Open Approach Lesson Study as an Innovation for Teaching Mathematics

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A Model of Curriculum and Instruction System

Intended Curriculum

Implemented Curriculum

Attained Curriculum

R&D cycle

DP-1: R&D on textbook and teaching materials

DP-2: R&D on teacher education and professional development program

DP-3: R&D on students' learning assessment

DP-4: R&D on educational policy

The Thailand 30-year Project (2000 - 2030)

- Investing in HRD
- Strengthening Network
- Expanding across the country and region

- A Strategy for Sustainable Development Goal

2011-2020
2021-2030
The Thailand 30-year Project (2000 - 2030)

- **1999**: Plane 30 years project (2000 - 2030)
- **2000**: started small community of Lesson Study with a group of student teachers (15 students)
- **2001**: started on how to change the way of teaching focusing on changing the problem we use in mathematical activity
- **2002**: first group of student teachers started implementing "open-ended problems" in 7 schools nearby Khon Kaen City
- **2003-2005**: tried the idea of using "open-ended problems" to create mathematical activities with 800 teachers in Khon Kaen Province
- **2006**: started 4 project schools using "whole school approach" to implement "lesson study" and "Open Approach"
- **2006-2010**: tried the idea of using "open-ended problems" to create mathematical activities with 800 teachers in Khon Kaen Province
- **2009**: expanded to 22 schools in the northeast and northern parts of Thailand
- **2012**: expanded to 120 schools across the countries.
- **2017**: 2013 - present expanded to 120 schools across the countries.
- **2013-2020**: started APEC Lesson Study Community in APEC and Non-APEC members economies
- **2021-2030**: Expanding across the country and region

Investing in HRD
- **2000-2010**: started small community of Lesson Study with a group of student teachers (15 students)

Strengthening Network
- **2011-2020**: expanded to 22 schools in the northeast and northern parts of Thailand
12 Years of APEC Lesson Study Project: 2006 Get Started
“A Collaborative Study on Innovations for Teaching and Learning Mathematics in Different Cultures among the APEC Member Economies Project”
How to develop Teaching Approaches (TA) through Lesson Study

1. Reflecting on Japanese Experiences
   
   Each economy started to share the ideas on movement of Lesson Study

2. Challenging in each economy
   
   Each economy challenge to develop Teaching Approaches through Lesson Study by involving school teachers

3. Sharing in Thailand
   
   Each economy shares developed TA as a part of using Lesson Study

4. Challenging Sustainability
   
   Encourage to use developed TA and classroom videos for Lesson Study Movement by teachers and other stakeholders in each economy
APEC LESSON STUDY Project: 2006-2018
Teaching

In the 20\textsuperscript{th} Century for active learning
People generally remember...
(learning activities)

10% of what they read
20% of what they hear
30% of what they see
50% of what they see and hear
70% of what they say and write
90% of what they do.

People are able to...
(learning outcomes)

Define
Describe
Demonstrate
Apply
Practice
Analyze
Define
Create
Evaluate

Passive Learning

Active Learning

Behavioral Learning Dimensions

Cone of Learning (Dale, 1969)
What is active learning?

• Bonwell and Eison (1991) define active learning as “instructional activities involving students in doing things and thinking about what they are doing.”
Metacognition roughly means "awareness of their own thinking" or, "Thinking of Thinking“ (Flavell, 1975)

Metacognition is a driving force while students are solving the problem. (Lesh, Silver, Schoenfeld, 1982)
Paradigm Shift about **Demanding Skills** for the 21\textsuperscript{st} Century

Behaviors \rightarrow \textbf{Thinking Skills}
New Demanding Skills for the 21st Century

Thinking Skills

- Not thinking only for the answer
- Not thinking for the same thing
- Not the repeating
- Not just thinking
For students, **How to practice**

“**Thinking Skills**” in the Classroom?

Started with

“**Thinking by yourself through**

Solving your own problem”

*(Shimizu, 2007)*
For teachers, How to teach “Thinking Skills”/not to teach subject in the classroom?
Three Big Ideas for Developing Teaching Approach
• Teaching Approach
  (Open Approach since 1999)
• Way to improve teaching approach
  (Lesson Study)
• Subject matter or content
  (New School Mathematics)
Figure 2. ‘Reform the Methods of Teaching’ (1883)

(Isoda, 2010)
Problem Posing Approach (1924)

Figure 3. Problem Posing Approach by Jingo Shimizu (1924) (Isoda, 2010)
Started introducing new ideas in schools

“Teaching mathematics in worldwide" *Started with Given Problems*- focusing on Problem Solving phase, especially to get right answer”

**But**

In Japan, they focus on “Problem Posing Phase”, that is the phase before Problem Solving phase
New ideas for Teaching mathematics in schools

Two Phases of Teaching mathematics

I. Problem Posing Phase
   How to develop/pose rich mathematical tasks to students?

II. Problem Solving phase
   How to provide chances for students to collaboratively solve their own problem in the classroom?
TRADITIONAL PROBLEMS used in mathematics teaching in both elementary and secondary school classrooms have a common feature: that one and only one correct answer is predetermined. The problems are so well formulated that answers are either correct or incorrect (including incomplete ones) and the correct one is unique. We call these problems “complete” or “closed” problems.
In the teaching method that we call an “open-ended approach,” an “incomplete” problem is presented first. The lesson then proceeds by using many correct answers to the given problem to provide experience in finding something new in the process. This can be done through combining students’ own knowledge, skills, or ways of thinking that have previously been learned.
Lesson Study bringing ‘Assessment’ to drive all classroom teaching processes

**Embedded Formative Assessment**

(Dylan, 2011)

Lesson Plan → Teaching → Evaluation

(Inprasitha, 2000)
“Open Approach” as an Innovation for Teaching Mathematics in the Classroom
A certain open-ended problem in terms of tasks or problem situation has been proposing in order to be students’ authentic or real problem.

Students’ self-learning through solving their own authentic problem while teacher changing his/her roles to observe and take note students’ ideas or ways of thinking.

Focusing on “how to learn” from students’ mathematical ideas

Focusing on ‘students’ ideas’ and teacher orchestrates students to do whole-class discussion and comparing

(Inprasitha, 2016)
Weekly Cycle of Lesson Study

Teachers collaboratively design lesson plans, once a week (Collaborative Plan)

A teacher teaches by using Open Approach in normal classes (Collaborative Do)

The School principal reflects with LS team and other teachers once a week (Whole school approach) (Collaborative See)

(Inprasitha, 2006)
Using weekly cycle Lesson Study to improve the quality of Open Approach

Lesson Study

Weekly cycle

4 Steps of Open Approach
Open Approach Lesson Study: An Adaptive Innovation for teaching Mathematics

Weekly Cycle

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The School principal reflects with LS team and other teachers once a week (Whole school approach).

Teachers teach by using Open Approach in normal classes.

Focusing on "how to learn" from students' mathematical ideas.

A certain open-ended problem in terms of tasks or problem situation has been proposing in order to be students' authentic or real problem.

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Weekly cycle of Open approach Lesson Study (Inprasitha, 2003; 2006; 2011; 2016; 2017)
Concluding Remarks

What we have learned form this study?

• How to change the way we teach through “topics”

• How to introduce “new school mathematics” to teachers
Concluding Remarks

What we have learned from this study?

- How to support teachers to get students’ ideas
- How to support teachers to bridge the gap between “students’ ideas” and “mathematical ideas”

Etc.,