ด่วนที่สุด

ที่ ศธ ๐๔๐๑๐ / ว ๑๙๑๖

สำนักงานคณะกรรมการการศึกษาขั้นพื้นฐาน
กระทรวงศึกษาธิการ กทม. ๑๐๓๐๐

๑ กรกฎาคม ๒๕๖๔

เรื่อง ทุนฝึกอบรมของศูนย์ SEAMEO RECSAM ประจำปี ๒๕๖๔/๒๕๖๕ รุ่นที่ ๑ และ ๒

เรียน ผู้อำนวยการสำนักงานเขตพื้นที่การศึกษาประถมศึกษา ทุกเขต

สิ่งที่ส่งมาด้วย ๑. รายละเอียดทุนฝึกอบรม จำนวน ๑ ฉบับ
๒. ใบสมัคร จำนวน ๑ ฉบับ

ด้วย สำนักความสัมพันธ์ต่างประเทศ สำนักงานปลัดกระทรวงศึกษาธิการแจ้งว่าศูนย์ระดับภูมิภาคว่าด้วยการศึกษาวิทยาศาสตร์และคณิตศาสตร์ของซีมีโอ (SEAMEO Regional Centre for Education in Science and Mathematics: SEMEO RECSAM) ประเทศมาเลเซีย ได้แจ้งให้ทุนฝึกอบรมแก่ประเทศไทย ประจำปี ๒๕๖๔/๒๕๖๕ รุ่นที่ ๑ และ ๒ ในรูปแบบออนไลน์ จำนวน ๔ หลักสูตร รายละเอียด ดังนี้

๑. ทุนฝึกอบรมประจำปี ๒๕๖๔/๒๕๖๕ รุ่นที่ ๑ จำนวน ๒ หลักสูตร อบรมระหว่างวันที่ ๒ – ๒๗ สิงหาคม ๒๕๖๔

๑.๑ หลักสูตร RC-PS-146-1 : Enhancing Primary Science Education through Professional Learning Community Engaging in Classroom-based Research จำนวน ๒ ทุน โดยผู้เข้าอบรมควรเป็นครูวิทยาศาสตร์ระดับประถมศึกษา หรือนักการศึกษาด้านวิทยาศาสตร์ซึ่งรับผิดชอบเกี่ยวกับการสอนวิทยาศาสตร์ระดับประถมศึกษา

๑.๒ หลักสูตร RC-PM-146-2 : Developing Conceptual Understanding in Primary Mathematics through Standard-based Curriculum and Best Pedagogical Practices จำนวน ๒ ทุน โดยผู้เข้าอบรมควรเป็นครูคณิตศาสตร์ระดับประถมศึกษา หรือนักการศึกษาด้านคณิตศาสตร์ซึ่งรับผิดชอบเกี่ยวกับการสอนคณิตศาสตร์ระดับประถมศึกษา

๒. ทุนฝึกอบรมประจำปี ๒๕๖๔/๒๕๖๕ รุ่นที่ ๒ จำนวน ๒ หลักสูตร อบรมระหว่างวันที่ ๔ – ๒๙ เมษายน ๒๕๖๕

๒.๑ หลักสูตร RC-SS-146-3 : Integrating Digital Technologies and Web-Resources in Secondary Science Education จำนวน ๑ ทุน โดยผู้เข้าอบรมควรเป็นครูวิทยาศาสตร์/ครูผู้สอนด้านเทคโนโลยีสารสนเทศและการสื่อสารระดับมัธยมศึกษา ผู้บริหารสถานศึกษา หรือนักการศึกษาด้านวิทยาศาสตร์/เทคโนโลยีสารสนเทศและการสื่อสาร ซึ่งรับผิดชอบเกี่ยวกับการสอนวิทยาศาสตร์ระดับมัธยมศึกษา

๒.๒ หลักสูตร RC-SM-146-4 : Developing Secondary Students' Mathematical Thinking through Problem Solving จำนวน ๑ ทุน โดยผู้เข้าอบรมควรเป็นครูคณิตศาสตร์ระดับมัธยมศึกษา หรือนักการศึกษาด้านคณิตศาสตร์ ซึ่งรับผิดชอบเกี่ยวกับการสอนคณิตศาสตร์ระดับมัธยมศึกษา

ในการนี้ ขอให้สำนักงานเขตพื้นที่การศึกษาประถมศึกษา คัดเลือกผู้มีคุณสมบัติเหมาะสมเพื่อเข้ารับทุนฝึกอบรมหลักสูตรที่ ๑.๑, ๑.๒, ๒.๑ และ ๒.๒ หลักสูตรละ ๑ คน พร้อมทั้งส่งใบสมัครและเอกสารที่เกี่ยวข้องเป็นภาษาอังกฤษ (สำเนาหนังสือรับรองการสำเร็จการศึกษาระดับปริญญา และประกาศนียบัตรรับรองผ่านการอบรมหลักสูตรต่าง ๆ) ส่งทางไปรษณีย์อิเล็กทรอนิกส์ giftedobec072@gmail.com พร้อมทั้งส่งเอกสารต้นฉบับ

/ทางไปรษณีย์ ...

ทางไปรษณีย์ไปที่กลุ่มพัฒนาการศึกษาสำหรับผู้มีความสามารถพิเศษ สำนักวิชาการและมาตรฐานการศึกษา อาคาร สพฐ. ๓ ชั้น ๗ สำนักงานคณะกรรมการการศึกษาขั้นพื้นฐาน กระทรวงศึกษาธิการ ถนนราชดำเนินนอก เขตดุสิต กรุงเทพมหานคร ๑๐๓๐๐ โดยหลักสูตรที่ ๑.๑ และ ๑.๒ ให้ส่งภายในวันที่ ๖ กรกฎาคม ๒๕๖๔ หลักสูตรที่ ๒.๑ และ ๒.๒ ให้ส่งภายในวันที่ ๑ ตุลาคม ๒๕๖๔ เพื่อรับการพิจารณาคัดเลือกและเสนอชื่อไปยังสำนักความสัมพันธ์ต่างประเทศ สำนักงานปลัดกระทรวงศึกษาธิการ สำหรับหลักสูตรที่ ๑.๑ และ ๑.๒ ภายในวันที่ ๗ กรกฎาคม ๒๕๖๔ หลักสูตรที่ ๒.๑ และ ๒.๒ ภายในวันที่ ๑๐ ตุลาคม ๒๕๖๔ ต่อไป

จึงเรียนมาเพื่อทราบและดำเนินการต่อไป

ขอแสดงความนับถือ

(นายกวินทร์เกียรติ นนธ์พละ)
รองเลขาธิการคณะกรรมการการศึกษาขั้นพื้นฐาน ปฏิบัติราชการแทน
เลขาธิการคณะกรรมการการศึกษาขั้นพื้นฐาน

สำนักวิชาการและมาตรฐานการศึกษา
โทร. ๐ ๒๒๘๘ ๕๗๗๒

คำอธิบายการกรอกข้อมูลในใบสมัคร
ทุนฝึกอบรมของศูนย์ SEAMEO RECSAM

- <u>ในส่วนหน้าที่ ๒๐</u> : - กรุณากรอกข้อมูลในข้อที่ ๖ – ๘ และเซ็นชื่อผู้สมัครตรงเฉพาะข้อความที่เขียนว่า **Signature of Applicant/Participant**
ทั้งนี้ ในส่วนข้อมูลอื่น ๆ ได้แก่ Date, Signature & Name of Official on behalf of Minister of Education ให้เว้นว่างไว้

กลุ่มความร่วมมือระดับภูมิภาค
สำนักความสัมพันธ์ต่างประเทศ
สำนักงานปลัดกระทรวงศึกษาธิการ
๒๓ มิถุนายน ๒๕๖๔

REGULAR COURSES

FOR FISCAL YEAR 2021/2022

SEAMEO RECSAM, PENANG, MALAYSIA

BATCH 1 2 - 27 AUGUST 2021

BATCH 2 4 - 29 APRIL 2022

COURSE INFORMATION BOOKLET

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COURSE CODE, TITLE AND DATE

REGULAR COURSES FOR FISCAL YEAR 2021/2022 (BATCH 1): 2-27 AUGUST 2021

Course Code	Course Title	Date	No. of Scholarships/ Country
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RC-PM-146-2	Developing Conceptual Understanding in Primary Mathematics through Standard-based Curriculum and Best Pedagogical Practices		2

REGULAR COURSES FOR FISCAL YEAR 2021/2022 (BATCH 2): 4-29 APRIL 2022

Course Code	Course Title	Date	No. of Scholarships Offered per Country
RC-SS-146-3	Integrating Digital Technologies and Web-Resources in Secondary Science Education	4–15 April 2022 (Online classes) & 18–29 April 2022 (Online project supervision)	2
RC-SM-146-4	Developing Secondary Students' Mathematical Thinking through Problem Solving		2

IMPORTANT DATES

Date	Action
Batch 1: 15 July 2021 Batch 2: 10 January 2022	DEADLINE to receive nominations from Ministries of Education
Batch 1: 20 July 2021 Batch 2: 20 January 2022	Notification of acceptance to successful applicants (via email) ***Please ensure email ID provided in participation form are valid.***

SOUTHEAST ASIAN MINISTERS OF EDUCATION ORGANIZATION
REGIONAL CENTRE FOR EDUCATION IN SCIENCE AND MATHEMATICS
Jalan Sultan Azlan Shah, 11700 Gelugor, Penang, Malaysia
Telephone: 604-6522700 Fax: 604-6522737
Website: http://www.recsam.edu.my/

1.0 QUALIFICATIONS

1.1 The **qualifications** required for the course participants are described in the annexures of different courses (refer to item 4.0). Please follow required qualifications strictly in your selection of participants. This would maximise impact of the courses and the nominated participants are expected to carry out multiplier effect training upon completion of the course.

1.2 Completed application form and other relevant documents of the nominated candidates must be sent to SEAMEO RECSAM by the **DEADLINE as stipulated in page 3**. OR, a list of the names of potential nominees with the certified copy of their qualifications in Science/Mathematics must be sent.

1.3 For selection purposes, Ministries of Education are encouraged to nominate at least **THREE CANDIDATES** for each course and SEAMEO RECSAM will only shortlist **TWO CANDIDATES** for each course. SEAMEO RECSAM has the right to reject candidates that do not match the requirement of the course. Please notify us if your country is unable to fill the number of the scholarships specified. The vacant places may be offered to other member countries.

1.4 All participants must have at least a moderate knowledge of written and spoken English.

2.0 GENERAL INFORMATION

2.1 Class Schedule

Participants are required to attend all classes via online as scheduled below:

Monday - Friday: 10.00am – 12.00pm & 2.00pm – 4.00pm / Malaysia Time (GMT+8)

3.0 PARTICIPANTS FROM SEAMEO MEMBER COUNTRIES ON FEE-PAYING BASIS

The following are conditions for participants from SEAMEO Member Countries on fee-paying basis:

i. They will also follow the requirements of the programme;
ii. They pay a minimum course fee. (For further enquiries, kindly write to Director, SEAMEO RECSAM, Jalan Sultan Azlan Shah, 11700 Gelugor, Penang, Malaysia, or email director@recsam.edu.my; Fax: +604-6522737).

4.0 COURSE DESCRIPTION

4.1 Course Code: RC-PS-146-1

Course Title: ENHANCING PRIMARY SCIENCE EDUCATION THROUGH PROFESSIONAL LEARNING COMMUNITY (PLC) ENGAGING IN CLASSROOM-BASED RESEARCH

Introduction:

The notion of professional learning community (PLC) in school is to embrace teachers in professional development that can improve pupil learning. This seems to be a widely accepted postulation, based, perhaps on 'empirical consensuses' that PLC as a vehicle for 'teacher learning' practice would attribute to better classroom instruction and enhanced pupil achievement. Hence forth, the more the effectiveness of PLC, there would have more positive impact associating with pupil success. This course is to expose participants with various pedagogical strategies, focusing on the classroom-based research of promoting sustainable capacity building in teacher professional development.

Rationale:

A PLC in a school is usually made up a small group of teachers who practice collaborative learning with their colleagues to foster professional development on improving pupil learning. PLC requires its members to focus on professional learning rather than teaching. This platform ensures contributions from everyone by engaging collectively to undertake activities and reflection in order to improve pupils' achievement. The effectiveness of PLC lies in shared values and vision coupled with mutual trust, respect and support among its members (Bolam, et al. 2005). The practical implications for developing an effective PLC should look beyond daily classroom teaching routines. This means, teachers should observe, reflect, and analyse their daily lessons to meet the ultimate goal of improving the quality of teaching, serving the needs of pupils, and enhance better learning. Bearing in mind that every teaching situation is unique: what works well in one class may be completely ineffective, or even counterproductive, for a different group of learners (Kostoulas & Lammerer, 2015). As responsible teachers we have to try to find out more about the teaching contexts in which we work. Hence, it is certainly appropriate to regard teachers as researchers.

Naturally, embracing classroom-based research would be most appropriate way to find out what works best in our classrooms, so that we might improve our practice in making learning more effective for the benefit of our pupils. With the establishment of PLC, teachers work collaboratively, to carry out the systematic study in learning about themselves, their learners and the classes they teach. Findings would be grounded on data rather than teacher reflection, and certainly considerably less abstract than the kind of research carried out by academia. The strength of the findings generated by classroom-based research are more personally relevant to teachers, and of much more direct practical impact (Kostoulas & Lammerer, 2015).

Objectives:

The aim of this course is to provide participants with the knowledge and skills required to conduct classroom-based research within the reign of professional learning community (PLC) in their own schools to enhance primary science teaching and learning.

Upon completion of the course, participants will be able to:

1. narrate the current trends and issues in teaching and learning of primary science;
2. relate some strategies or approaches to enhance the teaching and learning of primary science;
3. describe the basic procedures for conducting classroom-based educational research, such as action research, case study and lesson study;
4. implement classroom-based educational research methods to enquire the effectiveness of instructional practices for improving teaching and learning of primary science;
5. apply simple qualitative or/and quantitative techniques for data analysis gathered from classroom-based research; and
6. plan, design, implement, analyse and make conclusion collaboratively on a primary classroom-based research study.

Course Contents:

This course focuses on methodology of practical implementation of a classroom-based research inquiry in promoting teacher professional development leading to enhancing pupil learning. Participants are expected to engage actively and collaboratively in course activities and discussions, as well as fostering team work in designing and carrying out a small-scale classroom-based research study. The knowledge and skills acquired would enable them to initiate classroom-based research and form PLC for improving primary science classroom instructional practices in their respective schools upon returning to their own countries.

The major areas in the Core Components include:

1. Primary Science Education
   - 1.1 Trends and Issues in 21st Century Primary Science Education
   - 1.2 Selected Strategies/Approaches in Teaching and Learning of Primary Science
     - Inquiry-based learning (IBL)
     - Problem-based learning
     - Project-based learning
     - Outdoor science learning
     - Using ICT (digital tools & web-based resources) to enhance learning in primary science
     - Questioning techniques
   - 1.3 Assessment *as, for* and *of* Learning in the Science Classrooms

2. Introduction to Classroom-based Research Methodologies
   - 2.1 Nature and Elements of Educational Research
   - 2.2 Types of Research: Qualitative, Quantitative and Mixed-mode Research
   - 2.3 Examples of classroom-based research on teaching and learning of primary science

3. Workshop on a Classroom-based Research on Primary Science Education
   - 3.1 Probing deeper into a specific classroom-based research on teaching and learning of primary science
   - 3.2 Workshop on the classroom-based research may be in the form of an action research, lesson study or case study.

4. Data Analysis and Interpretation
    4.1 Qualitative data analysis and interpretation
        4.1.1 Methods of qualitative data collection: observation, interviews, field notes, reports, audio and video materials, etc.
        4.1.2 Techniques in qualitative data analysis: to describe, summarise, discover patterns, present, explore
    4.2 Quantitative data analysis
        4.2.1 Introduction Descriptive Statistics and Inferential Statistics
        4.2.2 Exposure to Software Programmes/Statistical Packages (e.g. EXCEL, SPSS) for Data Analysis

5. Professional Learning Community
    5.1 Teachers as Researchers
    5.2 What, Why and How: Establishing PLC

6. Theory into Practice: Implementing a small-scale Classroom-based Research
    6.1 Research Question and Design
    6.2 Data Collection and Analysis
    6.3 Interpretation, Conclusion and Report Writing

Duration: Four weeks

Participants: Science Educators or Key Primary Science Teachers

English Proficiency: Able to communicate in English

Expected Output: 1. Project Work Report
2. Individual Multiplier Effect Action Plan

References:

Bolam, R., McMahon, A., Stoll, L., Thomas, S., & Wallace, M., Greenwood, A., Hawkey, K., Ingram, M., Atkinson, A., & Smith, M. (2005). Creating and Sustaining Effective Professional Learning Communities, *DfES Research Report RR637*, University of Bristol. Retrieved from http://www.lcll.org.uk/uploads/3/0/9/3/3093873/plc_source_materials_summary.pdf

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DuFour, R. (2004). *Schools as learning communities*. Educational Leadership 61-8 (p.6-11). Retrieved from http://www.ascd.org/publications/educational-leadership/may04/vol61/num08/What-Is-a-Professional-Learning-Community%C2%A2.aspx

Gay, L.R. Mills, G.E. & Airasian, P. (2012). *Educational research competencies for analysis and applications* (10th edition). Boston: Pearson

Hard, S.M., Roussin, J.L. & Sommers W.A. (2010). *Guiding professional learning communities : inspiration challenge surprise, and meaning*. U.K.: Corwin

Kanageswari, S.S.S. & Lee, S.M. (2017). Barriers of implementing action research among Malaysian teachers. Pertanika J. Soc. Sci. & Hum. 25 (4): 1651 - 1666 (2017). ISSN: 0128-7702 © Universiti Putra Malaysia Press

Kostaulas, A. & Lammeter, A. (2015). *Classroom-based research materials created for ELT Connect 2015*. Craz: University of Craz

Lee, S.M. (2010). *Strengthening Collaborative Efforts between CRICED University of Tsukuba and SEAMEO RECSAM for Uplifting Science Education in Developing Countries through South-South Cooperation*, in South-South Cooperation of SEAMEO RECSAM A Program Report by Visiting Foreign Research Fellows No. 22. Japan: CRICED, University of Tsukuba

Lee, S.M.& Oyao, S.G. (2013). Establishing Learning Communities among science teachers through lesson study. *Journal of Science and Mathematics Education in Southeast Asia*, Vol.36 No.1, 1-22. Malaysia: SEAMEO RECSAM

4.2 Course Code: RC-PM-146-2

Course Title: DEVELOPING CONCEPTUAL UNDERSTANDING IN PRIMARY MATHEMATICS THROUGH STANDARD-BASED CURRICULUM AND BEST PEDAGOGICAL PRACTICES

Introduction:

The 21st century is a globalization era characterized by transformation. The world is experiencing rapid transformations from the old to the new; from the traditional to the contemporary; and eventually from the known to the unknown. As a response to the call for transformation, future workforce need to have the courage to face the unknown and the wisdom to generate solutions to problems that are still unknown at the present. This imply that schools need to function as "an incubator for talent, rather than a factory to mass produce knowledge workers" (Welsh, 2018).

Rationale:

School mathematics curriculum reforms have been accelerated worldwide since the arrival of the 21st century (NCTM, 1989; NCTM, 2000; Council of Chief State School Officers, 2009; SEAMEO RECSAM, 2017). One crucial aim of these reforms is to develop school mathematics programmes that could nurture school graduates who are able to apply mathematics successfully when dealing with challenges in their workplace. In the ASEAN region, a Common Core Learning Standards (CCRLS) in Mathematics had been developed as a guide to establish quality curriculum and best instructional practices for school mathematics (SEAMEO RECSAM, 2017).

Major instructional shifts are expected in these reforms. From the angle of teaching, teachers are expected to develop classroom pedagogies that will shift their roles from being a provider of information to a facilitator of learning. From the learning perspective, students are expected to be able to make sense of the mathematics learnt. When sense making is carefully integrated with the contents of mathematics, students will developed deep understanding that will enable them to apply mathematics flexibly (NCTM, 2009). In view of this, 21st-century mathematics teachers not only need to have a good grasp of pedagogical competencies, they also need to have a deeper level of understanding in the mathematics contents to be taught to their students (Nolan, Dixon, Safi & Haciomeroglu, 2016). Deep level of understanding is closely related to big ideas in mathematic which is defined as "an idea that is central to the learning of mathematics, one that links numerous mathematical understanding into a coherent whole" (Charles, 2005 cited in Yeo & Toh, 2019). Thus, the focuses of this course are: (a) essential features of a coherent mathematics curriculum, (b) conceptual understanding of the big ideas of some key strands in primary mathematics, and (c) best pedagogical practices in helping primary students develop a deep level of understanding in mathematics.

Objective:

By and large, this course intends to equip the participants with the necessary knowledge, skills and competencies required to design, implement, evaluate and improve a mathematics curriculum which promotes conceptual understanding in mathematics at the primary classroom level.

At the end of the course, the participants should be able to:

1. gain understanding of the development of standard-based curriculum in mathematics;
2. gain a better insight of their own country mathematics curriculum by comparing it with the SEA-BES Common Core Regional Learning Standards in Mathematics;

3. gain a deeper understanding of the big ideas in primary mathematics;
4. develop the competencies of teaching primary mathematics towards conceptual understanding;
5. assess the process and product of learning primary mathematics towards conceptual understanding; and
6. collaboratively plan, implement and evaluate a lesson on teaching primary mathematics towards conceptual understanding.

Course Contents:

This course will provide ample opportunities for participants to study the curriculum and pedagogical practices of mathematics at the primary school level. It will also allow the participants to compare mathematics curricula of the ASEAN region with reference to the SEA-BES Common Core Regional Learning Standards in Mathematics. A brief introduction to assessment based on both process and product (Danielson & Marquez, 2016) will also be presented to the participants.

The major areas of course contents include:

1. Mathematics Curriculum Reform in the 21st Century
   - 1.1 Standard-Based Curriculum in Mathematics
     - 1.1.1 Rationales for Standard-Based Curriculum
     - 1.1.2 Criticisms on Standard-Based Curriculum
   - 1.2 Prominent Influences on Standard-Based Curriculum in Mathematics
     - 1.2.1 National Council of Teachers of Mathematics (NCTM) Principles and Standards for School Mathematics
     - 1.2.2 Common Core State Standards for Mathematical Practice
   - 1.3 SEAMEO Basic Education Standards (SEA-BES): Common Core Regional Learning Standards (CCLRS) in Mathematics
     - 1.3.1 Aims of SEA-BES CCLRS in Mathematics and Its Framework
     - 1.3.2 Strands of Mathematics Contents in Key Stages 1 and 2
     - 1.3.2 Comparative Study on School Mathematics Curricula of ASEAN Countries
     - 1.3.3 Comparing School Mathematics Curricula of ASEAN Countries with SEA-BES CCLRS in Mathematics
   - 1.4 Essential Elements of 21st-Century Curriculum in Mathematics
     - 1.4.1 Mathematical Contents
     - 1.4.2 Mathematical Thinking and Processes
     - 1.4.3 Mathematical Values, Attitudes and Habits for Human Character

2. Best Pedagogical Practices in Teaching Towards Conceptual Understanding in SEA-BES CCLRS Key Stages 1 & 2 Mathematics Contents
   - 2.1 Identifying Big Ideas in each strand for Key Stages 1 & 2
   - 2.2 Making Connections Between Big Ideas in each strand for Key Stages 1 & 2
   - 2.3 Teaching Towards Big Ideas in each strand for Key Stages 1 & 2

3. Assessing the Process and Product of Conceptual Learning in Mathematics
   - 3.1 Performance Assessment
   - 3.2 Assessment Tools and Techniques

4. Theory into Practice: Planning, Implementing, Evaluating and Improving a Lesson on Teaching Primary Mathematics towards Conceptual Understanding.

Duration: Four weeks

Participants: Mathematics Educators or Key Primary Mathematics Teachers

English Proficiency: Able to communicate in English

Expected Output: 1. Project Work Report
2. Individual Multiplier Effect Action Plan

References:

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Council of Chief State School Officers. (2009). *Common core state standards for mathematics*. Retrieved from https://www.nctm.org/ccssm/

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Yeo, J. B. W. & Toh, T. L. (2019). Big ideas in mathematics. In Toh, T. L. & Yeo, J. B. W. (Eds.), *Big Ideas in Mathematics. Year Book 2019 Association of Mathematics Educators*, pp.1-10, Singapore: World Scientific.

4.3 Course Code: RC-SS-146-3

Course Title: INTEGRATING DIGITAL TECHNOLOGIES AND WEB-RESOURCES IN SECONDARY SCIENCE EDUCATION

Introduction:

Technology continually affects almost every area of our lives, resulting in constant shifts across all segments of our society which include the digital technology in education. In recent years digital technology and resources have transformed the way in which science education is conducted. Integration of digital technology in science teaching and learning can be taken to mean digital processing systems to enhance active learning, knowledge construction, inquiry, exploration, and remote communication between teachers and learners (Lang, Craig and Casey, 2016).

Rationale:

Integrating technology into classroom instruction means more than teaching basic computer skills and software programs in a separate computer class. Effective technology integration must happen across the curriculum in ways that research shows deepen and enhance the learning process (Ferrari, 2012). In particular, it must support four key components of learning: active engagement, participation in groups, frequent interaction and feedback, and connection to real-world context.

Technology helps to change the student/teacher roles and relationships: students take responsibility for their learning outcomes, while teachers become guides and facilitators. Technology lends itself as the multidimensional tool that assists teaching and learning process (Wegerif, 2012). However, proper technology integration guides students towards greater understanding of all concepts covered in science class (McLeod, 2015).

As new and emerging digital technologies transform the landscape of education, the possibilities for learning and discovery grow exponentially. The integration of technology in secondary science teaching is still challenging for most teachers in secondary school, even though there has been a historical growth of Internet access and available educational technology tools in schools. Many secondary science teachers have not incorporated technology into their teaching for various reasons, such as lack of knowledge of technology, time, support, and policy.

Today's classrooms are increasingly faced with technologically savvy students, and teachers must utilize 21st century knowledge, strategies, and skills that create an effective and motivational learning environment. Therefore, integration of digital technology should be optimised in order to provide a good science instruction and also to maximise the outcomes of science learning.

Objective:

The main objective of this course is to provide participants opportunities to integrate digital technology and resources to enhance science pedagogical content knowledge and skills.

Upon completion of this course, participants will be able to:
1. acquire knowledge on types of digital tools and web-resources;
2. develop skills in using digital tools to enhance teaching and learning in secondary science;
3. adopt strategies by utilizing digital tools and web-resources in project-based learning, active learning, online collaborative learning for enhancing effective teaching and learning of secondary science;

4. collaboratively plan, design, implement, and make conclusion of a technology enabled learning;
5. adopt and adapt the use of digital tools and web-resources in assessment;
6. incorporate digital technology and web-resources in science assessment; and
7. plan, design and implement science lesson by adapting a digital instructional design with emphasis on assessment as well as congruency to science content knowledge and pedagogical skills.

Course Contents:

This course emphasizes a good learning of theory with reflective classroom practices based on integration of digital technologies and web-resources in science education. The knowledge and skills acquired would enable participants to integrate digital technologies and web-resources for improving secondary science classroom practices in their respective schools.

The major areas include:

1. Trends and Issues in integrating digital technologies in Science Education
   - 1.1 Emerging technologies in education
   - 1.2 Internet of Things (IoT)
   - 1.3 Artificial Intelligence (AI)
   - 1.4 Computational Thinking
   - 1.5 Big Data in Science Education
   - 1.6 Web 2.0
   - 1.7 Industrial Revolution 4.0
   - 1.8 Universal Design Learning
   - 1.9 Robotics education

2. Type of Digital Learning
   - 2.1 e-Learning
   - 2.2 Blended Learning / Flipped Classroom
   - 2.3 Mobile Learning
   - 2.4 Virtual Learning Environment (VLE)
   - 2.5 Bring Your Own Device (BYOD)
   - 2.6 Web-based Learning
   - 2.7 Game-based Learning

3. Digital Tools and Applications to support science learning
   - 3.1 Interactive Presentation
   - 3.2 Animations and Simulations
   - 3.3 Digital Gamification
   - 3.4 Screen and Video Casting
   - 3.5 Augmented Reality (AR)
   - 3.6 Mixed Reality (MR)

4. Strategic Approaches to integrate digital technologies and web-resources
   - 4.1 Inquiry Based Science Education (IBSE)
   - 4.2 Project Based Learning
   - 4.3 Problem Based Learning
   - 4.4 Online Collaborative Learning (OCL)

5. Assessment for Science Learning
    5.1 Effective questioning skills
    5.2 Digital/online assessment
    5.3 Digital/online feedback

6. Digital Citizenship
    6.1 Digital ethics and responsibility
    6.2 Cyber security and policies

7. Theory into Practice (TiP)
    7.1 Planning, Designing, Implementing and Improving Science Lesson Plans and Strategies on promoting digital technologies and web-resources integration in Science Classroom

Duration: Four Weeks

Participants: Science/ICT Educators or Key Secondary Science/ICT teachers/School leaders

English proficiency: Able to communicate in English

Expected output:
1. Project Work Report
2. Multiplier Effect Action Plan

References:

Ferrari, A. (2012). Digital competence in practice: An analysis of frameworks. Seville: European Commission. Retrieved from http://ftp.jrc.es/EURdoc/JRC68116.pdf .

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Wegerif, R. (2012). *Dialogic: Education for the internet age.* London: Routledge.

4.4 Course Code: RC-SM-146-4

Course Title: DEVELOPING SECONDARY STUDENTS' MATHEMATICAL THINKING THROUGH PROBLEM SOLVING

Introduction:

Mathematical thinking is a basic goal of mathematics education (Isoda & Katagari, 2012). Thus, developing students who are able to think mathematically is always a major concern of mathematics educators at all levels of education. Due to its close association with thinking, problem solving in mathematics is often considered as a major vehicle to develop mathematical thinking. By solving intellectually challenging problems in mathematics, students acquire ways of thinking that help them to deal with real-life situations outside the mathematics classroom (NCTM, 2000).

Rationale:

The Fourth Industrial Revolution (IR 4.0) is transforming the world economic in an unprecedented way. The future workforce will need to equip themselves with the 21st Century skills such as the ability to think critically and creatively in order to excel in future careers which are dynamically changing all of the time. Thus, the impact of IR 4.0 on education is beyond the imagination of many educational practitioners in the present era. As an example, due to the vast amount of free and easily accessible information on the internet, certain standardized yardsticks for success in education such as rote memorization of factual knowledge will soon be irrelevant in the coming decades (Welsh, 2018a). Instead, the ability to critically analyze problem situations and creatively generate solutions will be of paramount important in mathematics education. As Welsh (2018b) put it, future schools need to function as an incubator for talent, rather than a factory to mass produce knowledge workers.

Mathematics is a school subject that will develop critical reasoning skills in citizens necessary for a nation to develop sustainably (Mangao, Nur Jahan & Isoda, 2017). As such, mathematical thinking is seen as a crucial survival tool in the 21st Century and the ability to use it to solve problems is considered an important goal of schooling. Consequently, problem solving has become an important component of mathematics curriculum around the world. Nonetheless, 'knowing how to incorporate problem solving meaningfully into the mathematics curriculum is not necessarily obvious to mathematics teachers' (NCTM, 2000). Therefore, this course is crucial in providing supports to mathematics teachers from the ASEAN countries to teach mathematics in a problem-solving environment that will nurture mathematical thinking among their students.

Objective:

This course intends to provide the participants with the necessary knowledge, skills and competencies required to plan, implement and evaluate a mathematics lesson on developing mathematical thinking through problem solving.

At the end of the course, the participants should be able to:

1. gain understanding on the meanings of problem solving in mathematics;
2. acquire the skills and experience in using appropriate heuristics to solve mathematical problems;

3. gain a deeper insight on the roles of problem solving in nurturing mathematical thinking as a habit of the mind;
4. develop the competency of teaching mathematics through problem solving;
5. assess the process and the product of mathematical thinking while solving a problem;
6. collaboratively plan, implement and evaluate a lesson on developing mathematical thinking through problem solving.

Course Contents:

This course will provide ample opportunities for participants to experience the authentic problem-solving process and appreciate how this experience will lead to developing mathematical thinking. While doing so, the participants will be introduced to the meaning of routine verses non-routine problem solving as well as Polya's problem-solving model and the associated problem-solving heuristics. A brief introduction to assessment of problem solving based on both process and product (Danielson & Marquez, 2016) will also be presented to the participants.

The major areas of course contents include:

1. Current Trends and Challenges in the Teaching and Learning of Mathematics
   - 1.1 Twenty-first Century Skills in Mathematics Education
   - 1.2 Education 4.0
2. Problem Solving in Mathematics
   - 2.1 Meaning of Problem Solving
   - 2.2 Polya's Model of Problem Solving
   - 2.3 Selected Problem-Solving Strategies for Secondary Mathematics
3. Mathematical Thinking
   - 3.1 Inductive, Analogical and Deductive Reasoning
   - 3.2 Statistical Reasoning
   - 3.3 Developing Mathematical Thinking Through Problem Solving
4. Teaching Through Problem Solving in Mathematics
   - 4.1 Scaffolding in Mathematical Problem Solving
   - 4.2 Teaching Through Problem Solving – The Japanese Open Approach
5. Assessing the Process and Product of Mathematical Thinking
   - 5.1 Performance Assessment
   - 5.2 Assessment Tools and Techniques
6. Theory into Practice: Planning, Implementing and Evaluating a Lesson on Mathematics Thinking Through Problem Solving

Duration: Four weeks

Participants: Mathematics Educators or Key Secondary Mathematics Teachers

English Proficiency: Able to communicate in English

Expected Output: 1. Project Work Report
2. Individual Multiplier Effect Action Plan

References:

Danielson, C. & Marquesz, E. (2016). *Performance tasks and rubrics for middle school mathematics. Meeting rigorous standards and assessments*. New York, NY: Routledge.

Isoda, M. & Katagiri, S. (2012). *Mathematical thinking. How to develop it in the classroom*. Singapore: World Scienific.

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: NCTM.

Welsh, B. L. (2018a). *Education 4.0 – How we will learn in the fourth industrial revolution*. Retrieved from https://medium.com/@brianna_91610/education-4-0-how-we-will-learn-in-the-fourth-industrial-revolution-e17206b73016

Welsh, B. L. (2018b). *Education 4.0? The classroom meets a brave new world*. Retrieved from https://medium.com/@brianna_91610/education-4-0-the-classroom-meets-a-brave-new-world-f6eba1dde8fc

5.0 CONTACT US

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Officer in-charge:
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Appendix 1

Please affix passport photograph

APPLICATION FORM

REGULAR COURSES FOR FISCAL YEAR 2021/2022

Please type or write clearly in capital letters. Do not leave any space blank. Use "NIL" or "N/A" where applicable

Please tick √ your choice. Kindly note that once you have indicate the subject, you are NOT allowed to change.0

Application for: ☐ RC-PS-146-1 ☐ RC-PM-146-2 ☐ RC-SS-146-3 ☐ RC-SM-146-4

Course Code:	**Course Date:**
Title Of Course:	**Your Country:**

1. PERSONAL DATA

Family Name (surname) :	Date of birth : Day | Month | Year
First Name :	Nationality (citizenship) :
Other Names :	Gender : Male / Female #
City and country of birth :	Marital status : Single / Married #
Passport No : Type of Passport: Expiry Date:	Religion :

Delete accordingly

2. COMMUNICATION AND MAILING ADDRESS

Applicant's Office Address :		Applicant's Postal / Home Address :
Mobile Phone Number Country | Area | Number		Home telephone Country | Area | Number
Office telephone Country | Area | Number	Telefax Country | Area | Number	Email

Person to be contacted **in case of emergency** :
Name :_____
Telephone :_____ Mobile Phone Number:_____
Address :_____
Email :_____

3. EDUCATION (list from highest qualification)

Name of Colleges/ Institutions/ University & Country	Major Field of Study	Years of study : from - to	Degree

4. EMPLOYMENT RECORD (list from current position onwards)

Name of Institution/Employer	Position	Years of work: from - to

Delete accordingly

Describe your work and responsibility:

5. REASONS FOR APPLYING THIS COURSE

Please state briefly the reasons for applying to this course and how you hope to benefit from the course.

6. OVERSEAS COURSES/ CONFERENCES/ SEMINARS ATTENDED INCLUDING PROGRAMME OF SEAMEO RECSAM

Name of Conference/ Seminar	Venue	Date: from - to

Delete accordingly

7. ENGLISH LANGUAGE PROFICIENCY

	Excellent	Good	Fair	Basic	Remarks
Listening					
Speaking					
Writing					
Reading					

8. INFORMATION, COMMUNICATION AND TECHNOLOGY (ICT) SKILLS PROFICIENCY

	Excellent	Good	Fair	Basic	Remarks
Microsoft Office					
Email					
Internet					

…… ……

Date Signature of Applicant/Participant

Recommended by Ministry of Education

…… ……

Date Signature & Name of Official on behalf of Minister of Education

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IMPORTANT: THIS FORM SHOULD BE COMPLETED IN DUPLICATE. A COPY TO BE SENT THROUGH YOUR MINISTRY OF EDUCATION BY REGISTERED AIRMAIL TO REACH THE FOLLOWING ADDRESS

DIRECTOR

SEAMEO RECSAM, JALAN SULTAN AZLAN SHAH,

11700 GELUGOR, PENANG, MALAYSIA