

## Science Teachers Self Reflection Of STEM Education Activities to Discover Understanding, Define and Solving Problem Skill through Lesson Study Model

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Lesson study as a model on building pedagogical knowledge, was integrated in the STEM education socialization program for science teachers in Indonesia. The program was created to inform a new way of enhancing students learning on science. The lesson study was adapted from Japanese, where teacher works in small teams to plan, teach, observe, analyze, and refine individual class lesson. Although individual teachers may reflect on and improve their practice, there are few occasions to converse with colleagues about what they discover about teaching and learning. Therefore, lesson study was adapted to enhance communication among them and teacher's skills such as problem solving skill. STEM education is new approach in science learning. It was developed to train students' 21st century skills. In the first implementation, STEM education was socialized on teacher training program using lesson study model. Through lesson study model activity, this study aimed to investigating teachers' self-reflection after STEM activities. The activities were conducted in three different challenge themes. They were balloon-powered car, reverse engineering, and Paper Bridge. It was collected by self-reflective question related to the STEM activities. The questions were; 1) what did you learn? 2) What problems did you face to learn? 3) How did you solve the problem? Those questions measured: teachers' understanding, define problem skill, and problem solving skill. It was scored using self-reflective assessment rubric in PBL. The understanding was measured the statements that described with specific details and examples and comparison how understanding has changed; the define problem skill measured how they identified the key element of the problem and clearly outline the objectives; and the problem solving skill measured how they develop excellent strategies that are insightful and use logical reasoning to reach accurate result. 16 teachers joined the program in one secondary private school. Data was analyzed using Kruskal Wall's variance analyses method. The results showed that there was significant difference of define problem and solving problem skill among teachers during activities, but there was no significant different of teachers' understanding during activities.

Abstract Number: 20073

## Pioneer Learning Study Research Model in the Singaporean School Chinese Language Classroom--Eliciting Deeper Learning in Teachers and Students

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By deploying the Learning Study (LgS) model, our research team aims to help a group of secondary three Higher Chinese Language (HCL) students master the concept of writing argumentative essays, specifically in understanding and discerning the characteristics of argument points, evidence, and ways to support their arguments. This paper focuses on sharing our learning experience in pioneering the CL LgS in Singapore classrooms. Specifically, in sharing our teachers' teaching experience before and after their involvement in the LgS; as well as studying the students' learning outcomes and reflections. We conclude that the LgS research model has provided the team with a precious opportunity to review their usual ways of teaching, planning and enactment, in which we found new perspectives and strategies to improve our teaching skills and to enrich our students' learning experience.

The concept of Learning Study (LgS) was introduced to Singapore schools in 2015. Tanjong Katong Secondary school joined the training programme in 2016 and became the first secondary school to experiment with LgS in the secondary Chinese language classrooms. After completing a three-day intensive training conducted by the LgS experts from Hong Kong Education Institute, the teachers and students involved in the research programme embarked on a unique learning journey where deeper learning of the subject matter has changed their way of teaching and learning.

This is a qualitative research project based on the research model designed by the Hong Kong specialists. The research methods employed include interviews, lesson observations, and pre/post-test analysis. Under the LgS research model, teachers involved have undergone rounds of professional discussion sessions, designing of and conducting pre-test and post-test and interviews, analysing pre/post-test performance during the three months of research period.

The significance of our presentation is built around the new perspectives that our teachers and students reflected during their involvement in the project. Through engaging in reflective thinking about what had been done right or what could be improved upon in the teaching of the subject matter, teachers discern the effects of different teaching strategies in teaching this object of learning. The students who had taken part in the various learning activities featuring discerning and discussing the characteristics of argumentative essay had enjoyed different methods to encourage deeper learning. This we hope, will allow some to master the subject matter at a higher level eventually.

Beyond the opportunity this study has presented our team with, to engage in reflective thinking practices in teaching of their subject matter, the project is also a significant case study of the LgS being localized used in the Singaporean context. We hope that our study and presentation can serve as a springboard for other groups in the Singaporean educational landscape, for them to consider use of LgS in their own learning communities.