Webinar Report

On

“Conditions to fuel integrated STEM education in schools.”

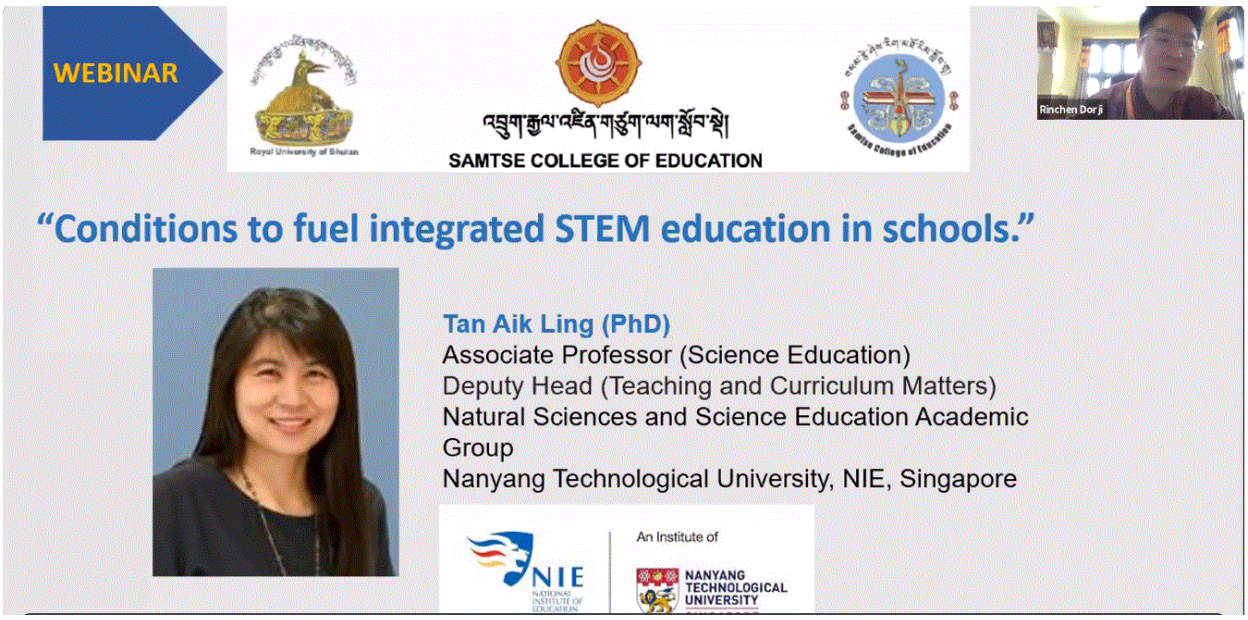
Date: April 12, 2021

Time: 9:00 AM to 10:30 AM

Resource Persons: Dr.Tan Aik Ling (Assoc Prof)

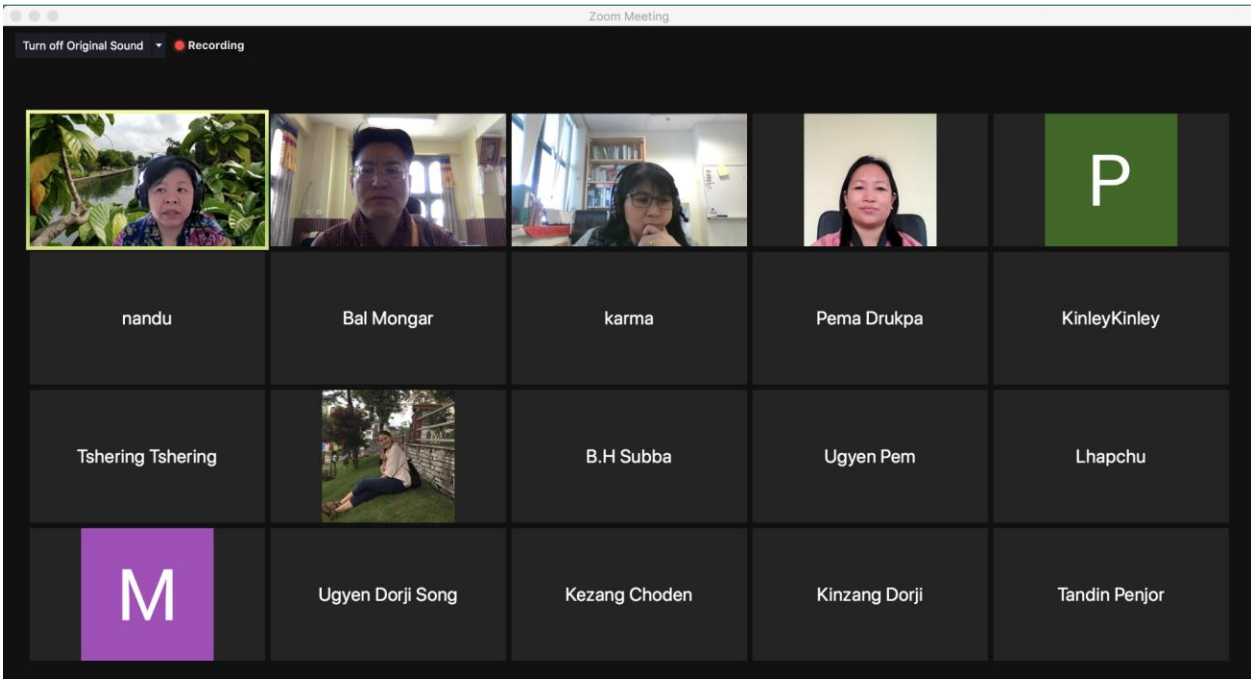
Dr.Teo Tang Wee (Assoc Prof)

Nanyang Institute of Education, Nanyang Technological University, Singapore.



1. Introduction

On April 12, 2020, the President of Samtse College of Education, along with faculty members from Math, Science, and Information Technology, attended a webinar titled “Conditions to Fuel Integrated STEM Education in Schools” resourced by Dr. Tan Aik Ling, Associate Professor in the Natural Sciences and Science Education at Nanyang Institute of Education (NIE), Nanyang Technological University (NTU), Singapore. Dr. Tang Wee Teo, Associate Professor in the Natural Sciences and Science Education (Academic Group), NIE, NTU, Singapore, was also present to complement the responses of Dr. Aik Ling to the questions from the participants.



The primary objective of the webinar was to enable STEM teacher educators in the College to learn about some of the good practices of STEM Education in Singaporean school system. Dr. Tan Aik Ling began her presentation with a brief history of how the Singaporean Government emphasized the importance of STEM education for specific purposes. She stated that after gaining independence in 1965, the government considered supporting technical welfare through STEM education, and that the government was focused on supplying technical workforce to the industries. The second

revision in STEM education was guided by the knowledge-based economy in 1980, and the current emphasis is on problem solving through innovation and enterprise. She shared that the slogan for the revised Science Curriculum Framework (2019) in Singapore is ***Science for Life and Society.*** With this, Dr. Tan Aik Ling reminded the participants to think about what the purpose of STEM education in Bhutan should be.

Then, using an activity, she introduced the participants to the concept of STEM education and the disadvantages of offering Science, Technology, Engineering, and Math education in silos. A good STEM education is regarded as the solution for producing innovative thinkers for STEM-related industries that will help the global economy. She emphasized that, in addition to preparing students for the future workforce, STEM education is critical for individual students' personal development, allowing them to make sense of a world increasingly powered by science and technological innovations. She further said that, despite the focus on STEM education, there is little agreement on what constitutes STEM, how STEM outcomes can be measured and the STEM educators do not share a common understanding of STEM education. She stated that, in order to address the aforementioned issues, the integration of two or more STEM disciplines or lessons based on connections between the subjects and real-world problems is recommended, which will also improve scientific content understanding and solve social issues. Hence, an integrated STEM education could be focused on either content integration or context integration.

She described the STEM QUARTET Model (Fig.1), an instructional framework for STEM integration based on the theoretical concepts of disciplinarity and problem-centered learning. The Multi-centric Education, Research, and Industry STEM Centre (meriSTEM) at NIE uses this model to train teacher trainees and teach STEM education in schools.

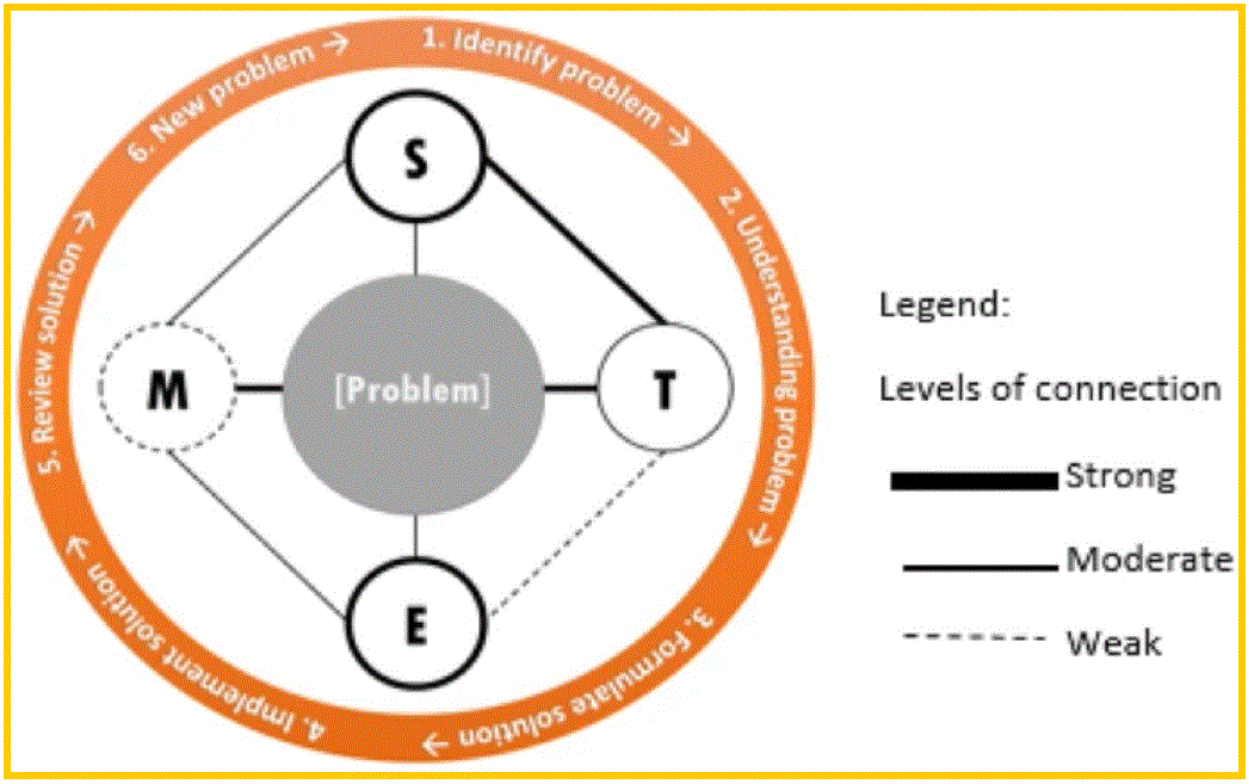


Figure 1: S-T-E-M Quartet instructional framework

This integrated STEM instructional framework is based on the fundamental perspective of solving complex, persistent, and deep real-world problems using practices unique to the four disciplines, while also drawing on connections within and between disciplines. She also said that making connections across disciplines is difficult, and that teachers must handle STEM content in a deliberate and explicit manner so that students can describe the connections when applying knowledge to solve real-world problems. Hence, the S-T-E-M Quartet is an instructional framework that aims to make the connections between disciplines more explicit. The framework's four main characteristics are as follows:

1. Problem-solving as the overarching process,
2. Complex, persistent and extended real-world problem at its core,
3. A focus on connections between the disciplines (i.e. horizontal connections), and

4. S-T-E-M as the four disciplinary domains (i.e. vertical learning) with a lead discipline.

She demonstrated the use of the Quartet Model to design an integrated STEM lesson for a high school biology lesson.

Following Dr. Tan Aik Ling's presentation, one of the participants asked whether Bhutan's current science education could be classified as STEM education because STEM subjects are taught in silos. To this Dr. Teo Tang Wee replied that STEM education has always been confusing from the start of the Act of STEM Education and it still remains, though the original idea is to integrate all the subjects, yet the actual implementation is difficult. But as a teacher, if we implement at least two out of the four STEM disciplines in our class, we can say it is a STEM education.

Another question was on the practice on integrating Biology, Chemistry and Physics in Singaporean education system. Here Dr. Teo Tang Wee replied that some schools in Singapore offer an Applied Learning Programme (ALP) in which more than 50% are for STEM ALP. These schools provide double periods in a week for the students to learn and experience STEM ALP lessons of integrated STEM education. Similarly, other interactions focused on designing STEM lessons, the challenges of integrating STEM subjects, and teacher subject backgrounds that may impede the implementation of integrated STEM education in schools.

With this the session came to an end with the last note from the President. The President appreciated and thanked the two resource persons for sharing some good STEM education practices, and he asked the science faculty of the College to review and reflect on their STEM education practices, as well as consider how we can contribute to raising the country's STEM education standards.He further added that STEM has become the language of education and stated the importance to make concerted efforts to make our education and society progressive and dynamic, as STEM education will be the solution to the majority of the problems we will face in the new century. The President and the STEM Research Center Coordinator thanked the

resource persons and requested for similar interactions and future collaborations in STEM education and research.

Report compiled by Dr.Reeta Rai and Ms.Sapna Thapa