

TSG 24

The role and the use of technology in the teaching and learning of mathematics at primary level

The Organizing Team

Cochairs:

George Gadanidis, Canada, Western University
Sitti Patahuddin, Australia, University of Canberra

Team Member:

Jiaxia Liu, China, Beijing Institute of Education

Conformed contributions: 5 long papers, 2 short papers, 2 posters

Session 1 – 90 min [Tuesday, July 13 at 7:30 – 9pm UTC+ 8]

1. 10 min – Patahuddin (welcome, introductions, TSG themes and structure)
2. 15 min – Applegate (home-school connections; texting)
3. 15 min – Shaikh (computer-mediated sharing)
4. 10 min – discussion
5. 15 min – Yi (digital games; fractions) → will be presented by the co-author: Kwan Eu Leong
6. 10 min – Patahuddin (web-based resources; framework; fractions)
7. 10 min – discussion

Session 2 – 90 min [Friday, July 16 at 9:30 – 11pm UTC+8]

1. 15 min – Leung (coding; computing and mathematical thinking)
2. 15 min – Gadanidis (apps; computational modelling)
3. 10 min – discussion
4. 10 min – Goto (tablet computers; textbooks)
5. 10 min – Babette Moeller (Building computational thinking (CT) readiness – POSTER)
6. 10 min – Qian Liu (exploring the use of digital platforms) – POSTER
7. 10 min – discussion

Session 3 – 120 min [Saturday, July 17 at 2:30 – 4:30pm UTC+ 8]

1. 15 min – Gadanidis (Ontario, Canada case study: is technology changing the mathematics taught/learned?)
2. 45 min – (presentations to be announced)
3. 30 min – discussion

Confirmed presentations:

EFFECTIVENESS OF DIGITAL GAME-BASED LEARNING (DGBL) IN ENHANCING FRACTION SKILLS AMONG PRIMARY FOUR PUPILS

Jia Yi Boo & Kwan Eu Leong

This paper presents the effectiveness of using the digital game-based learning (DGBL) in enhancing the fraction skills among Primary Four pupils. A quasi-experimental research design was conducted. Pretest and posttest were given to the experimental and control groups. The experimental group under the intervention using the Zap Zap Maths Apps as digital game-based learning which is designed based on Cognitive Information Processing Theory and Gagnes Conditional Theory. The intervention for experimental group was conducted for 6 lessons in six weeks to complete whole the lessons. The control group was taught using the traditional approach. The result from a non-parametric test, Mann-Whitney U test showed that there was a significant difference existed in the post fraction skills test between the experimental and control groups. In conclusion, the pupils fraction skills results improved using the DGBL. Implementing teaching and learning fraction skills using DGBL would help pupils explore concepts, knowledge and test their understanding. This would support pupils cognitive thinking level where teachers facilitate the pupils to develop their knowledge towards fraction more effectively.

ELPSA FRAMEWORK USES IN DESIGNING LESSONS WITH WEB-BASED RESOURCES: A CASE OF EQUIVALENT FRACTIONS

Sitti Patahuddin, Jonathan Adam

Research suggests that childrens performance is enhanced when they learn mathematics with web-based resources. Yet, the identification of quality and engaging online resources for classroom use is a notable challenge. This paper describes the use of the ELPSA (ExperienceLanguagePictorialSymbolicApplication) framework to assess web-based resources and to design learning experiences on equivalent fractions. The key word equivalent fractions was used to identify various sources, including links mandated by curricula, educational institutions and published papers. This study shows the implementation of ELPSA as a framework for assessing the abundance of web-based mathematics resources and highlights the pedagogical implications of using them to teach equivalent fractions.

USING MATHEMATICALLY-FOCUSED TEXT MESSAGES TO CONNECT FAMILIES WITH THEIR CHILDS LEARNING

Mollie Helen Appelgate, Christa DeAnn Jackson, Kari Nicole Jurgenson

Home-school partnerships and communication are critical for the educational growth and development in young children. Mathematically-focused text messaging is a promising way to better communicate with parents about what their child is learning in mathematics class, and ways to build on the mathematical topic at home. Parent focus groups were held to gather information on parents use and perspectives of the mathematically-focused texts. Parents expressed they appreciated receiving the text messages because it helped them feel more connected with what their child was learning at school, and the texts increased mathematical communication with their child at home.

Impact of Computer-Mediated Sharing on Classroom Activities

Rafikh Rashid Shaikh, Harita Raval, Harshit Agrawal, Nagarjuna Gadiraju

Many teaching-learning applications have a computer-mediated sharing feature and it is important that we study its role in the teaching-learning process in detail. The present study, which is a part of the larger study, probes the impact of the computer-mediated sharing feature on classroom activities. 45 students who belonged to a 4th-grade classroom were divided into two groups. One group has worked on a version of a digital game where each student played with the computer individually, whereas another group has worked on the version where a group of students played with each other mediated by networked computers. One classroom session from each setting was video recorded and analyzed. In this paper, we present the findings of the video analysis.

COMPUTATIONAL MODELLING IN GRADES 1-3 MATHEMATICS

George Gadanidis, Janette Hughes, Immaculate Namukasa, Ricardo Scucuglia

In our work in primary classrooms, we have been designing, developing and using topic-specific **computational environments** to engage young children with **dynamic modelling of mathematics** concepts and relationships. In this paper we briefly share and discuss the design and application of two such environments, one focusing on repeating patterns with visual and aural attributes, and another focusing on symmetry and transformation, where a symmetry is defined as a transformation that leaves an object looking unchanged. While we continue to use more generic computational environments, such as Scratch, we find that they have limitations for certain mathematical modelling purposes (for example, Scratch does not provide coding blocks for performing reflections of shapes). The focus of our work is unique in two ways: (1) unlike the current trend to teach young children coding, our primary focus is on engaging young children with mathematics + coding with minimal prerequisite knowledge of coding; and (2) in contrast to the current focus on computational thinking, our aim is to shift attention to computational modelling.

CODING IN ELEMENTARY MATHEMATICS LESSONS

K M Leung, P Y Tang

Identifying and adopting diversified teaching strategies to facilitate students mathematical learning has been teachers and researchers longstanding concern. A growing number of studies and reports all over the world refer to the importance of integrating Science, Technology, Engineering and Mathematics (STEM), in order to meet the increasing challenges of the 21st Century. STEM education can be an innovative way of learning and teaching mathematics, particularly on how **coding** can be implemented in the elementary classrooms. This paper reports the experiences of teachers and students in Hong Kong elementary mathematics classrooms in the course of how using tasks related to coding to enhance students **computing and mathematical thinking**. The focus of this report will be put on students learning progress and the teachers experience gained in the Study.

PROPOSAL ON HOW TO USE DIGITAL TEXTBOOKS AT PRIMARY LEVEL AND RESEARCH DIRECTIONS

MANABU GOTO

Since the launch of Apple's iPad in 2010, expectations for **tablet computers** (TPC) have increased in education. Unlike conventional desktop and laptop computers (PCs), the TPC is a plate-like 5-10 inch display. TPCs can input characters by pressing a displayed key with a finger or a touch pen or by sliding a finger. There are also built-in microphones and cameras at two locations, front and back, for taking still images and videos. In addition, TPCs can be connected to the Internet, and can be used for browsing and websites, SNS, etc., just like a conventional PC. Taking a picture using the built-in camera, writing an impression in the classroom while looking at it, shooting a video of a presentation scene in a group and discussing possible improvements, projecting a child's handset screen on a large presentation device to show it to other students; the learning environment in classrooms has changed greatly, and TPCs allow teachers to think of new learning processes. In this study, we propose how to use **digital textbooks** in mathematics education and present a direction for research.

Posters:

EXPLORING THE USE OF DIGITAL PLATFORMS IN SUPPORTING DIALOGUE IN PRIMARY MATHEMATICS CLASSROOMS

Qian Liu

BUILDING COMPUTATIONAL THINKING (CT) READINESS: A SELF-ASSESSMENT FRAMEWORK AND TOOLS FOR INTEGRATING CT IN PRIMARY MATH CLASSROOMS

Heather Sherwood, Babette Moeller, Cheri Fancsali, Maya Israel