



Open Approach Lesson Study as an Innovation for Teaching Mathematics

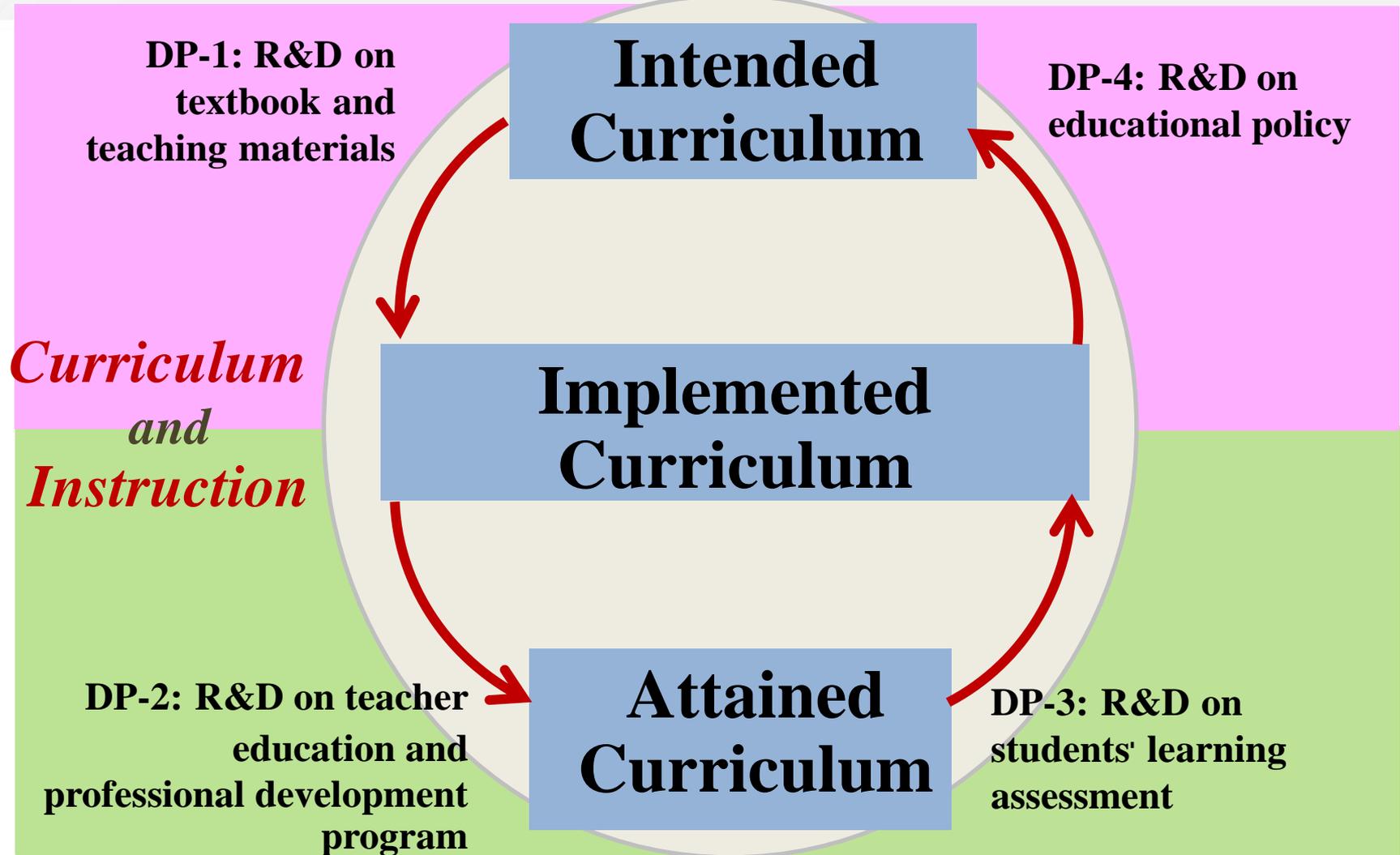
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Textbook Development for SDGs, STEM, and Energy by Cross-border Education
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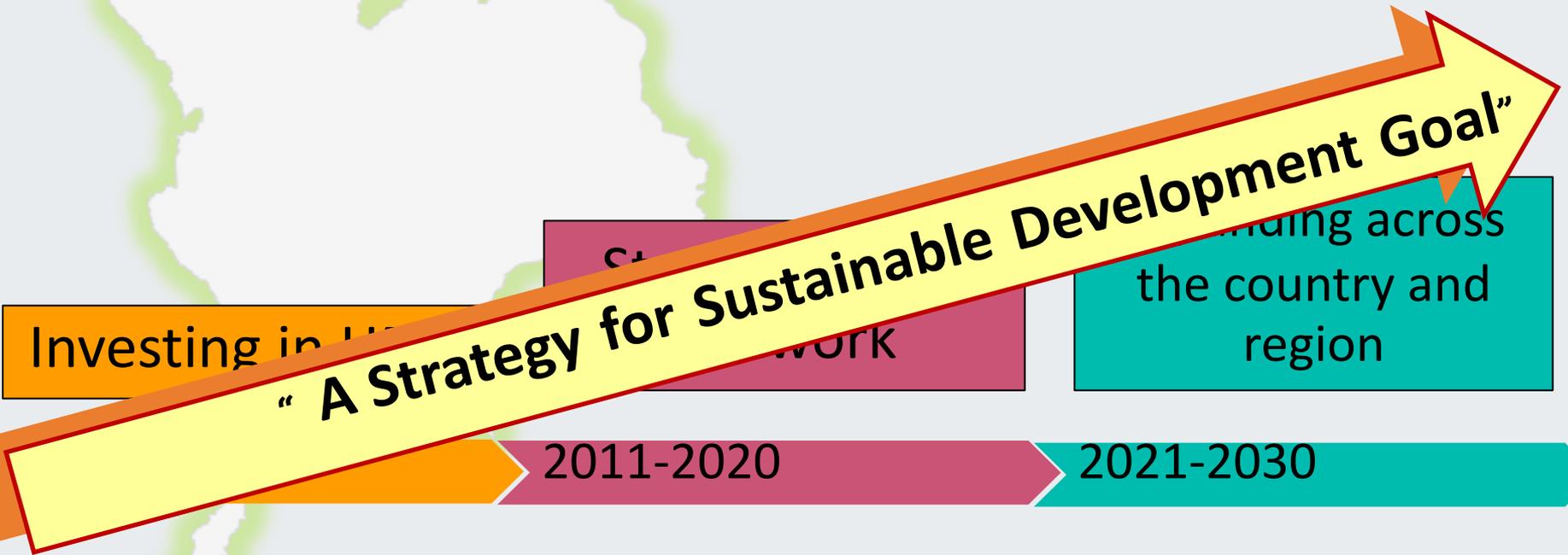
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A Model of Curriculum and Instruction System

R&D cycle



The Thailand 30-year Project (2000 - 2030)



The Thailand 30-year Project (2000 - 2030)

2030

started on how to change the way of teaching focusing on changing the problem we use in mathematical activity

2001

2002

first group of student teachers started implementing "open-ended problems" in 7 schools nearby Khon Kaen City

2006

2008

started 4 project schools using "whole school approach" to implement "lesson study" and "Open Approach"



2006 - present started APEC Lesson Study Community in APEC and Non-APEC members economies

2013

2013 - present expanded to 120 schools across the countries.

2017

1999

Plane 30 years project (2000 - 2030)

Investing in HRD

Strengthening Network

Expanding across the country and region

2000-2010

started small community of Lesson Study with a group of student teachers (15 students)

tried the idea of using "open-ended problems" to create mathematical activities with 800 teachers in Khon Kaen Province

2011-2020

expanded to 22 schools in the northeast and northern parts of Thailand

2021-2030

2000

2003

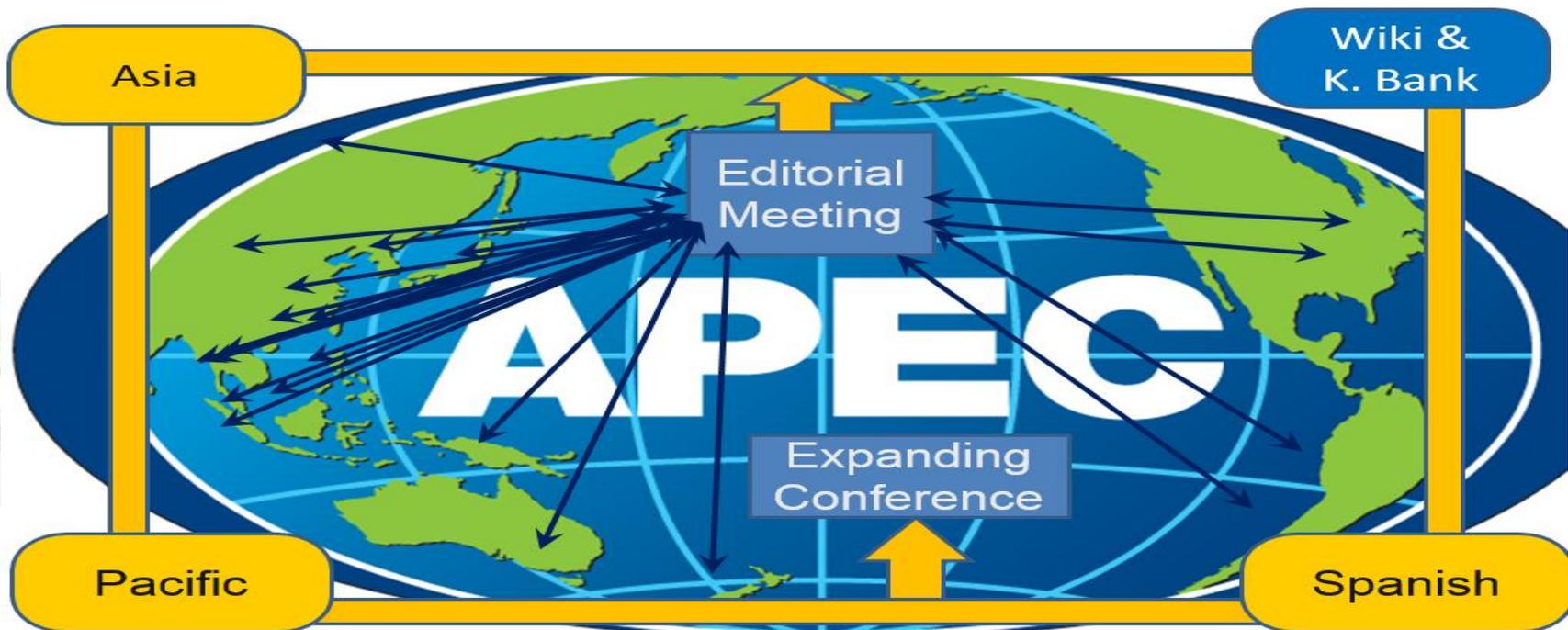
2005

2009

2012

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

Reflecting on

Japanese Experiences

Challenging in
each economy

*Each economy challenge to
develop **Teaching Approaches**
through **Lesson Study** by
involving school teachers*

*Each economy started to share the **ideas on
movement of Lesson Study***

1

2

Sharing in Thailand

*Each economy
shares
developed TA
as a part of
using **Lesson
Study***

Challenging Sustainability

*Encourage to use
developed TA
and classroom videos for
Lesson Study Movement by
teachers and other
stakeholders in each economy*

3

4

APEC LESSON STUDY Project: 2006-2018



2006



2008



2010

Teaching

In the 20th Century
for **active** learning



People generally remember...
(learning activities)

People are able to...
(learning outcomes)

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.

Passive Learning

Active Learning

Define
Describe

List

Demonstrate
Apply
Practice

Analyze
Define
Create
Evaluate

Behavioral Learning Dimensions

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)

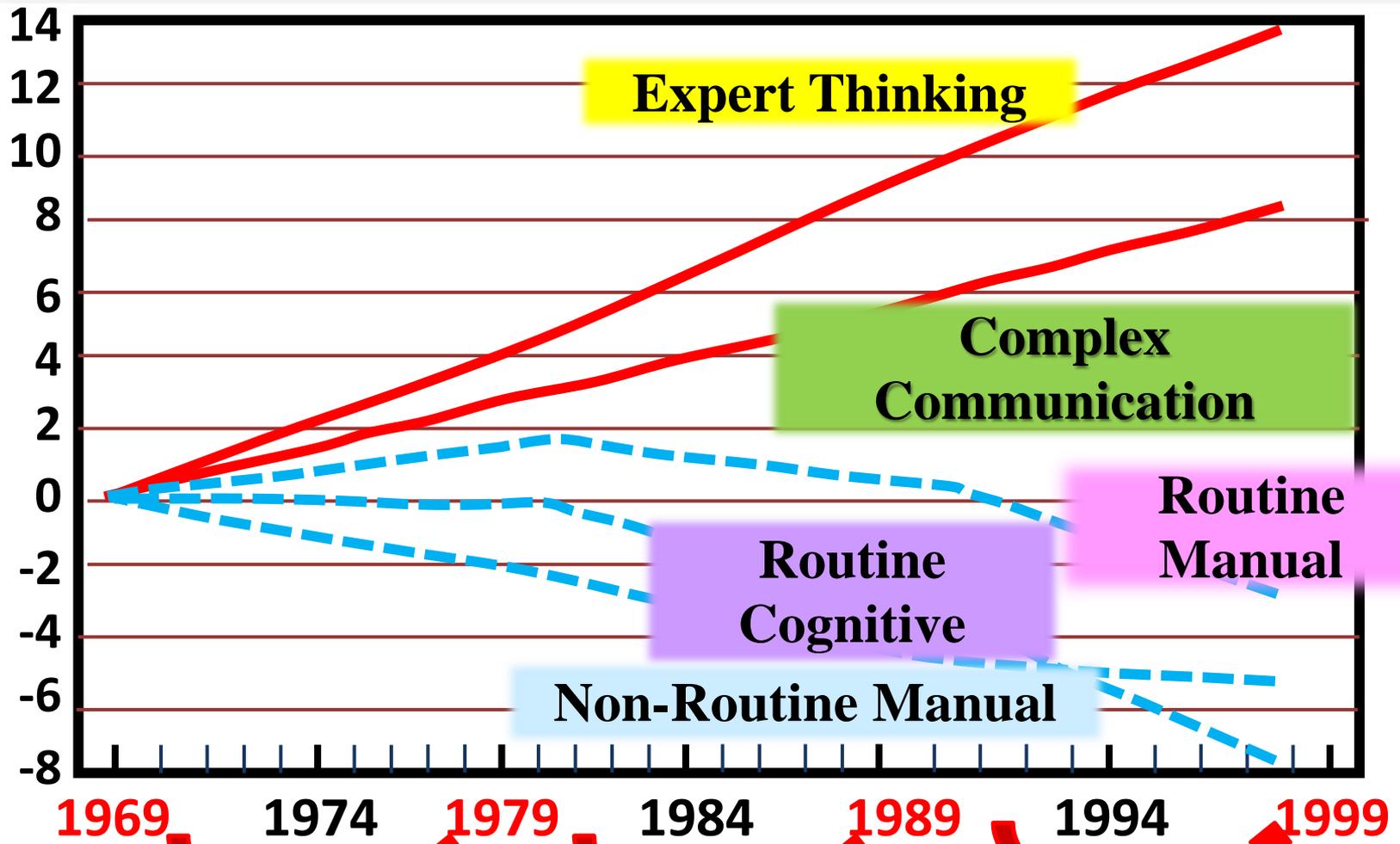
Paradigm Shift about **Demanding Skills** for the 21st Century

Behaviors



Thinking
Skills

New Demanding Skills for the 21st Century



Source: Levy and Murnane (2004). *The new division of labor*: 46. Princeton University Press

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)



(Isoda, 2010)

Figure 2. 'Reform the Methods of Teaching' (1883)



Figure 3. Problem Posing Approach by Jingo Shimizu (1924)

(Isoda, 2010)

Started introducing new ideas in schools

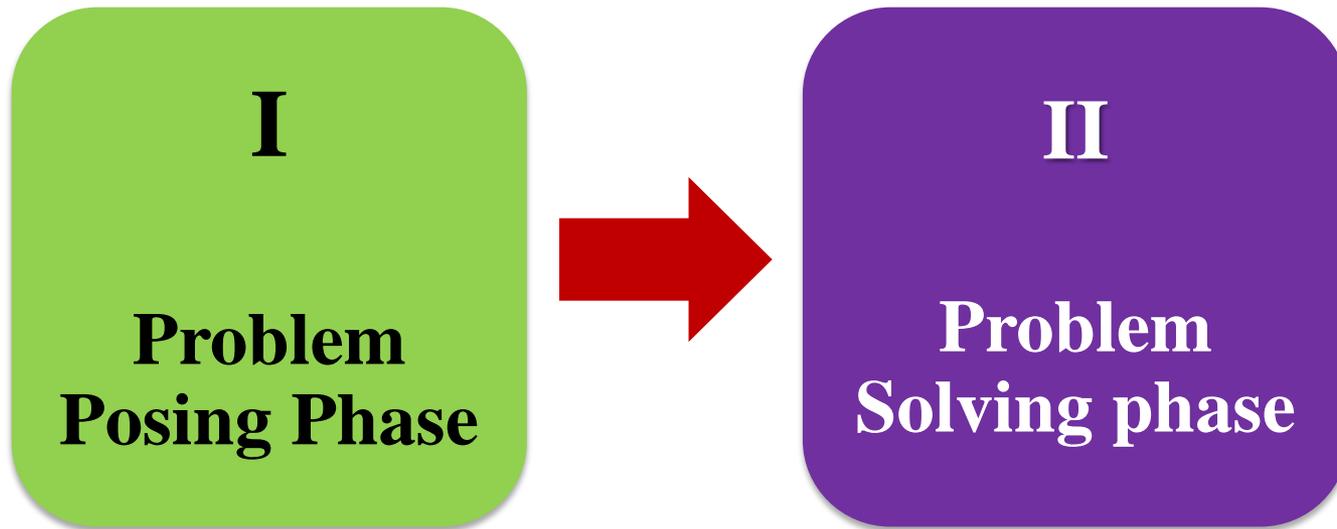
“Teaching mathematics in worldwide”
Started with Given Problems-
focusing on Problem Solving phase,
especially to get right answer”

But

In Japan, they focus on
“**Problem Posing Phase**”, that is the
phase before **Problem Solving phase**

New ideas for Teaching mathematics in schools

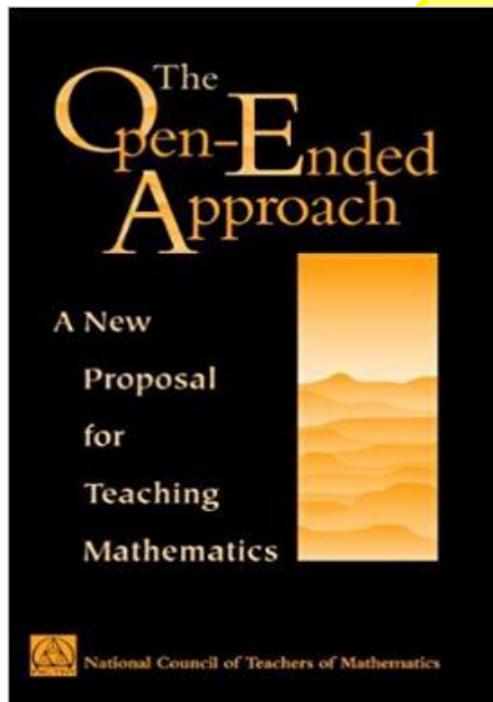
Two Phases of Teaching mathematics



How to develop/pose rich mathematical tasks to students?

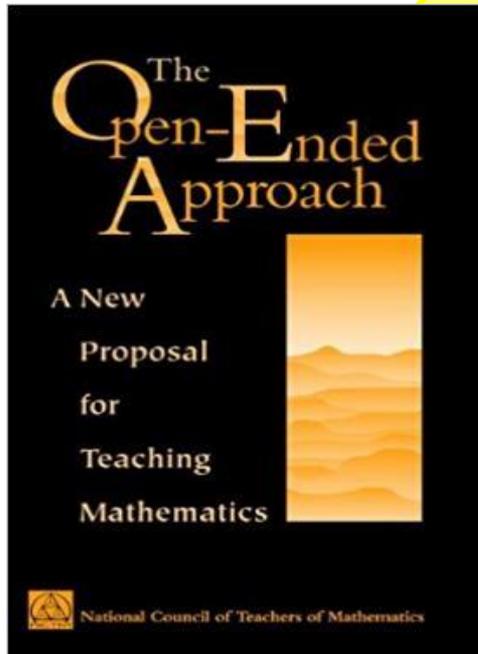
How to provide chances for students to collaboratively solve their own problem in the classroom?

Developing mathematical tasks based on "Open-ended Problems"



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.

“The Open-ended Approach” as a new teaching mathematics in Japan



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)



(Inprasitha, 2000)



“Open Approach”

as an Innovation for Teaching Mathematics in the Classroom

Open Approach

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.

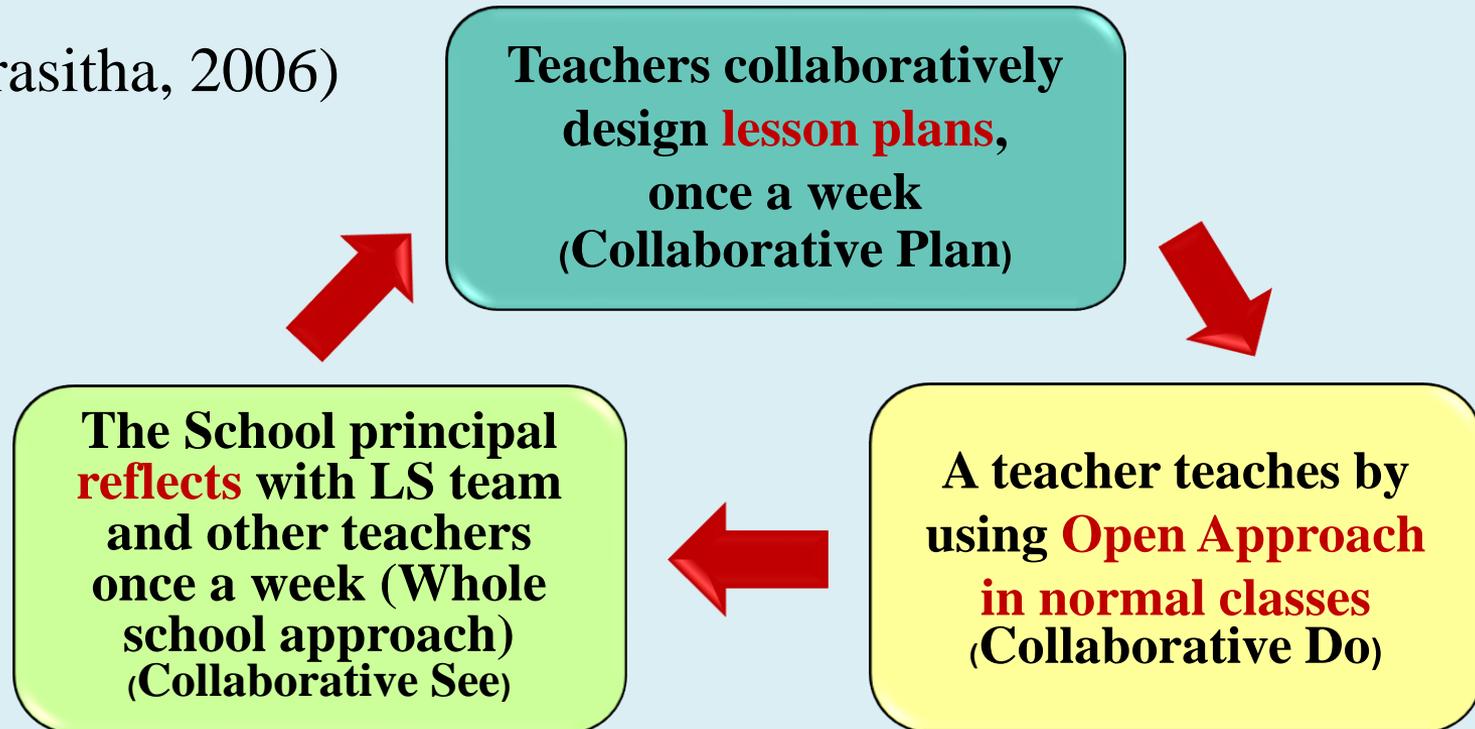
Focusing on "**how to learn**" from students' mathematical ideas

Focusing on 'students' ideas' and teacher orchestrates students to do **whole-class discussion and comparing**

(Inprasitha, 2016)

Weekly Cycle of Lesson Study

(Inprasitha, 2006)



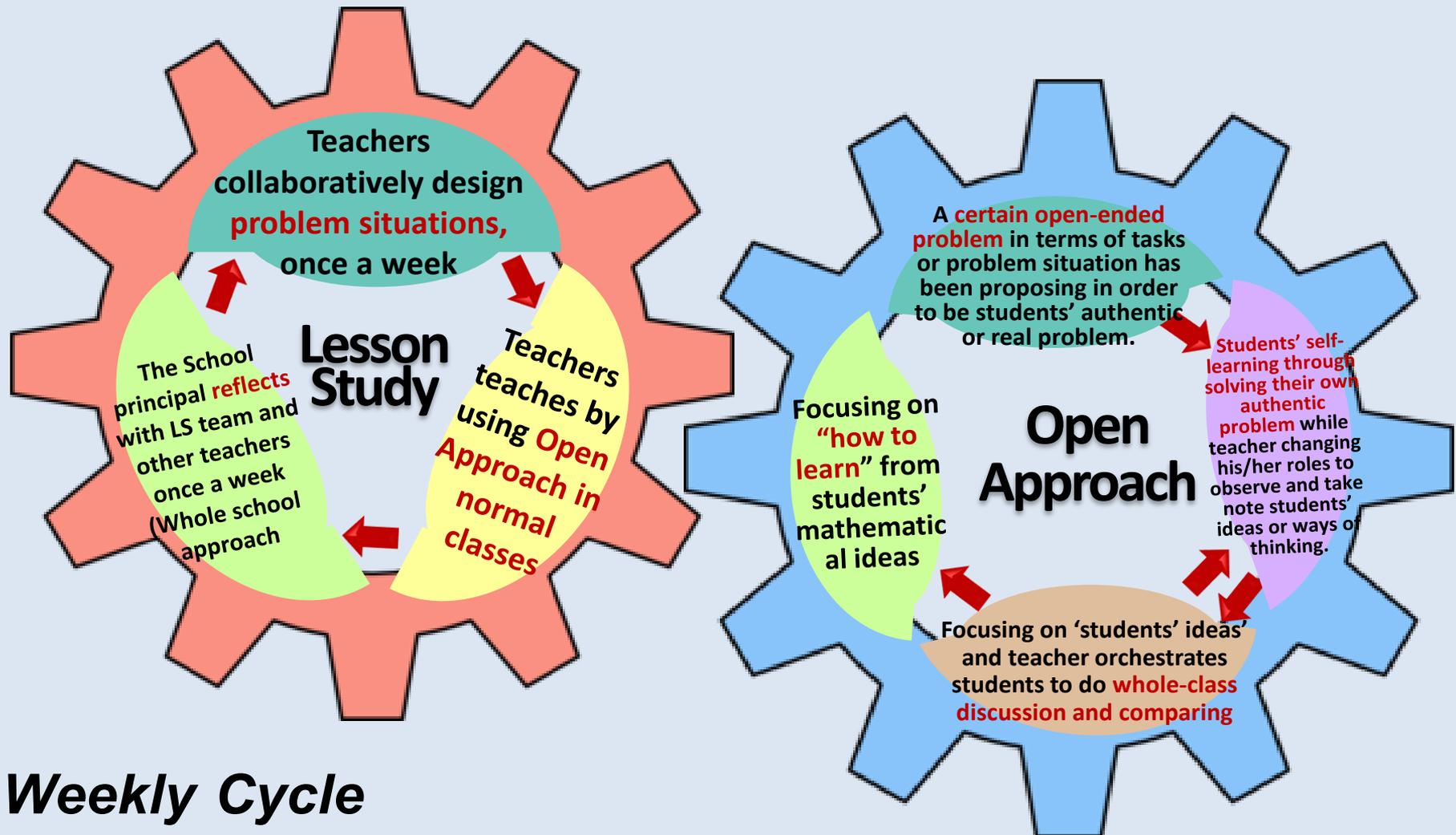
Using weekly cycle **Lesson Study** to improve the quality of **Open Approach**

Lesson Study

Weekly cycle

4 Steps of Open Approach

Open Approach Lesson Study: An Adaptive Innovation for teaching Mathematics



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 form 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.,