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| Conference | ATCM 2020 |
| Track | Full Papers |

All Abstracts

[Abstract for 21780](#)

Enhancing the Problem Solving Skills of Selected Grade 11 Students of Highway Hills Integrated School Through One Word Problem a Day (OWPaD)

Authors: [Reynaldo Jr Collado](#)

Affiliations: Highway Hills Integrated School, Department of Education-Schools Division Office of Mandaluyong

Problem solving is one of the major components in learning mathematics. It elicits learners' higher order and critical thinking skills. To be able to draw out a learner's potential and problem solving, one must provide a stable foundation of its basics. This study is about enhancing the problem solving skills of selected Grade 11 students of Highway Hills Integrated School through One Word Problem a Day (OWPaD). The study used 55 students who are under the class of the teacher-researcher. It employed the quasi-experimental design. A pre-test was conducted to determine the existing problem solving skills of the respondents. The scores obtained were used to determine the level of problem solving ability of the respondents ranging from poor (0%-58%), good (59%-79%) and satisfactory (80%-100%). This was used as the basis in conducting the day to day intervention for two months. OWPaD is an intervention designed to enhance the problem solving skills of learners by using the Law of Exercise and Learning by Doing Theory of Thorndike and Dewey respectively. Every day before the start of the lesson, the researcher gives a word problem for the students to solve. A post-test was done after 2 months of implementation. Results were tested at 0.05 alpha level of significance using a t-test which indicated that there was a significant difference between the means of pre-test and post-test scores of the respondents.

[Abstract for 21782](#)

Learning Action Cell as a School-Based Continuing Professional Development Program

Authors: [Ryan Jay Verbo](#)

Affiliations: Department of Education, Philippines, Schools Division Office Mandaluyong

ABSTRACT

The purpose of the conduct of this study entitle “Learning Action Cell (LAC) as a School-Based Continuing Professional Development” is to determine the effect of LAC to the content knowledge and instructional performance of the secondary mathematics public teachers in Mandaluyong. Mixed method design were used in the study. The researcher asked permission/approval to the Schools Division Office of Mandaluyong in utilizing the COT-RPMS (Appendix J.3) rating of the respondents as well as the copy of percentage of “Passed and Failed” of the students for 2nd Quarter and 3rd Quarter rating periods for School Year 2019-2020, respectively.

As revealed in the study the content knowledge and teaching ability of the teachers has improved after the conduct of LAC and it was validated during the observation of classes before and after the conduct of LAC. There is a significant difference on the teaching ability of the teachers before and after the conduct of LAC. Likewise, data shows that there was an increase in the over-all performance of the students before and after the LAC as reflected from the over-all mean grade of 82.79 (Approaching proficiency) and 87.52 (proficiency), respectively. This implies that LAC enhances the students’ performance.

The researcher conducted an interview among the teachers as to the challenges they encountered in the conduct of LAC. These constitute three challenges which were specified as follows: a) lack of preparation and professional development; b) excessive academic load for the students; and c) integration of lessons in real-life context.

[Abstract for 21783](#)

Model of e-Teaching and e-evaluation Methodology for Mathematics during COVID-19 Pandemic in Indonesia and Pakistan

Authors: [Faqir Bhatti](#), Dr. Eka Miranda

Affiliations: Riphah Institute of Computing and Applied Sciences, Information Systems Department, School of Information Systems Bina Nusantara University Indonesia

Abstract: Education is the key to escaping poverty and particularly Science education. To ensure equal access to education and to ensure students have access to continued learning during Covid-19 pandemic the government, public and private sectors need to design and deploy innovative solutions. This article looking at the problem and their solution during the Pandemic: (i) explain the problem on Higher Education (HE), (ii) explain recommendation of the HE problem and (ii) explain government response for continuous learning during the pandemic on HE level. The main aim of this paper is to focus on the higher education level in Indonesia and Pakistan about e-learning. Moreover, rubrics for both countries are given for evaluation the online examinations. The example course for discussion in this paper only focuses on Mathematics.

Keyword: Higher Education, Covid-19, Rubric, Indonesia, Pakistan

[Abstract for 21801](#)

Risk Prediction of Dengue Transmission using Artificial Neural Networks and Regression

Authors: [Leslie Chandrakantha](#)

Affiliations: John Jay College of Criminal Justice of CUNY

Dengue fever is fast emerging mosquito-borne viral disease with more than one third of the world's population is at stake. The objective of this paper is to predict the risk status (high or low) of dengue transmission based on climate factors using artificial neural networks and the logistic regression method. Previous studies have shown that climate factors influence dengue transmission. The rainfall, temperature, and relative humidity are considered as input for both models. The artificial neural networks possess the ability to identify complex relationships in data without any specific assumptions. Both models fared well and showed minimal false predictions.

[Abstract for 21802](#)

Connections between mathematics and digital technology in problem-solving: evidences of techno-mathematical fluency

Authors: [Hélia Jacinto](#), Susana Carreira

Affiliations: Institute of Education, University of Lisbon, University of Algarve, Faro, and UIDEF, Institute of Education, University of Lisbon, Lisbon, Portugal

In this paper we discuss the connections established between mathematical and technological knowledge that emerged from mathematical problem solving with digital technologies in a beyond school competition. We argue that mathematical problem solving with technologies is a synchronous activity of mathematization and expression of mathematical thinking, which leads to the emergence of conceptual models, and that the connections between mathematical and technological knowledge enhance the solving-and-expressing of the techno-mathematical solution of a problem. From an interpretative stance, we present the activity of a middle-school teenager working on a covariation problem and focus our analysis on the key aspects of the simultaneous use of mathematical facts and procedures and the digital tools she resorts to, in developing a conceptual model of the situation. We conclude that the resources available shape her mathematical thinking during problem-solving, that the connections established between these two types of knowledge open way to a progressive mathematization of the situation, allowing the production of a solution that displays a techno-mathematical discourse, which we explain expanding on the notion of techno-mathematical fluency.

[Abstract for 21806](#)

Web-based system for teachers to create teaching materials on a browser

Authors: [Takuya Kitamoto](#), Masataka Kaneko, Setsuo Takato

Affiliations: Yamaguchi University, Faculty of Pharmaceutical Science Toho University

Due to the influence of the new corona-virus, the need for ICT education in elementary schools, junior high schools, and high schools is increasing. Currently, the introduction of IT equipment such as personal computers and tablets is progressing in these schools.

However, to realize effective ICT education, software as well as hardware is also an essential element, and it is said that the software is not as complete as the hardware. Although there are some practical examples of ICT education, it is hard to say that it is being used in school education, mainly because of problems with cost and system flexibility.

In order to spread educational activities utilizing ICT, this paper proposes a web-based system that allows teachers of schools to create teaching materials on the browser.

Our system is able to create various teaching flexibly, and it is easy for school teachers to create their own materials including auxiliary teaching materials used in classes and E-learning teaching materials for exercises.

This paper gives some examples of creating teaching materials for class lessons.

This paper also presents a configuration example of a simple E-learning system using a computer algebra system.

[Abstract for 21808](#)

Teaching of the Graph Construction Techniques Using integer partitions

Authors: **Faqir Bhatti**, Iqra Zaman, Ms. Tabasum NAZ

Affiliations: Riphah Institute of Computing and Applied Sciences, Riphah Institute of Computing and Applied Sciences, Riphah International University, Lahore. Pakistan

In this paper, we give new ideas to construct graphs using Integer Partitions. Integer Partition is very useful area of Combinatorics and very fascinating for mathematicians. Integer partition is the study of integers by partitioning them into smaller integers. The graphs constructed in this paper are completely based on Integer Partitions and their graphical representations.

[Abstract for 21815](#)

Questioning The Unquestioned: How Primary School Teachers In Yogyakarta Perceive Calculator Use In Mathematics Lessons

Authors: **Russasmita Sri Padmi**, Wahid Yunianto

Affiliations: SEAMEO QITEP in Mathematics

The use of calculator in Indonesia is heavily stigmatized due to its allegedly detrimental effect on the students' learning. On the contrary, public education system in many developed countries has embraced calculator as part of educational technology, supported by myriad positive findings regarding its use in mathematics learning. Considering calculator is one of the most affordable and accessible options for educational technology, calculators can be a promising alternative to

introduce educational technology in developing country such as Indonesia. Therefore, changing the stigma is necessary, which can be made possible through appropriate intervention. This study investigated teachers' perception regarding the use of calculator in mathematics learning in primary school. Open-ended questionnaire was assigned to 30 primary school teachers' in Yogyakarta, followed by qualitative data analysis. The result suggests that calculator use in primary school mathematics classroom is not a common occurrence in Yogyakarta. Most teachers see calculators simply as calculating device and serve little educational benefit beyond that. The result is hoped to shed light on teachers' perception regarding calculator, in order to devise suitable and fruitful intervention in the future.

All Abstracts

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| Conference | ATCM 2020 |
| Track | Hands-on workshops |

[Abstract for 21773](#)

Fun with Drawings using TI-Nspire and flags of the world

Authors: **Raymond Rozen**

Affiliations: RMIT University, Jacaranda-Wiley

No not Sheldon Cooper, fun with TI-Nspire. The latest version V5.1 of TI-Nspire has intrinsic functions to draw and fill shapes. In this hands-on session we will use TI-Nspire to write programs to draw some of the flags of different countries of the world. Come along to this colourful activity and use coordinate geometry, STEM concepts and programming skills. Please bring along a TI-Nspire CX II CAS calculator, or your lap with TI-Npire V5.1.

[Abstract for 21844](#)

Creating Math Applications with Maple

Authors: **Paulina Chin**, Douglas Meade

Affiliations: Maplesoft, University of South Carolina

The Maple mathematics software package allows you to easily create and share interactive applications that take advantage of its natural math notation and extensive library. Examples of these can be found in the Maple Application Center, <https://www.maplesoft.com/applications>, and they are used in both educational and research contexts.

In this workshop, we will cover the following ics to help you generate your own applications:

- Authoring documents in Maple that include math and visualizations.
- Creating applications that include interactive components.
- A brief look at Maple's programming language and its mathematical and scientific library.
- Sharing your work in the Maple Cloud or the Maple Application Centre.

This workshop complements Prof. Meade and Dr. Chin's invited presentation, "Maple in the

Classroom: Strategies, Experiences and Lessons Learned", as it will explain how to build a number of the applications shown in that talk (though attendance at that event is not required). Some familiarity with Maple is helpful but not essential for this workshop.

All registrants will receive a limited-term license for Maple that they can use during and after the workshop.

All Abstracts

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Abstract for 21772

Surface roughness and deformation effect on the performance of hydromagnetic fluid based squeeze film on rough porous truncated Conical Plates

Authors: **RAKESH PATEL**, J. V. Adeshara, Hardik P. Patel, G. M. Deheri

Affiliations: DEPARTMENT OF MATHEMATICS, GUJARAT COLLEGE, AHMEDABAD - 380 006., GUJARAT, INDIA, VGEC, Ahmedabad, LJ College, Ahmedabad, S P Univ, Anand

This article has been study and analyze the effect of hydromagnetic fluid base squeeze film between rough spongy truncated conical plates by adopting and considering the effect of slip velocity and bearing deformation. By choice the various type of probability density function, the random roughness of the bearing surfaces is characterized by a stochastic random variable with nonzero mean, variance, and skewness. The associated stochastically averaged equation of Reynolds is solved with the help of suitable boundary conditions to obtain the pressure distribution in turn, which results in the calculation of the load-carrying capacity. The graphical and tabular representations indicate the transverse roughness. The graphical representations demonstrate that while the combined effect of bearing deformation and slip is fairly enhanced, the hydromagnetic fluid lubricant saves the situation to a limited extent. At least in the case of the negatively skewed roughness. The slip parameter should be maximized to improve overall bearing system performance. It is found that the semi-vertical angle and magnetization parameter combined effect are relatively better than that of the aspect ratio and porosity combined effect especially when variance (negative) is involved.

Abstract for 21787

DGS and CAS cooperation: doing old things better or doing better things?

Authors: Belen Ariño-Morera, Angelica Martinez-Zarzuelo, **Eugenio Roanes-Lozano**

Affiliations: Universidad Complutense de Madrid

The most popular educational programs are computer algebra systems (CAS) and dynamic geometry systems (DGS). But there is an implicit dichotomy concerning their educational roles.

On the one hand, CAS are nowadays generally considered a valuable tool, that should be part of

the students' skills, as it helps to perform some routine calculations in a symbolic, formally acceptable, way. Deciding whether it is more convenient finding by hand or by using a CAS the result of 123456×78910 or the expansion of the characteristic polynomial of a 5×5 matrix, does not seem to yield an educational earthquake. This is probably a consequence of the long experience in teaching with the help of calculators (for performing tedious numerical calculations).

On the other hand, concerning DGS, there are, since long ago, different and serious concerns about the negative influence of the visualization features of dynamic geometry systems, making students confused about the difference between "seeing" and "proving" geometric facts and eliminating their interest in developing any creative geometric thinking for proving rigorously geometric statements. In short: DGS might induce in students a kind of WYSIWYG (the well known acronym of "What You See Is What You Get") attitude.

Already back in 2001 the third author detailed in a plenary lecture at ICTMT-5 the need for cooperation between DGS and CAS. In the past twenty years this dream has been achieved in different ways, through external cooperation or by including CAS capabilities in the DGS. The latter is now offered by DGS such as GeoGebra and Geometry Expressions.

"GeoGebra Automated Reasoning Tools" (GG-ART) has gone one step beyond and is able to develop and present mathematically reliable (as CAS operations) automated proving tools for geometric properties (visualized in a DGS style). The educational impact of the dichotomy mentioned above is particularly difficult to deal with in the case of these DGS with CAS features. And this worry especially concerns the use of GG-ART.

In our presentation we will make a call to the education community on the urgency and the need to develop some firm ideas about how to handle this dichotomy. In particular, we will sketch and exemplify our ideas in this respect, summarizing reports on some experiments that have been conducted on different groups of Secondary School math teacher in their initial training, concerning the epistemic impact of handling GG-ART by these young, digital native, future math teachers.

Perhaps, as J. Kaput said long ago, the key point could be planning how to use different levels of technology (CAS & DGS in this case) to do (old) things better (approaching classic geometric statements with the use of GG-ART as an omniscient tutor, answering our partial conjectures and thus helping us to build our own proof), not neglecting, simultaneously, to do better things (formulating different creative geometric tasks that cannot be solved directly by GG-ART).

[Abstract for 21789](#)

Transferring mathematics lessons into their homes through the novel tools of GeoGebra Notes

Authors: **Robert Weinhandl**, Zsolt Lavicza, Markus Hohenwarter, Melanie Tomaschko

Affiliations: Johannes Kepler Universität, Johannes Kepler Universität, Linz, Österreich

Based on our research and related data collection and analysis of teacher and student feedback, interactive ePortfolio software could be a promising extension of mathematics learning environments. Extending mathematics learning environments in that way could be particularly beneficial in individual or self-learning phases, as was the case with COVID-19 conditional school closures. In our talk, we will present special features, possible implementations and related experiences as well as potentials for further development of GeoGebra Notes. GeoGebra Notes is a specific application of the mathematics software package GeoGebra and was developed initially as a whiteboard-software (Hohenwarter & Hofstätter, 2017). By using GeoGebra Notes, teachers or other users should be able to combine different features of standard whiteboard-software, such as handwriting, with mathematical specific applications like computer algebra systems (CAS) or dynamic geometry software (DGS). Furthermore, GeoGebra Notes enables integrating web pages, audio files or videos to connect presented materials with real-world situations or problems. However, GeoGebra Notes can not only be used as whiteboard-software but also operates in any standard browser, which significantly increases the scope of application of GeoGebra Notes.

Especially in the time of COVID-19-related school closures, the high potential of GeoGebra Notes as a teacher, but also as a student-software became obvious. In our GeoGebra Notes educational study in the school year 2019/2020, which was continued during the COVID-19 school closures, it became apparent that using GeoGebra Notes could improve the teaching and learning of mathematics in general and this applies especially to the time of homeschooling or distance learning. Using GeoGebra Notes as teacher software at the beginning of homeschooling facilitated the abrupt transition from classroom teaching to distance learning for many students in our study. One of the reasons for this facilitation for students was that a familiar blackboard layout, including specific features such as teacher handwriting, could be provided via a browser. In addition to the familiar layout, using GeoGebra Notes also contributed to interactively presenting new mathematical concepts by implementing teacher-developed DGS applications. Implementation of audio or video files created by teachers explained the specifics of the mathematical content as well as how to use GeoGebra Notes. This audio or audio-visual meta-information was highlighted as particularly helpful by the students of our study. However, GeoGebra Notes can not only be used as teacher software but can also be implemented to facilitate students in developing and presenting new mathematical skills. In our study, students developed ePortfolios on different mathematical topics, such as trigonometric functions (see figure). By using GeoGebra Notes, these ePortfolios could be designed dynamically and interactively by the students, and by embedding videos or other web pages directly into the ePortfolio, the mathematical content could be linked to real-world situations. Especially the interactive and dynamic aspect of GeoGebra Notes could contribute to a further development of the ePortfolio concept. According to Carl & Strydom (2017), a distinctive feature of ePortfolios is, among other things, that using photos, videos or other ICT tools should improve the process of creating, presenting and reflecting on learning achievements. The interactivity and dynamics of GeoGebra Notes, for example, that formulas or equations used in a text could also be linked to the CAS or DGS, could contribute to improving reflection on new mathematical concepts and their real-world applications.

Although the current features of GeoGebra Notes already enrich the learning and teaching of mathematics, further development and improvement of the software could bring further opportunities and benefits to both students and teachers. In autumn 2020, GeoGebra Notes will be extended concerning using spreadsheet functions and the associated creation of interactive

diagrams. The extension of GeoGebra Notes should also enable users to create mind maps and thus facilitate structuring and presenting ideas or new knowledge. In addition to creating mind maps, the integration of a recording function in GeoGebra Notes could make it easier for teachers or lecturers to present new concepts. Besides, producing learning videos directly with GeoGebra Notes, live streaming of lessons with GeoGebra Notes, or a multi-user functionality of GeoGebra Notes could enrich the teaching and learning of mathematics which is planned for autumn 2020 as well.

References

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[Abstract for 21791](#)

Outdoor STEAM integrated framework in elementary schools in Luxemburg using MathCityMap and GeoGebra 3D Calculator

Authors: **Ben Haas**, Yves Kreis

Affiliations: Johannes Kepler University Linz, University of Luxemburg

In elementary schools in Luxemburg, sciences and mathematics are generally taught in class based essentially on textbooks. However, the findings of multiple studies on understanding and applying skills in STEAM (Science, Technology, Engineering, Arts and Mathematics) report that students need hands-on activities on real-world objects. Furthermore, in times of the COVID-19 pandemic, where numerous restrictions and risks dominate teaching inside the classroom, outdoor learning is safer and offers many opportunities. Hence, we created outdoor mathematical trails with a STEAM integrated approach for elementary schools using the free educational software MathCityMap and the dynamic mathematics software GeoGebra 3D. In these outdoor trails, students used a set of promising technologies, i.e. AR (Augmented Reality) or GPS, to support STEAM education. Based on results from our first study on outdoor mathematical trails in June 2020 (in review), we developed and evaluated a framework on outdoor STEAM integrated teaching. This framework was used for further outdoor task and trail creations in elementary schools, which we investigated by conducting semi-structured interviews with students and teachers. Hence, we will present how this framework was used in elementary schools to create outdoor mathematical trails and describe how it affected the students' learning

[Abstract for 21792](#)

Use of silent video tasks in the mathematics classroom

Authors: **Bjarnheiður Kristinsdóttir**, Zsolt Lavicza, Freyja Hreinsdóttir

Affiliations: University of Iceland School of Education, Johannes Kepler University Linz, Austria

Starting with an innovative idea from mathematics teachers and teacher educators in a Nordic-Baltic collaboration project, Bea has designed and developed silent video tasks and their instructional sequence within a design-based research project in Iceland.

Silent videos are ½-2 minutes long animated video clips, showing mathematics dynamically without sound or text. In a silent video task, students get to add their voice-over to a silent video, either by creating a screen recording or by recording a sound file. First, the teacher chooses a silent video displaying some previously studied mathematical ic and shows it to the whole class. Next, students get assigned into pairs to view the video as often as they want whilst they prepare and record their voice-over to the video. Students are free to choose what they include in their voice-over, but one can expect some explanations, descriptions, or narratives. All students' responses to the task get listened to and reflected on in a whole group discussion. Teachers can highlight some shared knowledge present in students' responses. Also, ics such as precision in language use and misunderstandings can be addressed and discussed.

Results from the design-based research study indicate that silent video tasks can be used for formative assessment. Teachers can gain insight into students understanding and students get an opportunity to share and become aware of their own knowledge about the mathematical ic shown in the video. Furthermore, it was observed that during implementation of the silent video task, students would participate in the discussion and talk about mathematics with their peers. This was also the case in classrooms where students normally worked silently and individually on problems from their textbooks and were not used to participating in discussions about mathematics.

[Abstract for 21798](#)

Training pre-service teachers in real life STEM education

Authors: [Piedad Tolmos](#), Ana Cid, Rocío Guede, Arcadio Sotto

Affiliations: Universidad Rey Juan carlos, Universidad Rey Juan Carlos

Taking contact with the real world is essential in order to have a good mathematical education, as well as a full STEM training. Students need to experiment, to touch, to see with their eyes where are the mathematics around. In order to assure the best learning process for our students, pre-service teachers must have also the best training.

Based on previous studies we present an experience using MathCityMap with the students of the Master in Training Teachers on Secondary Education level. In a way of active learning, are the pre-service teachers themselves who prepare the activity to hypothetical scholars, so that they will be capable to repeat it in the future with their real students.

As part of their training process, pre-service teachers had to develop not only the complete guide to the mathematical trial, but also the mathematical objective of the activity, how they will evaluate the experience, the possible mistakes made by the students and how to help them, and measures of attention to diversity. In addition, with the goal of providing a STEM framework, they were able to include some signs of real problems that children might see along the way. Finally, both to prepare the activity previously in the classroom, and for subsequent

mathematical work, Geogebra will be used.

This experience is part of a set of activities developed by our research group Gie STEM with the objective of improving the training in STEM education of pre-service teachers, both in the master's studies, the degree in primary education, and the degree in early childhood education.

Abstract for 21811

PROMOTING LEARNER ENGAGEMENT IN A MATHEMATICS CLASSROOM

Authors: **Matshidiso Moleko**, Prof Percy Sepeng

Affiliations: University of the Free State, SACE, Central university of Technology, SACE, AMESA

Engaging learners in the learning process increases their attention, motivates them to practice higher-level critical thinking skills, and promotes meaningful learning experiences. Using the learner engagement theory, the study sought to explore how learner engagement could be promoted in a mathematics classroom. Teaching that is not centred around learner engagement principles makes it hard for learners to develop conceptual understanding and to demonstrate an in-depth understanding of the mathematical concepts. Six mathematics teachers participated in this study. Data in this qualitative case study were collected using open-ended questionnaires, free attitude interview and later analysed through thematic analysis technique. In response to the research question: how can learner engagement in a mathematics classroom be promoted? four approaches were considered investigated. i, removing unnecessary learning barriers ii, tapping into learners' prior knowledge iii, integrating modern technology and vi, providing authentic, specific, and frequent feedback. The study shows that successful learner engagement depends on the removal of learning barriers, eliciting prior knowledge, integrating technology into the teaching of mathematics as well as providing frequent feedback. The study thus suggests the need for teachers to consider these approaches in order to strive to promote learner engagement so to provide meaningful learning experiences.

learner engagement, mathematics classroom, meaningful learning experience

Abstract for 21818

Discovering Architecture for Mathematics Learning through Digital Fabrication and GeoGebra

Authors: **Kristof Fenyvesi**, Kyeongsik Choi, Natalija Budinski, Shereen El Bedewy, Eva Ulbrich, Julia Handl, Zsolt Lavicza

Affiliations: University of Jyväskylä, Sejong Academy of Science and Arts, Petro Kuzmjak school, Serbia, Johannes Kepler University, Linz

Architecture is among those ics, which has a multitude of connections to both mathematics and culture. In this presentation, we introduce innovative mathematics education practices, focusing on different mathematical connections in architecture, and employing digital fabrication to create tangible tools for mathematics learning. Digital fabrication in the mathematics classroom has

opened new perspectives for providing engaging, collaborative, and creative problem-solving activities based on real life. Connecting 3D-printing, physical manipulatives (e.g., building blocks), and GeoGebra in mathematics learning offer several opportunities to promote creativity, critical thinking, teamwork, ICT skills as part of transversal competence development. Digital fabrication can efficiently support introducing the STEAM approach in the mathematics class by connecting mathematics learning to applications in various fields, such as technology, engineering, arts, and design. Implementing these complex links in mathematics education can get a new impulse by employing both digital and physical modeling in the learning process. The presentation will include examples of mathematics classroom practices designed for students in different age groups.

Abstract for 21819

Web-browser based STEM learning activities with JSXGraph

Authors: Pekka Alestalo, Roman Hašek, Marc Bernat Martinez, Igor Pesek, **Alfred Wassermann**
Affiliations: University of Bayreuth, Aalto University, Finland, University of South Bohemia in České Budějovice, Czech Republic, BonNouEdu. La Vila Joiosa, Spain, University of Maribor, Slovenia

We will present examples for STEM learning activities for High School and higher education based on the open source JavaScript library JSXGraph (<https://jsxgraph.org>) and the moodle plug-ins Formulas and STACK.

These examples are developed in the European ERASMUS+ project ITEMS (Improving tools for E-assessment in Maths and Science, <https://itemspro.eu>).

JSXGraph offers a wide variety of mathematical visualizations, including interactive geometry, function plotting, symbolic derivatives, splines, various curve types and animations, see <https://jsxgraph.org/wiki> for examples.

From a technical point of view, JSXGraph merely takes 160 kByte to load and offers a tight integration into web pages. It is used in a wide variety of elearning platforms, like moodle, ilias, WIMS to name a few. The JSXGraph filter for the popular elearning platform moodle (<https://moodle.org>) allows inclusion of JSXGraph material into moodle learning activities.

Together with the plug-ins Formulas or STACK, randomized questions are possible. The project Abacus (<https://abacus.aalto.fi/>) is a huge source for STACK material, including many JSXGraph based questions.

The new handbook on programming JSXGraph (<https://ipesek.github.io/jsxgraphbook/>) enables a gentle introduction to creating JSXGraph applications.

Abstract for 21828

Teaching Math Remotely

Authors: **Karishma Punwani**
Affiliations: Maplesoft

Teaching Math Remotely

By: Karishma Punwani, Director of Product Management

Teachers and students around the world have been suddenly faced with the need to teach and learn math without a classroom. This is a challenging task, but Maplesoft can help. Maplesoft offers a variety of tools and services that support remote learning of math and math-based courses. Learn how the Maple Calculator, Maple Learn and Maple work together to help students solve and visualize math problems, check their homework, and explore mathematical concepts. In this presentation you will see how these tools work together and the resources that are available to support learning.

[Abstract for 21831](#)

Simple Augmented Reality (AR) for Elementary School Mathematics

Authors: [Dee Jean Ong](#)

Affiliations: International College Suan Sunandha Rajabhat University, Thailand

Augmented Reality in education is relatively new but developing rapidly. AR is a live direct or indirect view of a physical, real-world environment whose elements are augmented (or supplemented) by computer-generated sensory input. This work shows how AR is used for the development of a simple Mathematic concept for elementary school children. These activities can arouse curiosity as well as develop interest and better understanding of the concept of Mathematics. The AR materials are in the form of flash cards. The users have to use application software “Augment” to scan the flash cards to view the numbers appearing in 3D from the flash cards.

Keywords

Augmented Reality, 3D, flashcards, elementary school mathematics, mathematics education

[Abstract for 21837](#)

An accurate time measurement of short interval using an electronic RC-charging circuit

Authors: [Janchai Yingprayoon](#)

Affiliations: International College, Suan Sunandha Rajabhat University

Janchai YINGPRAYOON

janchai.yi@ssru.ac.th

International College,

Suan Sunandha Rajabhat University, Bangkok,

THAILAND

Abstract: Some experiments need to do in a short span of time. It is not possible to measure the

time manually using a normal swatch. Some can be done by using a highspeed photography. There is another way of a measurement of short time accurately by the help of an electronic RC-charging circuit. The time measurement starts by charging a capacitor C through a resistor R. The voltage across a capacitor, V_c is an exponential function of time t with the constant values of R, C and a constant voltage supply V_s of the circuit. The voltage across a capacitor C can be measured by using a datalogger with high sampling rate. The voltage charging across capacitor V_c is very fast and the charging time t can be calculated from the equation $V_c = V_s \cdot (1 - \exp(-t/RC))$. This time measurement can be applied to a freefalling object experiment in order to calculate the acceleration due to gravity, g.

Keyword: Capacitor, RC- Charging circuit, freefalling object, gravity

[Abstract for 21839](#)

THE EFFECTS OF INQUIRY-BASED LEARNING ON STUDENTS' ACHIEVEMENT AND MATH ANXIETY

Authors: **Nutcharun Yanakit**

Affiliations: Master of Education International College, Suan Sunandha Rajabhat University

This study was classroom action research. The purposes of this research were: 1) to enhance students' achievement by using inquiry-based learning and 2) to investigate the effect of inquiry-based learning on levels of students' math anxiety. This classroom action research used Stringer's model: look, think, act. The participants were thirty-one grade 12 students who enrolled in the first semester of the academic year 2019 at a secondary school in Bangkok, Thailand. Research instruments consisted of eight lesson plans for twelve periods in the 'Limits and continuity of functions' ic, pretest, posttest, and student's math anxiety questionnaire. Data were collected regarding students' pretest and posttest scores and students' responses in math anxiety questionnaire.

The results of this action research indicated that: 1) the effectiveness concerning for students' achievement after being instructed had an Effectiveness Index (E.I.) score of 0.7689 which means that the students can be developed 76.89% from the beginning and 2) student opinions towards the instruction that affect their math anxiety in learning mathematics were at 'Very high anxiety' (6.45%), 'High anxiety' (25.81%), 'Low anxiety' (48.39%) and 'Very low anxiety' (19.35%).

[Abstract for 21841](#)

THE DEVELOPMENT OF GRADE 11 STUDENTS' MATHEMATICAL ACHIEVEMENT AND REASONING ON THE EXPONENT IC BY USING QUESTIONING TECHNIQUES

Authors: **Borwonnun Daokrajang**

Affiliations: International College, Suan Sunandha Rajabhat University

Reasoning skill is one important mathematical skill, which teachers need to find the effective strategies to foster this skill and promote students' achievement in learning mathematics. The purposes of this classroom action research were (1) to develop students' mathematical achievement of Grade 11 students who have been taught by using questioning techniques on the exponent ic; and (2) to investigate students' hierarchy of mathematical reasoning. There were 31 Grade 11 students (N=31) selected by cluster random sampling from one class of four classes (121 students) of practicum school in Bangkok. Research instruments were 6 lesson plans on learning exponent ic, pretest-posttest, and formative test.

The results of this action research showed that (1) the students' achievement development by using questioning techniques for mathematical reasoning after being instructed had an effectiveness with respect to effectiveness index (E.I.) score of 0.6676 which means the achievement of students was increased from the previous knowledge by 0.6676 or 66.76%; and (2) students' hierarchy of mathematical reasoning after the instruction helped them in learning mathematics logically and reasoning at 'Basic Reasoning' and 'Critical Reasoning' with level 4-Superior. For further study, it can be helpful to apply questioning techniques to develop students' hierarchy of mathematical reasoning with other ics.

Abstract for 21842

Exploring the successfulness of a blended online training program to promote math teachers to create online lessons

Authors: Chaweewan Kaewsaiha, **Pongrapee Kaewsaiha**

Affiliations: Digital International Business Program, SSRU, Associate Professor in Mathematics Education Program, SSRUIC

This study aims to explore the success of a blended online training program to promote math teachers to create online lessons. This study used the design-based research method. The sample consisted of 156 junior high school math teachers from 10 educational districts in Thailand using stratified sampling. The training consists of 3 phases, starting from designing the lessons that meet online learning requirements following the instructions from the manuals and resources provided on the website. The next step is introductory and preliminary feedback regarding the Pedagogy, Content, and Knowledge (PCK) given via live streaming and Technological Knowledge (TK) given via videoconference. In the third phase, participants joined the on-site workshops for additional training. In the end, qualified lessons have been published on the Massive Open Online Course (MOOC) platform created for this project. Gathering information related to PCK and TK showed that teachers created online lessons using different techniques. The lessons are accurately presented and are engaging. Moreover, interviews and satisfaction questionnaires revealed that the produced online lessons are useful in real-world situations, such as teaching and learning during the COVID-19 epidemic. However, the lessons produced did not cover all the ics specified in the Basic Education Core Curriculum in mathematics.

Abstract for 21845

Enhancing Students' Achievement and Investigating Students' Satisfaction in Learning Mathematics by Using Flipped Classroom

Authors: **Chalongrat Khaolok**

Affiliations: International college, Suan Sunandha Rajabhat University

The objectives of this classroom action research were to enhance students' mathematical achievement and to survey students' satisfaction in learning by using flipped classroom. The participants were 32 grade 11 students who enrolled in the second semester of the academic year 2019 at a secondary school in Bangkok, Thailand. The ic used in this study was Vectors in Three Dimensions. The instruments were 7 lesson plans using flipped classroom. Before class, students studied online learning through video clips, work sheets, exercises, and tests. During class, students discussed the contents that they had studied from home, solved harder problems, and getting individual help from teacher. Learning lasted 14 periods with 50 minutes in each period. There were three cycles of action plan. Data were collected from pretest, posttest, and satisfaction survey. Data were analyzed by using Effectiveness Index (E.I.), mean, percentage, mode, and standard deviation. The results showed that: 1) the Effectiveness Index (E.I.) of the class was 0.8017 which revealed that students' scores were increased 80.17 percent from the beginning and 2) students' satisfactions towards understanding, learning management, and learning atmosphere by using flipped classroom were at very satisfied, satisfied, and satisfied, respectively.

Abstract for 21846

Online Learning and Augmented Reality: Enhancing Students Learn Transformation Geometry During the Covid-19 Pandemic

Authors: **Krongthong Khairiree**

Affiliations: International College, Suan Sunandha Rajabhat University

The purpose of this study aims to explore the students' perceptions of online learning self-study on Transformation Geometry using augmented reality, via smartphone. In the 2020, action research was conducted in Bangkok, Thailand. The total of 20 Lower Secondary students participated in this study. The duration of the action research was about two months from June to July 2020 during the Covid-19 pandemic in Thailand. The students had self-study through online learning lesson and used smart phone to scan QR Code Reader to explore Transformation Geometry: Translation, Reflection and Rotation animations and activities. Based on the students' interviews they revealed that they studied through online learning incorporated with augmented reality they were able to visualize contents in a textbook. Augmented reality animated content of Transformation Geometry and it made the concepts easier to learn and retain. However, more than 50% of the students revealed that they wanted to study in the normal classroom and used augmented reality in mathematics class.

Abstract for 21851

THE PREDICTIVE VALIDITY OF THE CONTEMPORARY TEACHING APPROACHES IN MATHEMATICS

Authors: **Mailyn Tumanan**

Affiliations: Andres Bonifacio Integrated School

This study was conducted to determine the Predictive Validity of the Contemporary Teaching Approaches in Mathematics which include the development of the instructional learning kit, its application, refinement, and evaluation. Evaluation was done using the performance of the Grade Seven students of (ABIS) Andres Bonifacio Integrated School in Mandaluyong City in selected ics in geometry. The respondents were the Grade Seven students of Andres Bonifacio Integrated School. A sample random was used to select a respondent. A total of 100 students were included in the study, 44 boys and 56 girls. All data were interpreted and computed with the use of the Statistical Package for Social Sciences (SPSS) version 20 and PH Statistics. Based on the findings of the study, the researchers arrived at the following Conclusions:(1.) The performance of the students in the selected ics in geometry are closely towards mastery of the subject. (2.) There is no significant difference in the performance of the students in the selected ics in geometry using the contemporary approaches in learning mathematics. (3.) The math-lab approach is the identified indicator among the teaching approaches of the teachers which match the knowledge and skills of the students. (4.) Student's role is to adopt the contemporary approaches of teaching and learning process in mathematics. Mastery of the lessons is better to the students. (5.) Carefully prepared learning kits in teaching ics in mathematics rouse the interest in the potential of learners and usefulness in education.

[Abstract for 21852](#)

CASIO FX-9800GII GRAPHING CALCULATOR AS A TEACHING TOOL IN STATISTICS AND PROBABILITY FOR GRADE 11

Authors: **KARL GADWIN DELA CRUZ**

Affiliations: Jose Rizal University, Ilaya Barangka Integrated School

ABSTRACT

The purpose of this study is to examine the effectiveness of Casio FX-9800GII graphing calculator as a teaching tool in solving real-life problems in different disciplines involving normal distribution in Statistics and Probability for grade 11 students.

The sample of the study involved two selected groups from four classes in Ilaya Barangka Integrated School, Division of Mandaluyong. Students in the experimental group received an instruction using graphing calculator while the control group students underwent the traditional chalk and talk method without the graphing technology. Instrument was used in this study is the real-life problems in different disciplines involving normal distribution with 25-item test. Findings of this study show existence of a significant difference in the mean scores between the two groups; students who used graphing calculator performed better compared to students without access to graphing calculator. This study is pertinent as it investigates a different approach in teaching real-life problems in different disciplines involving normal distribution while integrating the latest graphing calculator technology in the lessons.