



Workshop on

“Enhancing Teaching and Learning of Mathematics through Problem Solving: Developing Mathematical Reasoning, Conceptual Understanding and Procedural Fluency in an Enquiry Environment”

8 & 9 August 2022

SEAMEO RECSAM, Penang, Malaysia

Facilitator:

Mr. Gan Teck Hock

Mathematics Education Specialist

SEAMEO RECSAM

Target Participants:

Primary / Secondary Mathematics Teachers and Teacher Educators

Organised by:

Southeast Asian Ministers of Education Organization
Regional Centre for Education in Science and Mathematics

www.recsam.edu.my

Rationale

In this challenging era of human civilization, developing reasoning competencies among students has always been a major goal of teaching school Mathematics. However, the path to achieve the goal still remain as a big challenge for many teachers. In this endurance, isolated and meaningless learning on procedures relying purely on rote memorization has also appeared to be a road block in achieving the goal. Hence, it is crucial for mathematics teachers to nurture inquisitive mindsets that lean towards understanding mathematical content knowledge conceptually. This will in turn lead to mathematical mindsets that are capable of interpreting natural phenomena harmoniously and discover the orders that ruled the world. In view of this, the workshop focuses on revealing the process of developing conceptual understanding in mathematics that will eventually leads to procedural fluency and mathematical reasoning.

About the Workshop

This workshop will look at Teaching through Problem Solving¹ (TTP), a highly-effective approach from the Japanese's mathematics classrooms. It highlights a key philosophy of "*students learn for themselves and by themselves*" that molded majority of the Japanese mathematics teachers' pedagogical practices. Its training methodology relies mainly on the impactful experiential-learning practices in teacher education, where participants will take part in ample hands-on problem-solving activities that gear towards the development of reasoning competencies in an enquiry environment. These experiences will then be used as the basis for reflection on effective resources and pedagogies to enhance reasoning, conceptual understanding and procedural fluency in their own mathematics classrooms. Ultimately, this workshop will build up participants' capacities in designing appropriate TTP tasks for their own mathematics classrooms. Last but not least, the issue of individual differences will also be discussed in the workshop to address the needs of differentiated learning among students with diversified background.

Objectives

Participants will be able to enhance their instructional capacities in:

- developing computational fluency, conceptual understanding and mathematical reasoning;
- identifying key features of a TTP lesson in mathematics;
- designing a mathematics lesson based on the TTP approach; and
- supporting diversified learners in a TTP lesson.

Programme Schedule

Time	Activity
Day 1 (8 August 2022, Monday)	
0800 – 0815	Registration
0815 – 0830	Briefing
0830 – 1030	Reasoning, Conceptual Understanding and Content Knowledge in Mathematics <ul style="list-style-type: none">• Overview of Mathematical Reasoning and Conceptual Understanding in Mathematics• Connecting Reasoning and Conceptual Understanding with Content Knowledge in Mathematics• Promoting Mathematical Reasoning Through Problem Solving
1030 – 1100	Group Photo & MORNING TEA

¹ Takahashi, A. (2021). *Teaching mathematics through problem-solving. A pedagogical approach from Japan*. New York, NY: Routledge.

1100 – 1300	Problem Solving in Mathematics <ul style="list-style-type: none"> • Overview of Problem Solving in the Learning of Mathematics • Promoting Conceptual Understanding Through Problem Solving • Developing Procedural Fluency from Conceptual Understanding in Mathematics
1300 – 1430	LUNCH
1430 – 1630	Teaching Through Problem Solving (TTP): Plug-N-Use Approach <ul style="list-style-type: none"> • Case Study on Number Operations • Promoting Reasoning Through Sequencing of Learning Tasks
Day 2 (9 August 2022, Tuesday)	
0830 – 1030	TTP: The Japanese 5-Step Structured Approach <ul style="list-style-type: none"> • Exemplar Lesson Demonstration • Best Practices in Teaching Mathematics from Japanese Classrooms: <i>Kyozaikenkyu, Neriage, Bansho</i>
1030 – 1100	MORNING TEA
1100 – 1300	Developing Problem Task for TTP <ul style="list-style-type: none"> • Designing Problem Tasks & Preparing Anticipated Students' Solutions in Small Groups • Presentation of Group Works • Debriefing on TTP
1300 – 1430	LUNCH
1430 – 1600	Supporting Diversified Learners in TTP <ul style="list-style-type: none"> • Solving Mathematical Problems in an Enquiry Environment • Differentiated Enquiry: Fulfilling Diversified Learners' Needs in TTP
1600 – 1630	Q & A Session Evaluation Closing & Certificate Presentation Ceremony

Note. This programme schedule may be subjected to changes without prior notice.

Workshop Facilitator



Mr. Gan Teck Hock is a specialist for Mathematics Education at SEAMEO RECSAM, Penang, Malaysia. Before joining RECSAM, he had taught Mathematics for 6 years in schools and trained both pre-service and in-service mathematics teachers for 30 years in Teacher Education Institute, Malaysia. In the journey as a mathematics educator, his passion has been centred at creative pedagogy for mathematics classrooms especially in the areas of (a) problem solving, (b) mathematical reasoning, (c) constructivist's teaching, (d) cooperative learning, (e) indigenous pedagogy, (f) enquiry learning, (g) STEM education, (h) Literacy & Numeracy Screening (LINUS), and (i) Content & Language Integrated Learning (CLIL) for PPSMI programme. Additionally, he had developed and written more than 50 books, training modules and journal articles in these areas in the English language and Bahasa Malaysia. His latest publications are two books titled *Mathematics Challenges for Classroom Practices at the Lower Primary Level* and *the Lower Secondary Level* which focus on problem tasks emulating the Japanese textbook approach for teaching and learning of Mathematics.

Participation Fees

Type 1: RM 200.00 per participant (Without Accommodation)

Type 2: RM 255.00 per participant (Twin Sharing)

Type 3: RM 305.00 per participant (Single Occupancy)

Accommodation at RECSAM International House

Check-in: 7 August 2022, 2.00 p.m. onwards

Check-out: 9 August 2022, after the workshop

Food

Morning tea & lunch will be provided by SEAMEO RECSAM during the workshop sessions.

For stay-in participants (Type 2 & Type 3), breakfast will be provided too.

Registration, Payment & Closing Date

To enroll, please register and pay online by **1 August 2022** via shorturl.at/fhnE2 or scan the following QR code. Upload your payment slip for confirmation of registration.



Payment (Internet Banking)

Pay to: SEAMEO RECSAM

Bank: MAYBANK GELUGOR BRANCH, PENANG

Account Number: 5571 5700 0647

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