

Track: Presenting a talk with only an abstract

Presentations in English

Abstract for 12386

A Comparison Theorem of the Improving Gauss-Seidel method for H-matrix and its Comparison Matrix

Authors: liying Sun, xingye xu

Affiliations: Math Dept.of Guangdong Education Institute, Math Dept. of Guangdong Education Institute

Keywords:

In 1997, Kohno et al. have reported that the improving modified Gauss-Seidel method, which was referred to as the IMGS method, was superior to the classical iterative methods. H-matrix is a widely used matrix. In this paper, we apply this method to H-matrix and its comparison matrix, with a more general splitting we present the corresponding convergence results and the comparison results of the spectral radius. The convergence rates are as well as compared. Some recent results are improved.

Abstract for 12680

Using Computer Multimedia to Dissolve Cognitive Conflicts of Mathematical Proof

Authors: Chun-Yi Lee, Ming-Puu Chen

Affiliations: National Taiwan Normal University

Keywords:

This paper exemplified the design of an instructional support by means of computer-multimedia to dissolve students' cognitive conflicts during the process of a mathematical proof problem, the pasture problem. Cognitive conflicts occur when there are expectations which are not fulfilled. The pasture problem provides cognitive conflicts and encourages students to explore and bridge the gap between conjectures and proofs. In the beginning of the problem-solving process, students made a conjecture concerning the solution of the pasture problem and proposed a reason why it was true. The reason was often rooted in common sense or based on previous learning. Through multimedia-represented cognitive conflicts, students are more capable of visualizing and accepting the new conjecture. Then, it led them to construct a new explanation for this new conjecture naturally. It is believed that through the multimedia-supported exploration students were guided to use deductive reasoning, construct reasons to support the new

conjecture, and be motivated to solve the pasture problem.
Full paper will appear at the second issue of eJMT
(<http://www.radford.edu/ejmt>)

Abstract for 12724

Two explorations with Cabri 3D leading to two theorems
Authors: Jean-Jacques Dahan
Affiliations: IREM of Toulouse
Keywords:

Topics: Applications using Dynamic/Interactive Geometry or/and CAS
Exploring the volume of the convex envelope of a net of a cube with Cabri 3D, as the net opens and closes will lead to a conjecture about the maximum of this volume. We will prove this conjecture. We will also solve experimentally the problem of the tessellation of a cylinder with equilateral triangles after the observation of a picture taken in the convention enter of Hong Kong. The proof will be exposed. Eventually we will present quasi-tesselations to illustrate the Schwarz paradox in relation with the lateral area of a cylinder

Abstract for 12726

The process of discovery of a theorem with Cabri 3D
Authors: Jean-Jacques Dahan
Affiliations: IREM of Toulouse
Keywords:

We will show all the stages of our experimental research to prove a theorem about the quasi tessellation of a cylinder with equilateral triangles. These stages are described with the theoretical frame I have developed in my research work (Ph D thesis). We will particularly show the levels of geometry during this research (praxeologies G1, G2, G1 informatique and G2 informatique). We will compare to what we can expect from students during their process of discovery.

Abstract for 12727

Helping teachers to Develop Self Learning Package using MicroSoft Office
Authors: Che-yin Suen, Boon Cheok Toh
Affiliations: Hong Kah SEcondary School, Hong Kah Secondary School, Singapore
Keywords:

Many self-learning packages have been developed. Parents are unhappy

to pay the on-line package subscription for their children to learn mathematics. Teachers also feel that these packages are not tailored for their own pupils. The authors used Excel to develop some lessons so that pupils can learn in an environment which they are familiar with. Parents need not to pay a single cent. Teachers can modify the contents easily to fit their pupils' need. As the author used Macro and sliders in their development, all learning is interactive. Furthermore, the examples are not static. Pupils may have many different examples during their learning.

Abstract for 12729

Transfer of spatial visualization: Training with discrete, composite transformations in USA, Taiwan and Turkey

Authors: Helen Gerretson, Glenn Smith, Yuan Yuan, Sinan Olkun

Affiliations: University of South Florida, Chung Yuan Christian University, Ankara University

Keywords:

Problem: The learning and transfer of spatial skills, such as spatial visualization (SV) and mental rotation (MR), although important to mathematics, remain resistant to educators and researchers best efforts to teach them. Through re-testing and practice, people improve spatial skills within a narrow context, but such context-specific improvements have not transferred globally to other contexts.

Research question: We investigated whether: a) composition of discrete transformations (mental rotation, reflection, dilation, and translation), b) in multiple contexts, c) using multiple interventions could affect transfer to MR and SV. We also investigated how such spatial learning played out in different countries.

Method: The study investigated whether six weekly sessions involving interactive software could aid female pre-service elementary teachers in the USA, Taiwan, and Turkey in the transfer of MR and SV, as measured by two standardized tests: Flags test of mental rotation and the Differential Aptitude Test (DAT) space relations subset (surface development). The study employed a pretest, intervention, posttest design with experimental and control groups to compare pre to post improvements in spatial skills between groups within each country. The intervention consisted of six weekly sessions (approximately 15 minutes each) of structured activities, in the computer lab, that used interactive computer programs involving composition of discrete spatial transformations (e.g. 90

degrees of rotation, dilations a factor of two, etc.): NCTM Illuminations applets, Copycat and Mathmagic™. All students were enrolled in the second of a two-course sequence of mathematics methods, however the US course involved geometry content, while the Turkish and Taiwanese courses did not.

Results: At this writing, data from USA and Turkey are in, but not from Taiwan. See figures 1 and 2. All participants improved on MR from pre to post, but the intervention did not make a difference for MR. For the Turkish students, the training made a significant positive difference for SV.

Table 1: Flags Mental Rotation test pre to post differences

Country Within subjects (all groups) Between groups/between subjects
USA SIG., .0001, $t = 6.33$ Not sig.
Turkey SIG., .02, $t = 2.47$ Not sig.

Table 2: DAT Spatial Visualization test pre to post differences

Country Within subjects (all groups) Between groups/between subjects
USA Not sig. Not sig.
Turkey SIG., .001, $t = 3.7$ SIG., .05 (.04), $F = 4.65$

Implications: Consistent with most prior studies, re-testing, but not training, improved MR. However, based on the significant between-group differences in improvements on the DAT for the Turkish (who were not yet exposed to geometric transformation content), training with composition of discrete transformations may improve multi-step SV and effect transfer.

Abstract for 12736

A Study of School Teachers' Applications of Using Magic Board : a Web-based Virtual Manipulatives

Authors: Yuan Yuan

Affiliations: Chung Yuan Christian University

Keywords:

Usually, school teachers do not have the time neither the skills to produce their own educational materials. Magic Board is a Web-based instructional tool, which includes a virtual collection of pictures and symbols, teachers can use to create learning materials and to design context-oriented learning activities for elementary school students. The researcher gave a three-hour workshop to elementary school teachers in April, 2007. In June, a questionnaire was mailed to those who registered as a member and used Magic Board to design instructional materials on the Web. A total of thirty-one teachers

were surveyed and three elementary school teachers were interviewed to collect their experience of using Magic Board in school. Research results showed that most school teachers like to use this tool to design instructional materials. They expected to include more conceptual kits, such as fractions and fraction digits and suggested to have ready made activities, so teachers may have more wish to use these virtual manipulative and use them effectively. Interviewing results showed that Magic Board could be used to teach basic number concepts effectively. School students were surprised to see and use this tool to learn mathematics. The three teachers thought that this tool could be used to pose questions easily and to promote students' conceptual understanding. Suggestions from questionnaire surveys and interviews were useful and used as directions to the improvement of Magic Board.

Abstract for 12746

A Mathematical Lesson on the Applications of Differentiation Principles

Authors: Hong Eng Ding, Wooi Ping Hew, Mohd Hazhar bin Jamal

Affiliations: University of Malaya

Keywords:

Differentiation is an important topic in the Additional Mathematics syllabus in the Malaysia upper secondary school curriculum. This topic is used extensively in Engineering where it can be used to investigate or predict the natural characteristics of machineries. The Department of Electrical Engineering in the University of Malaya has developed an E-Learning package for studying induction motor. Differentiation principle was used to determine the maximum torque the motor can generate. This paper presents a lesson on application of differentiation that utilizes the relevant part of the Electrical Engineering E-Learning package. The lesson was being taught to a group of students in an upper secondary school in Malaysia.

The lesson starts with showing pictures of induction motors from the E-Learning package, so that the students have a clear idea on the machine where differentiation can be applied. A small actual induction motor can also be shown in the classroom. The teacher then shows a PowerPoint slides on the applications of induction motor in everyday life. The torque-speed equation is given. The students are required to differentiate the given equation and equal it to zero (the principle of finding maximum or minimum value). This condition yields an optimum parameter that generates the maximum torque. The students can choose different motors with different characteristics

to perform the required differentiation in order to obtain the maximum torque. They can check their answers and view the torque-speed curve using the E-Learning package. The teacher then concludes on the practical implications of different torque-speed curves. Furthermore, the students are free to explore other aspect of the E-Learning package to learn more about application of differentiation in Engineering.

As a result, the students are exposed to the application of differentiation principles using real examples. Using this contextual learning approach, Differentiation will no longer be an abstract topic but actually it could be applied to a real machine that they can see and touch. This arouses the interest of students in the topic of Differentiation and Electrical Engineering. It is a synergy between the tool (Mathematics) and the application (Engineering).

Abstract. 12759

Visualization of Mathematics Against Misconceptions in Computer Graphics Course

Authors: Vladimir Nodelman

Affiliations: Holon Institute of Technology

Keywords:

Topics: Technology and Curriculum Issues

The “Computer Graphics” course is one of intensively utilizing mathematics units in Computer Science studies. Related literature often refers to mathematical notions and techniques in not sufficiently correct, adequate and precise manner in order to obtain a quick result of calculations for real-time rendering (programming games, simulations etc.) This paper presents several ways to prevent misconceptions and mistakes by means of computer modeling and visualization of correspondent mathematical material:

- Visual comparison of two 3D scenes: one, produced by traditionally used algorithms with wrong mathematical model, and the other, based on adequate mathematical understanding.
- Taking into account mathematical features that are missed in studied algorithms and lead to more efficient performance.
- Introduction of new, not studied previously mathematical notions that ensure appropriate and fruitful application.

Proposed educational methods and aids provide solutions in studies of both computer science and mathematics itself.

Abstract for 12760

A Graphical Explanation of Fundamental Vector Operations for Engineering Students

Authors: Hitoshi Nishizawa, Takayoshi Yoshioka

Affiliations: Toyota National College of Technology, Dept. of

Electrical and Electronic Engineering

Keywords:

At the achievement test of fundamental mathematics for third-year students of colleges of technology in Japan, the students' performance in linear algebra was lower than the ones of calculus, trigonometry, or algebra. Many students failed to separate the equation of a straight line in 3D space from the one of a flat surface. Interviews to the students revealed that:

- 1) they have memorized those equations just before term-end examinations, but
- 2) they didn't have the experience to relate them to graphic objects, so
- 3) they couldn't explain how the change in a parameter of the equation affects on the position or direction of the related graphic object, even qualitatively.

Their knowledge in linear algebra seems to evaporate in thin air because it is not related to the experiences which students feel more reality.

To improve this situation, we have been building some graphical explanation of vector operations in 2D and 3D space with the help of graphic software. In the explanation, we need:

- 1) physical phenomenon which is familiar to engineering students, and its mathematical model,
- 2) graphic objects in the model, and
- 3) vector operations and their graphical meanings.

Our explanation and the implementation are described in this paper.

Abstract for 12767

Designing Web-based Cognitive Tools to Enhance Teaching and Learning of Mathematical Problem Solving

Authors: Luis Tirtasanjaya Lioe, Yanping Fang, Kai Fai Ho

Affiliations: Centre for Research in Pedagogy and Practice, National Institute of Education, Singapore, Centre for Research in Pedagogy and Practice, and Curriculum Teaching Unit, National Institute of Education, Singapore., Centre for Research in Pedagogy and Practice, National Institute of Education, Singapore.

Keywords:

Many researchers and cognitive scientists have been exploring effective professional development for teachers that offers flexibility of time and a continuity to ensure successful transfer of learning to teachers' daily practices (Ball and Cohen, 1996; Hapgood, Palincsar, Kucan, Gelpi-Lomangino, & Khasnabis, 2005). This

paper reports on a large research project which aims at building web-based cognitive tools for teacher professional development in the area of mathematical problem solving (MPS) in upper primary and lower secondary schools in Singapore. To this end, we draw on a rich variety of classroom data to design web-based cognitive tools, such as video cases of teachers' practices, students' problem solving processes (Boaler and Humphreys, 2005) and a databank of mathematical problems. The video cases of teaching practices aim to initiate, through guided discussion forums, a peer-sharing and peer-learning among participant-teachers, while the video cases of students' pair work aim to open discussions among the teachers on students' challenges in solving problems and ways to help students overcome them. Over time, such on-line discussions will be able to build a virtual community of learners (Gee, 2003) through interactive technologies and digital media as teachers pose questions, analyse data, consider different perspectives, and apply new knowledge to their own teaching practice (Baildon & Fang, 2007). Meanwhile, our databank of problems, with wide variety of contexts, rich problem types and multiple solution approaches (Foong, 2002; Frobisher, 1994), serves as a resource to support problem solving activities in classrooms as well as scaffold cognitive processes of various problem-solving strategies. The development of these web-based cognitive tools involves iterative process of improving and evaluation based on feedback from teachers as users. This paper will highlight the design and implementation processes of these cognitive tools as well as the research implications for teachers' professional learning.

Reference

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Educator, 6(2), 15-31.

Frobisher, L. (1994). Problems, investigations and an investigative approach. In A. Orton & G. Wain (Eds.), *Issues in Teaching Mathematics* (pp.150-173). London: Cassell.

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Hapgoof, S., Palincsar, A.S., Kucan, L., Gelpi-Lomangino, A., & Khasnabis, D. (2005). Investigating a new measure of teachers' pedagogical content knowledge for teaching informal text comprehension. Paper presented at the annual meeting of the American Educational Research Association.

Abstract for 12768

An Online Study of Math Learning from Meta-Cognition Point of View

Authors: Fu-Shiang P. Tsen

Affiliations: National Chiao Tung University

Keywords:

To get hold of the real math learning process of our students is the key step to study their math learning problem. In this study, we took the full advantage of our highly motivated students toward preparing college exance examination. First,we formed 6 small collaborative study groups among a class of students, so that they may discuss about their math problems after class. Second, we utilized an on line web conference tool to help us recording the complete process of each group confernce after a reviewing written test which was regularly held in school for the whole class, one chapter per week. A short answer was given from their teacher to check their answer right or wrong, but leave the detailed learning activity been their on in their web conference. We focused our study on their problem solving part of recording, so that A. Shonfeld's meta-cognition concept may be used to parse each problem solving process into different sections. After the analysis on each problem solving, we could summarize to form our important results. By summarize our detailed analysis on all the recording, we found several important results. First, the learning effect is heavily related to their elaborate discussing process in terms of meta-cognitive procedure, and the effect could be validated through individual basis because of the identify property of the web based recording. Second, we found that group discussing will promote the meta-cognitive functions well and hence the problem solving process may go through a long road in stead of a short path.

Third, we found a misconception which confused a group of students of 4, that may have chance been cured through an elaborate use of a technique in meta-cognition, plus an persistent on result against time pressure.

Abstract for 12769

Student-Centered Assessments in Mathematics

Authors: Premjit Singh

Affiliations: Dept. of Mathematics, Ohio University

Keywords:

This presentation outlines the ways in which I involve my students" in reflecting on their performance as they learn mathematics. I strongly believe that these class-room assessment techniques including minute notes, visualization techniques with TI calculators, etc...) keep them grounded and engaged during class and ensures that they absorb course material at higher levels.

I also solicit their feedback on course materials and their performance by asking them to fill out a questionnaire after each exam. This exercise further promotes ownership of learning. Based on their responses, they are asked to figure out what they should do differently to improve their performance in the course as well as get a better grade in the course.

Abstract for 12773

How to motivate teachers to want to use technology

Authors: Douglas Butler

Affiliations: iCT Training Centre (Oundle School), UK

Keywords:

The TSM (Technology for Secondary Math) workshops have a fantastic reputation in the UK for motivating teachers to use computer-based technology effectively. The annual 3-day residential workshop concentrates on two areas: to become fluent in Word and Excel for mathematics, and then to make the best use of dynamic software in the classroom.

Abstract for 12789

Engaging grade 7 and 8 students in using Cabri 3D: approaches to instrumental genesis

Authors: Kate Mackrell

Affiliations: Cabrilog

Keywords:

This paper reports on ongoing design research with grade 7 and 8 students in an Ontario school where tasks, materials and approaches are being created to enable students to essentially treat Cabri 3D as a microworld, using mathematically mediating tools to pursue their own goals, such as exploring polyhedral or building houses and animated figures. The focus will be on the means by which students have been enabled to gain familiarity with the software. A variety of materials and approaches have been trialed and it has been found that both Flash demos and pre-constructed files to replay are perceived by students to be effective in facilitating their use of the software. Questions arise, however, as to whether these materials provide the optimum scaffolding to enable students to move forward or whether too much is provided and hence opportunities for student creativity and challenge are restricted.

Abstract for 12806

What is the function $y^{(n)} = y$?

Authors: Shin Watanabe

Affiliations: Tokai University

Keywords:

We will be using Taylor Series with technological tools to explore the functions which could be a solution of the differential equation $y^{(n)} = y$. There are functions, which are number of n .

Before we use the Fundamental Theorem of Algebra, which states that every non-zero single-variable polynomial, with complex coefficients, has exactly as many complex roots as its degree, if repeated roots are counted up to their multiplicity. We will use the fact that there are n linearly independent vectors to form a basis in the space of R^n to solve the equation.

Abstract for 12807

TI-Nspire CAS - A New Generation Math Teaching and Learning Tool

Authors: Bernhard Kutzler

Affiliations: ACDCA - Austrian Center for Didactics of Computer Algebra

Keywords:

Texas Instrument's new product TI-Nspire CAS carries the technology of the legendary TI-92 further into a new generation Math/CAS tool. Its innovative double-platform design (handheld + 100 % compatible

computer software) and the seamless integration of the various applications make it a very powerful teaching and learning aid for teachers and students.

In this lecture presentation we demonstrate all applications (CAS, graphing, dynamic geometry, spreadsheet, word processing, and data collection) with live examples and show how to create powerful experimentation and visualization examples by combining the modules.

Abstract for 12887

The Effect of the Use of a Computer Algebra System on Junior College Students' Achievement in Mathematics

Authors: Wee Leng Ng

Affiliations: National Institute of Education, Nanyang Technological University

Keywords:

The purpose of this study was to investigate the effect of the use of the Voyage 200 graphing calculator, a portable computer algebra system (CAS), on the achievement of junior college students in mathematics. Positive results were obtained though the gain was not statistically significant.

Using the CAS Attitude Scale (CASAS), which comprises four sub-scales, developed by the researcher, students' attitudes towards CAS were also examined and statistically significant results were found. The reliability index, Cronbach's alpha, for each of the four subscales of the CASAS was found to be high and the reliability for total scale was 0.96. The four sub-scales of the CASAS were also found to be highly correlated with each other and with the total scale.

Abstract for 12894

A Study of Interactive Mathematical Environments for Teacher with Trigger-based Animation

Authors: Ming Jang Chen, Ning-chun Tan

Affiliations: National Chiao Tung University, National Taipei University of Education

Keywords:

Teaching strategy in information age usually needs close cooperation between teachers and technique professionals from the very beginning when the original ideas for teaching come out. Moreover, the performing of teaching information usually need to be reorganized within a single screen structurally, flexibly and interactively. The

costs needed in man power and in time are high; it will be even higher if drawing software or the programming languages are applied.

For the purpose of reducing digital divide while promoting its popularity simultaneously, the system 'Mathematical Presentation System (MathPS)' is developed as an interaction model for dynamic presentation on the platform of Microsoft PowerPoint in terms of trigger-based animation by reorganizing its original functions of interaction.

This system MathPS provides an environment with friendly interface, and it is good for mathematical multi-presentations with the ability of dynamic interaction as well as an efficient environment for drawing. Under this system, the occurrences of information can be handled efficiently, which will help the performance needed in teaching. For example, it can help to present abstract mathematics concepts dynamically and even to demonstrate possible connections among those patterns found. In addition to its interactive ability, structural cloning method is also developed, leading to drawing environments for complicated figures efficiently and friendly.

The purpose of this research is to provide an environment for course material preparation in a user-friendly manner, so that teachers can integrate their ideas into the material; moreover, the MathPS environment will also provide a chance for teachers to keep these material lively by using in class practically and revising continuously. Therefore, teaching pedagogy, teaching strategies, and teaching activities deserve further studies within the environment supported by the system of MathPS .

Abstract for 12899

Developing Mathematical Thinking and Problem Solving Skills through Card Tricks

Authors: Poh Yew Teoh

Affiliations: Creative Wizard Pte. Ltd., Malaysian Invention and Design Society, Malaysian Association of Profesional Speakers

Keywords:

Useful mathematical knowledge only becomes really useful when they can be recalled and used in other contexts than those in which they have been learned. This requires the development of mathematical thinking and problem solving skills; not just the proficiency in handling mathematical operations. Cognitive theory suggests that instruction that actively involves children is the best means in helping them to construct mathematical understanding and develop more mature thinking patterns. One of the most effective ways to actively involve pupils in learning is through mathematical magic.

Of all branches of mathematical magic, that which is concern with playing cards is perhaps the most prolific and exciting. Playing cards are one of the most effective, low cost and easily accessible manipulative materials that can do wonders in mathematics classroom. Mathematical card tricks can serve as an effective means of motivation at almost all levels of instruction. In this presentation, participants will see two very creative and powerful examples of how a single card trick can be made relevant to develop mathematical thinking and problem solving skills from preschool to high school level. Mathematical concepts involved in these examples include ascending/descending orders, addition/subtraction, inductive reasoning and arithmetic progression.

Key Words:

card tricks, recreational mathematics, mathematical thinking, problem solving, constructivism, creativity.

Target audience:

Preschool, Primary and Secondary schools mathematics teachers as well as teacher trainers.

Abstract for 12915

Graphical Differentiation with ClassPad300Plus

Authors: Mutlu AKAR, Mustafa Bayram, Hasan Unal

Affiliations: Yildiz Technical University

Topics: Implementation of Technology from K-12 Level, Mathematics Research with Technology, Assessment of Implementation of Technology in Education, Technology and Curriculum Issues, Mathematics Teaching, Learning and Assessment using Technology, Applications using CASIO technologies

Research studies (e.g. Vinner, 1989) have shown that students' mathematics understanding is typically analytic not visual. The use of multiple representations (visual and analytic) of mathematical concepts, in instruction can be beneficial for to students develop conceptual understanding of mathematics. The process of calculating the derivative f' of a given function f is called differentiation. The graph of f' can often be sketched directly from that of f by visualizing slopes, a procedure called graphical differentiation. In this poster presentation, authors will share the results of graphical differentiation activity done with ClassPad300+. We have tried activity with high school students and will share the results in detail. The results revealed that graphical differentiation have a positive effect on students understanding of differentiation concept compare to those received traditional instruction

Abstract for 12920

Teaching with Autograph

Authors: Mun Chou Fong

Affiliations: QED Education Scientific

Keywords: Intermediate

Autograph is the signature software for secondary mathematics education. It incorporates the 3 main principles in the teaching and learning of Mathematics: Flexibility-Reversibility-Generalization. Autograph enables students with less vision to follow the talk, deepen and excite them further. The teacher will be motivated to promote mathematical thoughts by asking students to write out what they see on screen. It will help both teacher and student to see the connections between visual representations and symbolic ones. The discourse that follows would create the environment for the correct vocabulary to be used, and for concepts to be internalized. Autograph can be used for the learning and teaching of Transformations, Graphs, Trigonometry, Statistics, and 3-D activities and the author believe that if correctly used it is bound to excite secondary students in their study of Mathematics.

Abstract for 12969

Transforming a Mathematical Data into a Visual Form Through the Use of Graphic Calculators

Authors: Fatih YILDIZ, Nuray GOKDAL

Affiliations: Mersa Technological Products Co., Math Teacher in Ministry of Education in Turkiye

Keywords: Novice, Intermediate, Undergraduate Level, K-12 Level, ClassPad 300, Casio, Comprehensive teaching, Graphics calculators, new methods of teaching, new curriculum, easy learning, visual and easy mathematics

Mathematics is a subject that relies on a solid foundation from which to build on. The learning process is more effective when enhanced by visual representation to assist cognitive learning.

Graphics calculators have become an essential tool to transfer, store and manipulate mathematical data in both scientific and business fields.

The workshop will cover the graphics calculators use in mathematical subjects from kindergarten to university level.

We will begin by covering its use in teaching Trigonometry in year 8 and continue with Polar coordinates covered in year 11 and finish with spherical coordinates used at a university level.

Abstract for 13033

Hartree _Fock Numerical calculations for Helium atom

Authors: Sabri EL Atresh

Affiliations: Department of physics, 7th October University,
Misurata, Libya

Keywords:

The self-consistent field derived quantum mechanically by the Hartree Fock approximation is used to calculate the ground state and excited states of the helium atom (He). The electric potential, used in this approach, is calculated by using Poisson's equation. The ground state value of He is found to be -2.89459 a.u which is below the commonly accepted limit[1]. The excited states are found to be -4.149 eV for 1s2s, -3.431 eV for 1s2p, -1.725 eV for 1s3s and -1.521 eV for 1s3p. We should note that using Poisson's equation greatly simplified the mathematical calculation.

R. Celeste, H.F.M. da Costa, A.B.F da Silva and M. Trsic, J. Chem.. Phys. 23 (1991) 1831

Abstract for 13127

Development and Implementation of the Online Mathematics Course.

Authors: Bakhodirzhon Siddikov

Affiliations: Associate Professor of Mathematics, Department of Mathematics, Ferris State University, 820 Campus Drive, ASC 2021, Big Rapids, Michigan 49307, USA

Keywords:

For the last ten to fifteen years there has been wide exploration of innovative approaches to classroom instruction: the use of the computer in teaching science courses. Rapid development of the internet technology and improvements of mathematics software made possible designing and implementing all levels of mathematics courses to satisfy the nontraditional students' need of being able to take the mathematics courses off-campus. Today, a majority of colleges and universities are offering the online mathematics courses.

In 2006, Ferris State University has received a grant from the U.S. Department of Education and Labor to develop the fully online the Heating, Ventilation, Air Conditioning and Refrigeration (HVACR) program, which leads to a Bachelor of Science degree. As part of this grant project, an "Intermediate Algebra and Numerical

Trigonometry” online course has been developed, and implemented in 2007. Maple software has been used to make the new online instruction platform more interactive and dynamic.

This talk is about the results of the development and implementation of the online teaching platform for the “Intermediate Algebra and Numerical Trigonometry” course. We will discuss advantages and disadvantages of the developed online course. We will talk about the different techniques of preventing academic cheating in taking the online mathematics courses, as well as difficulties of designing online tests, quizzes, lecture notes, and discussion of the homework problems. We will share with the audience our experiences of overcoming these difficulties. At the end of the talk, we will discuss the statistical results of the implementation of the online “Intermediate Algebra and Numerical Trigonometry” course at Ferris State University, Michigan, U.S.A. in 2007.

Abstract for 13530

Authors: Amy Leh, Lee Grafton

Affiliations: California State University San Bernardino, USA, PSUSD

Keywords:

Topics: Implementation of Technology from K-12 Level, Assessment of Implementation of Technology in Education, Mathematics Teaching, Learning and Assessment using Technology

This paper reports on the implementation and evaluation of an Enhancing Education Through Technology Competitive Grant (EETT-C) project. During 2005-2007, the project served 60 sixth to eighth grade mathematics teachers and approximately 6,500 students in Palm Springs Unified School District, a medium-sized, high-poverty school district in Southern California in the United States. The research-based program was designed to facilitate the delivery of a student program that effectively integrated technology into the curriculum to improve student achievement. Classroom observation and interview results indicated that the program was effective.

The presentation will start with an overview of the instructional strategies used to deliver the student program and the corresponding faculty development strategies. Descriptions of technologies used in the program are embedded. The overview is followed by the program evaluation, with a focus on classroom observations and interviews.

Abstract for 13791

Brief study of what high school students think about using technology tools in learning math and how they actually use them in learning math

Authors: Tae Young Ha

Affiliations: University of Hawaii, Kapolei High School, NCTM, PME

Keywords:

Topics: Implementation of Technology from K-12 Level, Mathematics Research with Technology, Technology and Curriculum Issues, Mathematics Teaching, Learning and Assessment using Technology

In this study, students' perceptions on using technology in learning mathematics were identified through questionnaire and interviews. Then their actual classroom

Abstract for 13811

Exploring Steiner's Porism with Cabri Geometry

Authors: Chien-Hsun Lu

Affiliations: Shing-Hua High School maintained by Miaoli County Government

Keywords:

Topics: Applications using Dynamic/Interactive Geometry or/and CAS

The purpose of this thesis is to explore Steiner's Porism by the software "Cabri Geometry". There are two discussions referring to inversion and Steiner's Porism. Definition, properties and applications of inversion are introduced in the first part and constructing Steiner Chain by inversion to explore Steiner's Porism is the second one. The contents of this thesis are also presented dynamically on the website by CabriJava which is a Java program developed by the Cabrilog company.

Abstract for 13902

Google Earth and Spherical Geometry

Authors: Hualun Li

Affiliations: Chung Hua University

Keywords:

Topics: Internet Technology for Mathematics

We investigated the relation between popular computer programs and geometry. On the educational level, we focus on tools like paintbrush in Microsoft windows and Google earth. We discovered these (somewhat easy) tools provide interesting links between theoretical mathematics and experimental world.

In this talk, these new ideas for teaching and learning geometry will be presented.

Abstract for 13994

Comparison Between Computer Supported Collaborative Learning and The Traditional Means in Learning Probability Concepts

Authors: Carmelita Ragasa

Affiliations: University of the East Manila, Philippine Normal University, MATHTED, Inc., Philippine E-Learning Society

Keywords:

Topics: Mathematics Education using Information & Communication Technology, Assessment of Implementation of Technology in Education, Mathematics Teaching, Learning and Assessment using Technology, Applications on Statistics with Technology

Abstract

This study is a quasi experimental research involving 35 students in the experimental group (taught probability concepts using CD-ROM) and eight students in the control group (taught same topics using the traditional method of teaching). The experimental group were sophomore students taking up Information Technology while the control group were mixture of different courses. The statistical tools used were the t test of the difference of means for dependent and independent correlated samples, descriptive statistics, and the regression analysis using spss 11.5 version. The following were the findings of the study. There is a significant difference between the mean of the achievement test of the pretest and the mean of the achievement test of the posttest in the experimental group. There is no significant difference between the mean of the pretest and the mean of the posttest of the achievement tests in the control group. There is no significant difference between the pretests of both the experimental and the control group. There is a significant difference between the posttests of the experimental and the control groups. The variables that are correlated significantly at the .05 level of significance are: high school mathematics grade and the college entrance test total; the high school general weighted average with the college entrance test total. The posttest is not correlated with any of the variables and neither is the pretest correlated with any of the variables. The predictors of the posttest achievement test are the pretest achievement, the high school mathematics grade, the high school general weighted average, the college entrance test in mathematics, the college entrance test total score.

Abstract for 15000

The Effect of "Cyber Home School" on Korean Students' Mathematics Achievement

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It has been noted in several international comparison studies on math achievement that Korean students demonstrate a high level of achievement. When the data is disaggregated, it shows that urban students are achieving at much higher rates than rural students. This significant difference between urban and rural students may result from an assortment of complex social factors associated with rural areas such as parents' relative indifference toward education, less competitive educational atmosphere, unfavorable working condition for teachers, poor educational surroundings, and insufficient instructional materials.

An understanding in Korea's education requires a thorough acknowledgement of the stance of out-of-school education within the overall educational framework of Korea. According to Kim, Yang, Kim & Lee(2001), 84.1% of Korean parents provide some form of shadow education for their children (primary 91.1%, middle school 81.5, high school 70.2%) and it has been reported that such phenomenon is only getting more severe and public education fees including college tuition in 2000 equaled 33.5 billion US\$, whereas out-of-school tutoring fees were calculated at 37 billion US\$. In effect parents in Korea are using approximately 10% of their income on their children's out-of-school tutoring fees.

Following the several reports and studies showing the significant differences in math achievement among rural and urban students and the social problem out-of-school tutoring fees have happened to parents, the Korean government proposed the plan to lessen the disparity of educational opportunities between rural and urban students and to reduce out-of-school tutoring fees of parents. One such government-sponsored program is “E-learning” or commonly known as ‘cyber home school’. The program targets low-income families throughout the country and provide them with a free computer, internet access, and cyber tutor.

For this study analyzes 'cyber home school' impact on mathematics achievement and mathematical disposition of Korean 8th grade students. The content focus for the study is Algebra, which is taken by all Korean students during the second year in middle school (8th grade). Generally, the course is tailored to students' different learning abilities. In particular, middle- and low-level achieving students have opportunities to review elementary algebra as needed, whereas high-level achieving students have experiences to deepen their knowledge and to think at higher mathematical levels. Students may change their levels of studying, but most students remain in designated achievement levels. The study of ‘cyber home school’ was conducted for two months with 20 middle school students from one middle school at one small city in Korea. Students were divided into three achievement groups (high, middle, and low level) by the results of a pre-test. Teachers confirm the process of student ability; manage on-line meetings and e-board discussions to promote two-way communications with students. Some of the students had difficulty using their computer at home, so they were given opportunities to use a computer at school before and after the class or lunchtime.

The post-test of mathematics achievement illustrated the degree of change resulting from the study. This study did a comparison analysis between 20 students who were exposed to the on-line learning environment and another 20 students of the same school who enrolled out-of-school programs and had a similar achievement level averagely to the level of experimental group in the pre-test of mathematics achievement.

This study suggests a powerful way for rural students or low-income brackets students who have insufficient educational opportunities to learn mathematics tailored to their levels, and provide an empirical foundation on how to promote substance of public education at small outlay.

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Chinese Presentations

Abstract for 12896

以知覺理論為基礎的數學數位教材設計原則

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Affiliations: Gung-Guan Junior High School, National Chiao-Tung University

Keywords:

數學課堂裡，教師將數學概念具象化為文字、圖像及口語等形式的訊息，透過各式的媒體傳達給學生。就學生的知覺歷程而言，上述訊息透過生理神經之感覺登錄為近側刺激；經由知覺組織形成知覺表象，再經辨識及操作形成其所理解的內部表徵。在此過程中，形成的知覺表象是否易於後續的辨識與操作是影響學習成效的關鍵之一，亦是教材設計上必須重視的課題。數學教材的設計，經常需要在單一畫面上將訊息切割重組，有組織、有彈性、有步驟的逐一呈現或互動呈現；使用教材時，亦須兼顧全班學生的差異性及進度的同步性。就上述課堂情境的觀察，以知覺理論為基礎，歸納數位教材設計的四面向原則：1.

在學生專注於理解訊息前，影響學生對訊息之初步理解的相關原則歸納為「基本安排面向」；2.

學生透過教材來觀察、學習時，就畫面上物件的變動與否，將教材呈現區分為「動態觀察面向」與「靜態觀察面向」；3.

課堂中師、生與教材三者間的互動，歸納為「師生互動面向」。初步觀察發現，妥善運用這些原則，可以降低雜訊之干擾，提升教材的品質，有效進行課程。

Abstract for 12904

數學數位教材設計之視覺原則

Authors: ChinFu Lee ; Ming Jang Chen

Affiliations: FuHo junior high school; National Chiao-Tung University

Keywords:

電腦的即時運算及立即回饋功能，給了數學教學上一種新的面貌，電腦也成為學習上一種新的利器。但是在強大的工具之下若無正確地掌握訊息的傳遞，一味地追求電腦所可產生的效果，只是將原本不易學習的內容變得更加地複雜。因此在從事電腦輔助教學之前，必需先要了解訊息的傳遞技巧，才不會將電腦所提供的功能作誤用。視覺設計領域已存在著一套可以掌握訊息傳播的方式，我們可以藉用視覺設計的理論，結合數學學習時資訊呈現的特性，發展出適合數學數位教材設計的視覺原則。

以視覺設計的眼光看待教材設計，大致上有下列幾個原則可遵守：(1)畫面構圖：有圖形與文字各成一區塊的兩欄式構圖，和圖形與文字結合的整合式構圖，這兩種構圖方式各有其適用的時機。(2)配色原則：以色相環作為選色的依據，處理畫面上物件的差異性或相同性。(3)造形元素：改變點、線的樣式，但也不能改變點、線給予觀察者的感覺；文字則是以適合閱讀為原則，避免擾亂觀察者的閱讀動線。(4)視覺引導策略：利用幾個方式抓住觀察者的目光，游標、標籤、線條、圖地原理、開關。(5)動態呈現策略：動畫的使用必須遵守下列幾個原則，與視覺同步、一次一個、隨機使用。

以上的原則提供作為設計數學教材時的參考，讓教材設計者在發揮電腦功能的同時，也能掌握觀察者的視線。如此在課堂授課時，數位教材成為師生互動的良好媒介，將原本複雜不易理解的內容變得淺顯易懂。相信這也是設計教材的當初所欲達到的目的。

Abstract for 12906

A Study of Using Mathematics Software, DERIVE, to Teach Polynomials in High School

Authors: Tsai-Hung Lee

Affiliations: High School

Keywords:

本研究的目的是使用數學軟體DERIVE應用於高中「多項函數的圖形」和「多項方程式」單元主題的教學，主要採行動研究的方式以了解高中學生對此試探性教學活動的看法與回饋，探究數學軟體DERIVE應用於高中數學教學之可行性。本研究以台北縣某完全中學8名高中一年級普通班學生為研究對象，依多項式之學習成就測驗前測的結果，將研究對象分為四組。前測階段8人同時進行二次共計110分鐘的電腦軟體教學課程，之後分組分次進行7小時的DERIVE教學活動，逐次地修正與調整教學活動，使教學模式能較佳化，在未來可作為大班教學的參考。藉由課堂觀察、學生電腦操作觀察、學習單、學生問卷、學生學習成就測驗以及訪談等資料之蒐集整理，來進行研究結果之分析。

研究結果發現在合適的學習單循序漸進引導下，DERIVE免除學生作單調繁雜的計算，讓學生有更多的時間去作數學思考；當抽象的數學變成可具體操作時，學生心中的解題策略在D

ERIVE的輔助下得以延續；DERIVE有別於傳統教室教學的呈現，除了給學生新鮮感，亦激發學生學習數學的興趣。以DERIVE來輔助教學的模式，學生反應可以適應、接受，並不會因此而分心，並依學生學習成就之前後測的整體結果及學生給予的回饋，研究者相信數學軟體DERIVE應用於輔助高中學生學習多項式是具可行性的。惟教師以DERIVE輔助教學時，對於教學環境的限制、軟體可能帶來的迷思概念等，應有相對的應變與調適。最後根據研究結果與發現，提出若干建議以作為教師改進與未來研究之參考。

Abstract for 12914

A Study of Using Mathematic Software, DERIVE, to Teach Inequality in a Vocational School

Authors: Yu-Ling Chen

Affiliations: High School

Keywords:

本研究主要是使用數學軟體DERIVE設計高職一年級學生學習不等式單元的數學科學習素材，並分析教師使用數學軟體DERIVE來進行不等式單元的教學活動後對學生學習的影響。本研究採單一組前後測準實驗設計，以新竹市某私立高職附設職業類科一年級學生86人為研究樣本。為檢驗學生在不同環境下的評量結果，將學生依前測分數進行S型分成A、B二組，其中A組學生在電腦教室進行後測，B組學生在一般教室進行後測。

本研究結果及發現如下：

1.

不論在電腦教室或一般教室進行評量，學生在接受DERIVE所設計的學習活動後，其後測成績均顯著高於前測成績。

2.

經逐題分析A、B兩組學生在後測的解題表現，顯示在電腦教室進行後測的學生已能嘗試使用DERIVE作為求解不等式的工具，因此在求解不等式的問題比在一般教室進行評量的學生表現較好，但對於圖形及不等式的解之間的聯結仍有不足，故兩組學生在此部分的解題表現並無顯著差異。

最後根據研究結果和發現，提出若干建議以做為教師教學改進與未來研究之參考。

Abstract for 12931

Examples of Designing High School Mathematics Teaching Elements through the Use of Adaptive Software EXCEL

Authors: Cheng-Feng Li

Affiliations: high school

Keywords:

高中數學教材內容包括代數、三角、幾何、組合數學、機率統計、微積分等範圍。目前常用於製作高中數學教學元件的軟體有GSP、Cabri、Cabri 3D、Excel、VBA、Maple、Mathematica、Visual Basic、MPS(Dynamic Math PowerPoint)、Flash、Java等類別。每一種軟體都有它獨特的功能與優勢，如果能夠將一個教材單元的內涵，根據它的特性，用最經濟、方便、有效、合適的軟體（單元適性化軟體）設計教學元件，以配合數學素材教學內容的呈現，將可達成最好的教學效果。

這個工作坊我將以Excel作為設計數學學習素材的工具，分享其應用實例。Excel具有計算、函數繪圖、處理演算法及遞迴關係等特性，而Excel VBA具有計算控制的功能。由這個工具可以發展的教學元件範例有：區隔式輾轉相除法、二元一次、三元一次整係數不定方程式的整數解、勘根定理高斯消去法、常態分配、信賴區間。期許未來教師能利用單元適性化軟體的優勢，呈現素材特點，希望本工作坊能帶動數學教師投入教學元件製作的興趣，並進一步提升數學教學效果。

Abstract for 12958

題目：在電腦套裝軟環境下經營數學探究之研究

Authors: Cheng-Hua Tsai

Affiliations: National Taichung First Senior High School

數學輔助軟體所具備的數學溝通與計算、動態呈現及操作-模擬-實驗等特性，為學生提供一個具有創新溝通及假設猜想的學習環境，是十分有利於學生的自主發現和樂於探索。因此，我們提出一個應用軟體輔助數學探索的模式--

「提出問題-探究活動-成果交流」，作為一種體驗學習，亦是一種快樂學習，更是一種研

究學習的基準。這樣的模式是以問題為主軸，透過數學軟體的輔助特性，藉以貫穿整個探索過程，並可作為指導學生進行數學探究或進行專題式教學的一個參考依據，讓學生在數學問題的探索過程中，不會被動地記憶或理解體會老師所講解的知識，而能敏銳地發現問題，主動地提出問題，積極地尋找解決問題的方法並能探知結果。