functional phenomena relevant to their future professional field. This position is contrary to the current specification of the curriculum at the university, which focuses on mathematics as an isolated activity of the physical and social world of the student. In that sense, it goes to an innovation in which changes in the approach to teaching and learning of mathematics. In this paper, we analyze the activities of a group of students, who participated in an environment of teaching and learning, supported by the use of graphing calculator and a CAS in the context of calculus. Subjects participating in the study were students attending mathematics basic cycle of the Faculty of Economics and Social Sciences at the University of Carabobo, Campus La Morita, Maracay, Venezuela. It is considered a qualitative approach in the analysis of the productions of the participants, the product of his performance in the classroom and the answers to problems set conducted outside the classroom. The reports show changes in the mathematical

knowledge of students, expressed in the understanding and application of concepts in the interpretation of the calculation of the physical world of phenomena, natural and social. The participants used CAS in the achievement of complex calculations and understanding of concepts and ideas involved in solving problems relating to the discipline and the social environment. The results revealed the use of several systems of representation of mathematical concepts and properties, as well as conceptual understanding and practical use of calculus in the real world.

ABSTRACT FOR 19049

TEACHER'S OPINION TOWARDS EMPLOYING GEOGEBRA SOFTWARE IN THE TEACHING OF MATHEMATICS

Authors: Hutkemri Zulnaidi, Effandi Zakaria
Affiliations: Universiti Kebangsaan Malaysia

A study has been conducted to observe teacher's evaluation towards GeoGebra software in teaching Mathematics. The study comprises of four respondents who are currently enrolled in Mathematics Education course at Universiti Kebangsaan Malaysia. The study generates similar opinion among the respondents based on their experience, with regard to GeoGebra software content. All respondents agree that the software employs straightforward and comprehensible instructions in addition to accurate and simple information offered. As for technical aspects, respondents are clearly of the same opinion. They find that the software is user friendly. The respondents on the whole have positive opinions towards the idea of employing GeoGebra software in the teaching of mathematics.

ABSTRACT FOR 19122

ACTIVITIES FOR TEACHING CONCEPT OF SYMMETRY WITH THE SOFTWARE "SIMETRIA"

Authors: Pelin Turan
Affiliations: Anadolu University

The concept of symmetry is one of the most important application areas in geometry. People need the idea of symmetry as a way of understanding nature and environment which they live in. We see the most beautiful examples of symmetry in architecture, in arts, in the world of plants and animals, etc. Mainly, symmetry is a movement of rotation and translation. So it is a tool to analyze mathematical situations. Also the study of symmetry offers one approach to analyze patterns. These important two concepts (symmetry and patterns) are included all the classes in geometry curriculum of primary school in Turkey.

The aim of this study, with using geometry software "Simetria", is to give examples of activities that include the concept of symmetry in patterns into technology-based environment for teachers. In this study, firstly the potential of geometry software "Simetria" is introduced, secondly it is explained how steps of activities can be constructed and finally applications of activities in class are discussed.

ABSTRACT FOR 19360

MULTIPLEX-R: BASIC CONCEPTS OF NUMBERS AND OPERATIONS THROUGH MULTI-TOUCH & LINKED MULTIPLE REPRESENTATIONS

Authors: Silke Ladel
Affiliations: University of Education Karlsruhe, Germany

Many difficulties that children have in learning arithmetic are based on the fact, that their concept of numbers and operations is insufficiently developed. E.g. addition and subtraction is only a demand to count forward or backward. Those children fail to build up relations between number triples. They lack the part-whole concept of numbers, where a numeral identifies a quantity which can be decomposed in several parts. As a consequence of the insufficiently developed concept of operations certain children are not able to link different forms of representations. They are acting with mathematical symbols without any visualization of the meaning of these operations.

With multi-touch technology we are now able to link mathematical representations so that children can experience the relations. They act with the virtual material and see the consequences of their operations on the symbolic side.

Our research question is how a multi-touch learning environment has to be designed to support the development of the part-whole concept and to give the opportunity to experiment with interconnected mathematical representations in due consideration of the fundamental theories of mathematical learning. To implement prototypical environments and for recording experimental data of children‘s interactions we use the interactive geometry software (IGS) Cinderella, which acts as a standard tool for rapid prototyping of learning environments. The integrated scripting language CindyScript can be triggered by user actions and so it is possible to change the standard behaviour of this IGS into the required interaction for an experiment.

ABSTRACT FOR 19368

INTRODUCTION OF COMPLEX GEOMETRY BY LEARNING VISUALLY WITH TECHNOLOGY

Authors: Chieko Fukuda, Kyoko KAKIHANA
Affiliations: Teikyo University, JAPAN, Tsukuba Gakuin University

Euclidean geometry has traditionally been studied by figure description. On the other hand, it has also been studied analytically using numerical formulas. This analytical method connects geometry with other mathematical fields, and many applications of geometry are created, for example computer graphics, object recognition, and so on. In high school mathematics, analytical geometry using real numbers is an important academic unit but students have little chance to study it using complex numbers. It can be appreciated, for example, that some kinds of calculation become simple by using conjugate complex numbers and there are materials containing interesting topics. Also, learning complex geometry is an important way to familiarize students with complex numbers before they study complex analysis.

The purpose of this paper is to show educational materials to help students’ understanding of geometrical meaning of complex numbers by using software. We developed materials by using software to teach a visual approach to complex geometry. First, students sort the basic characters of complex numbers from a geometrical view. Then, they solve some geometrical problems which are easy to manipulate by transforming geometrical characters into complex formulas. In those problems, we take up inversion from the viewpoint of transformation by complex function and, more generally, linear fractional transformation.

ABSTRACT FOR 19555

MAPLETS FOR CALCULUS: EFFECTIVE RESOURCE FOR TEACHING AND STUDYING CALCULUS

Authors: Douglas Meade, Philip Yasskin
Affiliations: Department of Mathematics, University of South Carolina, Industrial Mathematics Institute, USC, Department of Mathematics, Texas A&M University

Learning calculus is not a passive activity. As university resources continue to be stretched, section sizes have increased and grading support has declined. With limited resources, more courses are making use of computer-based homework systems. Unfortunately, most of these systems still have pedagogical limitations.

Maplets for Calculus (M4C) is an electronic study guide that consists of 129 customized applets for specific topics in precalculus, univariate calculus and multivariate calculus. Each applet presents an algorithmically-generated problem, requires correct intermediate responses before moving on to the next step, employs computer algebra to analyze student responses and provides customized hints and feedback. Graphics (2D, 3D, animation and stereo) are used whenever possible to reinforce the symbolic mathematics. In short, M4C is a "tutor without the tutor".

Students appreciate the step-by-step guidance through problems and the way algebraic, graphic, numeric and verbal approaches support diverse learning styles. Instructors like the interactions that arise when students in a lab have different versions of similar problems and frequently use the applet graphics as lecture demonstrations. Initial assessment of M4C's effectiveness is underway.

ABSTRACT FOR 19571

*2*N-PRIMES DEFINED BY UNCEASING N-TWIN PRIMES*

Authors: Hirotaka Ebisui
Affiliations: Oval Research Center

We found 12 unceasing primes which are 6 twin primes. Now One set is found as Followings.

[[325267931,325267933],[...37,...39],[...49,...51],[...61,...63],[...79,...81], [325267991,325267993]]

We found this primes sequence using Maple software and consuming 30 hours. Before we found these prime, we found unceasing 5-twin primes. So, we can expect the existence of 2*N (N is arbitrary natural number) unseasing primes consisted by N-Twins. This fact shows any long dense primes in natural numbers and N-Twins behave like compound number. In poster session, we show various number tables.

Thank you for your reading of this abstract.

ABSTRACT FOR 19573

CHOOSING TECHNOLOGY APPLICATIONS: CONSIDERING STUDENTS' MATHEMATICAL DEVELOPMENTAL BACKGROUNDS

Authors: Agida Manizade, Marguerite Mason
Affiliations: Radford University, The College of William and Mary

In this paper we are using van Hiele theory of students' geometric development as an underlying structure of our framework for teachers' decision making when assessing appropriateness of technology applications for teaching mathematics at the high school level. When planning their mathematics lessons teachers have to consider many factors, including but not limited to how appropriate is a given on-line technology application for students' mathematical background and their levels of mathematical development. We propose a framework for teachers' decision making when using free, open source GeoGebra applications when teaching high school geometry topics.

17th Asian Technology Conference in Mathematics

ATCM 2012

Bangkok, Thailand
December 16-20, 2012

Discovering the beauty of mathematics through technology

December 16-20, 2012,
Suan Sunandha Rajabhat University,
Bangkok, Thailand

Conference Activities

Papers presentations, workshops for mathematics teachers, training sessions, poster sessions, discussions, books and software presentations, excursion, Bangkok explorations.
For more information check conference web site at:

http://atcm.mathandtech.org

Selected topics

Teaching Mathematics with technology, Internet technology for Mathematics, Dynamic Geometry software, Computer Algebra Systems in Mathematics, Assesment in Mathematics using technology, Mathematical art, Hand-held technology, Mathematical research using technology, Statistics using Dynamic Statistics software, Multimedia & Mathematics, and a lot more.

© M.M
Poster and graphics design by Mirek Majewski