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## Using a Process-Analysis Model to Support Lesson Study Improvement in Singapore

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Data analysis is at the heart of a professional development experience (NEA, 2003), particularly for lesson study. Improving the research lessons requires teachers to develop an eye on children for evidence of their learning during classroom observation and form professional judgment on what and how to fine tune instructional language and resources (Cohen et al, 2003). Yet teachers often find it difficult to provide solid evidences to inform lesson improvement through data collection and analysis (Perry & Lewis, 2008; Fernandez et al. 2003), particularly when it lacks specific and systematic reference frames to guide the decision making in the improvement process.

To address this difficulty, our research aims to develop a process analysis method which is capable of deriving more sophisticated patterns of whether and how the discourse succeeded in developing the students' understanding by giving meaning to their mathematical experience in an activity (Wells, 1999). Based on two research lessons and their improved lessons on the same topic of equivalent fractions conducted in 2006 and 2007 in a Singapore local primary school, our research aims to understand how the discourse succeeded in developing the students' understanding by giving meaning to their mathematical experience in an activity. This analysis model holds potential to provide solid case data to inform teachers what needs to improve, how to improve them, why the improving act is reasonable. It also helps to verify and reflect on how lesson study mechanism improves and change instructional practice. Moreover, with process analysis, we aim to build a reference framework and an investigative tool for teachers to gauge their investigations (Perry et al., 2009). Ultimately this analysis model is hoped to serve as an instrument to evaluate quality of lesson study practice as professional development for teachers.

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## University Education Experts and In-service Elementary School Science Teachers Collaboration for Professional Development through Lesson Study

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Professional development (PD) for in-service teachers are known to be vital especially after curriculum reforms. This is to equip teachers with the new competencies aligned with the new learning standards and assist teachers to reflect on their practices. An effective PD however, involves and recognizes various sectors of education and their contribution to the improvement of the increasing complexities of teaching and learning. In the recent years, various models of PD gained popularity as they incorporate the qualities of sustainability, collaboration and classroom-based research. Classroom-based research with teachers was the least explored model with the notion that teachers are hesitant to do research because of reasons such as lack of time, motivation, priority and their view that research results are irrelevant to their immediate needs. This study therefore, empowered teachers to participate in a classroom-based research to explore what needs to be improved in response to the recent curriculum reform in the Philippines.

In this qualitative study, a research-based PD was conducted to recognize the equal and collaborative role of teachers and university researchers in identifying the problems and the areas for improvement in response to the recent curriculum reform in the Philippines. Results showed that through collaboration, sustainability, trust, and commitment, the teachers recognized the advantages of classroom-based research in the improvement of their instructional capacities. This study yielded three major themes on the importance of classroom-based research as revealed by their reflections: increased understanding of classroom dynamics; shared ownership and involvement; and reflective practice to connect and resolve ideas against prior beliefs. As an evidence of increased understanding of classroom dynamics, teachers recognized the importance of 'wait time' and that it is best to give students enough time to accomplish their tasks for quality learning. Teachers also recognized that the lesson implementation and observation phase of lesson study allowed them to collaboratively conduct a systematic analysis of the classroom dynamics especially on the students' responses. Moreover, their open sharing of their traditional lesson implementations during the reflection phase served as a starting point where they pooled together good practices in order to construct a good lesson plan. Lastly, the teachers recognized the importance of reflective practice because they are given opportunities for self-examination (for the implementing teacher) and group reflection and with the help of the mentors, it becomes a metacognitive approach to evaluate planned versus enacted practices.

Results showed that through collaboration, sustainability, trust, and commitment, the teachers recognized the advantages of classroom-based research in the improvement of their instructional capacities. With their full involvement, the classroom research-based PD employed in this study empowered teachers and eliminated the negative notions of research and rather was used as an opportunity for immediate learning.

Moreover, through classroom-based PD implemented in the lesson study process, teachers realized that their enacted practices can be improved. To conclude, this study conveys that through lesson study, teachers started to give consideration to their lesson plans as feasible material to evaluate their own instructional practices.

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## "Stroll" and "Exploring" as Sociocultural Artifacts that Embody Teacher's Professional Work

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This presentation aims at preparing a theory of embodiment of teacher professional work through lesson study based on Vygotskian mediation model. The presenter poses a radical question towards 'toek of experience' model in literature on lesson study, and proposes an alternative model of 'production of experience'.

There has been a hidden teacher professional development (TPD) model in lesson study; repeating reflection can change teachers' actual performances at classroom. In this model the presenter call it as 'toek of experience' model, teachers obtain lessons learnt by retrospective reflection and utilize them to the next lessons. The cycle of Plan-Do-See centers on teachers' retrospections entailing input-output of their knowledge. According to the model reflection takes place after the live lessons, which assumes reflection as the controller of action. Hence the literature concerns sufficient amount and quality of retrospection for TPD.

The presenter questions this premise and proposes a conceptual proposition that counters such cognitive approach in TPD research. Reflective practitioner (Schön) conducts the simultaneous occurrences of reflection and action; they are not separated. Operation of knowledge and live implementation of acting should be located appropriately in teacher professional work.

The presenter proposes a model 'production of experience' where the mediation of sociocultural artifact 'disposition' determines the quality of teacher work by the minutes. This mediation model employs the two artifacts of teacher act and value shared in the collective teachers: how teachers' action and value shapes reflection. In this model the teachers achieve their professional experience by the minutes by borrowing shared professional repertoires in the teacher collective. In this process teachers always negotiate and transact with the sociocultural artifact shaped and shared in their community to produce every moments of their work. Teacher knowledge and thinking are produced by the function of this mediation of artifacts.

Disposition signifies a transportable artifact borrowed from teacher culture. Teacher community historically shapes and prepares such artifacts that affect individuals' professional work through the mediations. How the teacher use a disposition in teacher community informs how s/he produce her/his professional experiences.

Vietnamese case is illustrated to show the mediation of disposition. The act of stroll introduced by lesson study for learning community (LSLC) gradually has influenced Vietnamese teachers in pilot schools and subsequently transforms their quality of professional works. While the teachers who received the conventional TPD training of retrospective reflection did not show changes in their everyday practice, those who utilize the new artifact of stroll in LSLC made differences in their knowledge production as well as transformation of their identity.