Open Approach Lesson Study as an Innovation for Teaching Mathematics

APEC-Tsukuba and UNESCO(MGIEP) International Conference XII:
Innovation of Mathematics Education through Lesson Study
Textbook Development for SDGs, STEM, and Energy by Cross-border Education
Date: February 7-12, 2018
Venue: Tokyo Campus, University of Tsukuba, Japan

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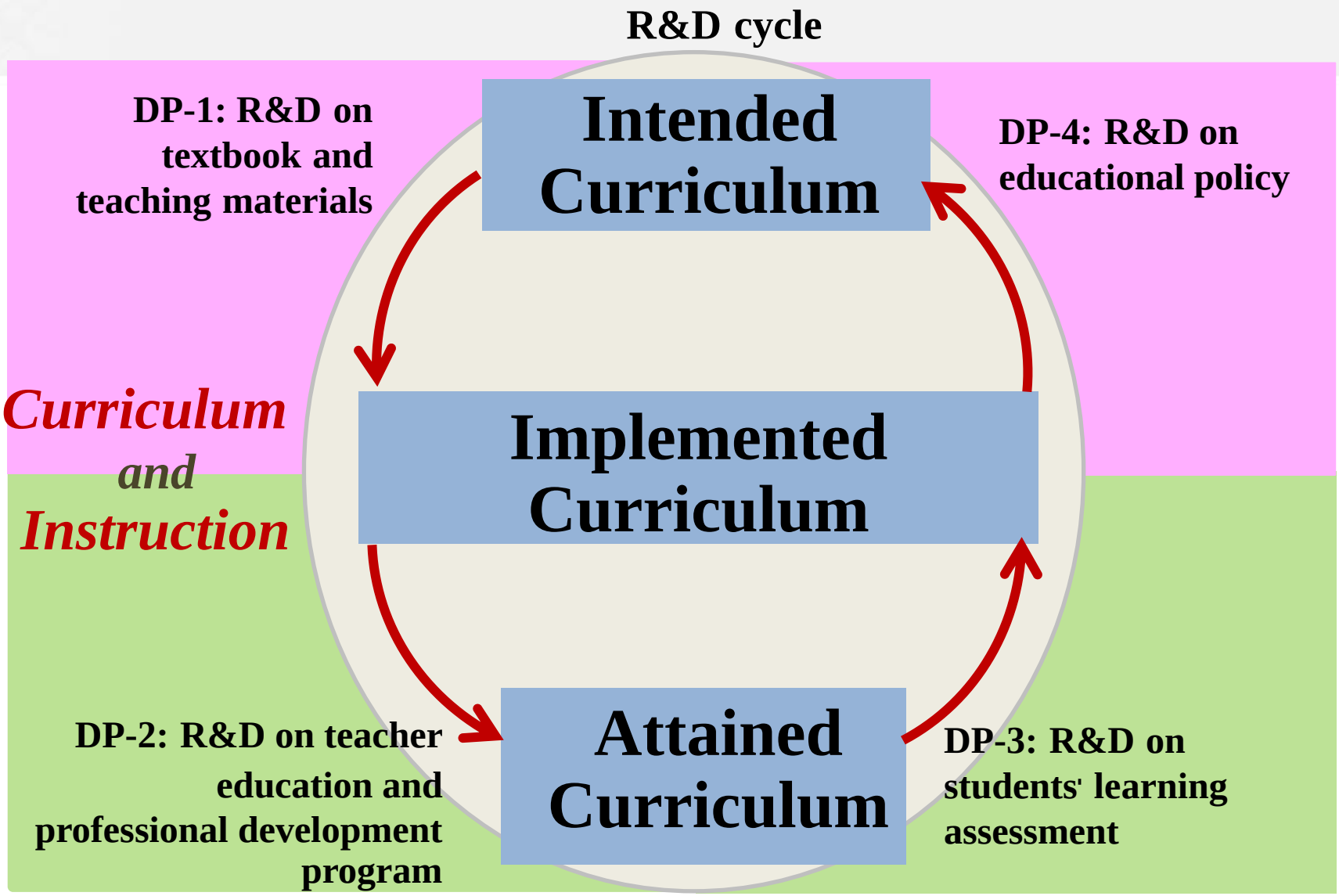
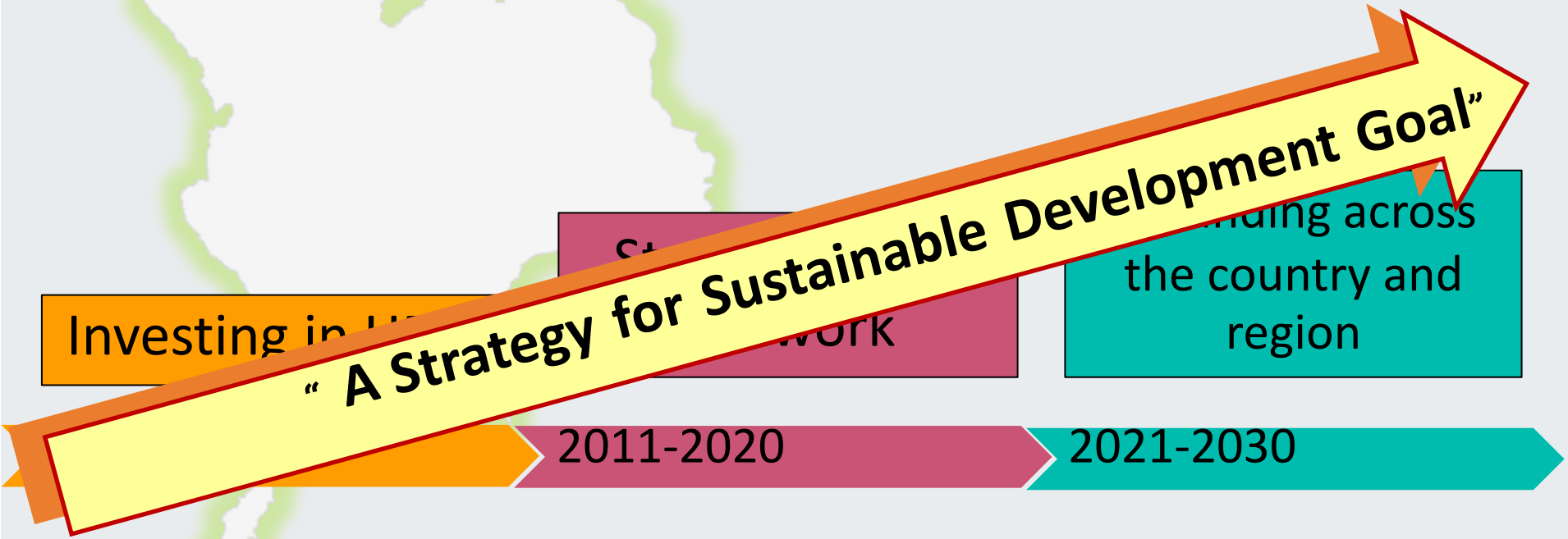
A Model of Curriculum and Instruction System

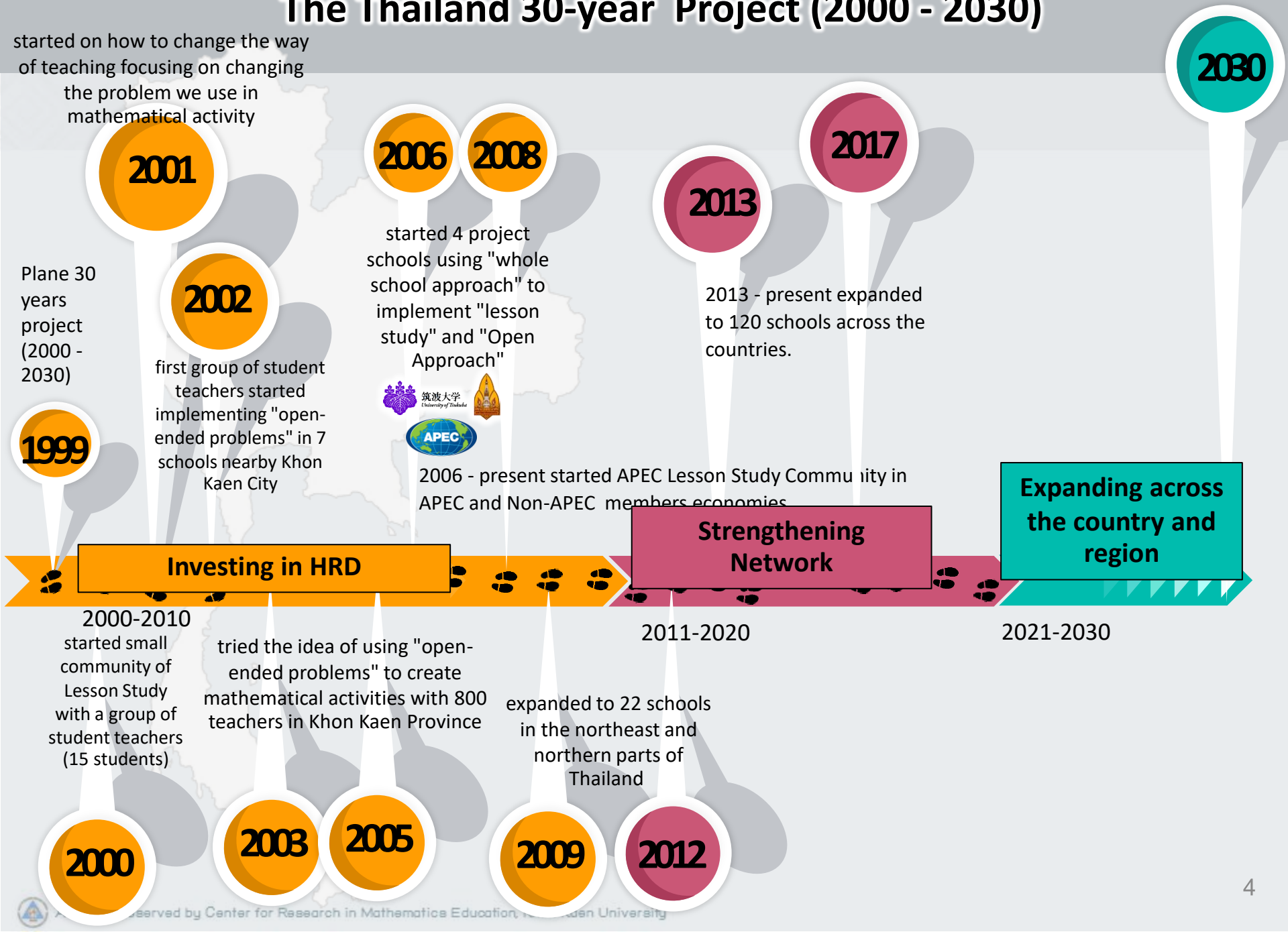


Inprasitha, M. (2015). The Reform of Curriculum and Instruction System: Focusing on Curriculum and Evaluation. In, **Proceedings of the Korean Society of Mathematical Education 2015 International Conf. on Math. Edu.** (Seoul Nat'l U.: November 6-8, 2015) 256-265.

The Thailand 30-year Project (2000 - 2030)



The Thailand 30-year Project (2000 - 2030)



Background of the study

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

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

1

Challenging in each economy

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

2

Sharing in Thailand

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

3

Challenging Sustainability

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

4

APEC LESSON STUDY Project: 2006-2018


2006

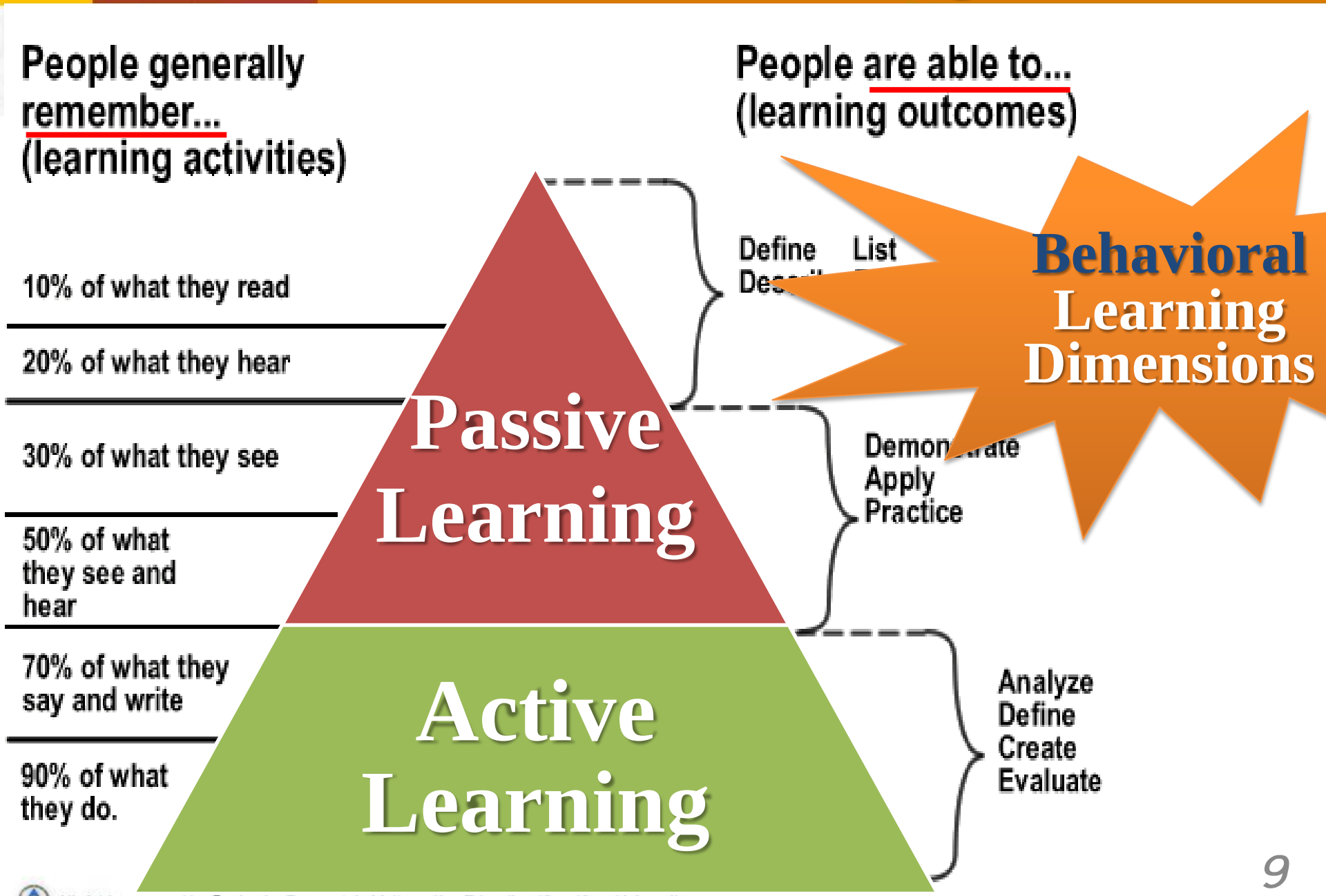
2008

2010

Teaching

In the 20th Century for active learning

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.**"

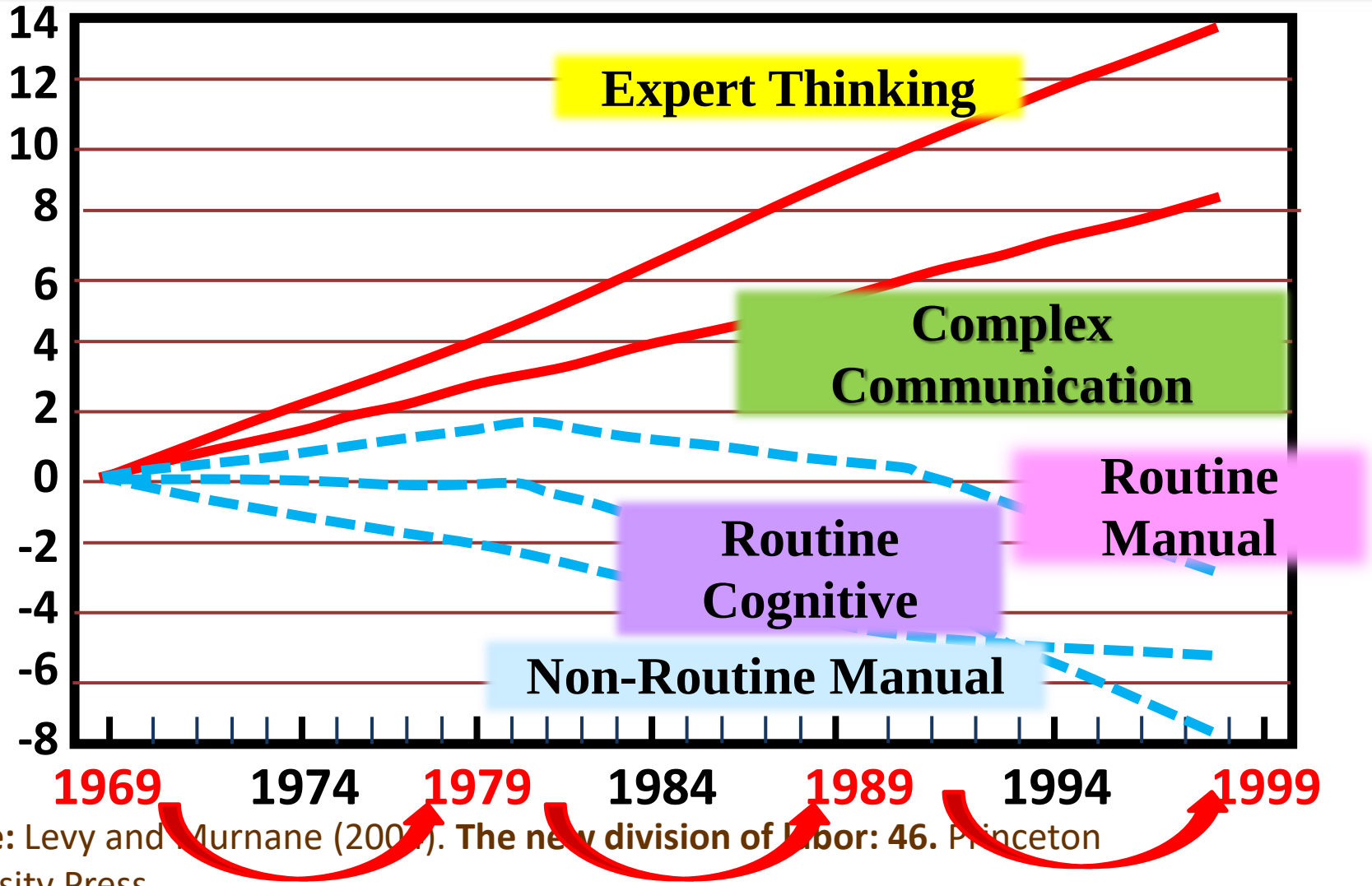
Metacognition roughly means "awareness of their own thinking" or, "Thinking of Thinking“ (Flavell, 1975)

Metacognition is a driving force while students are solving the problem. (Lesh, Silver, Schoenfeld, 1982)

Paradigm Shift about Demanding Skills for the 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)

Format of Lesson Plan

Necessity of Lesson Plan

(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-

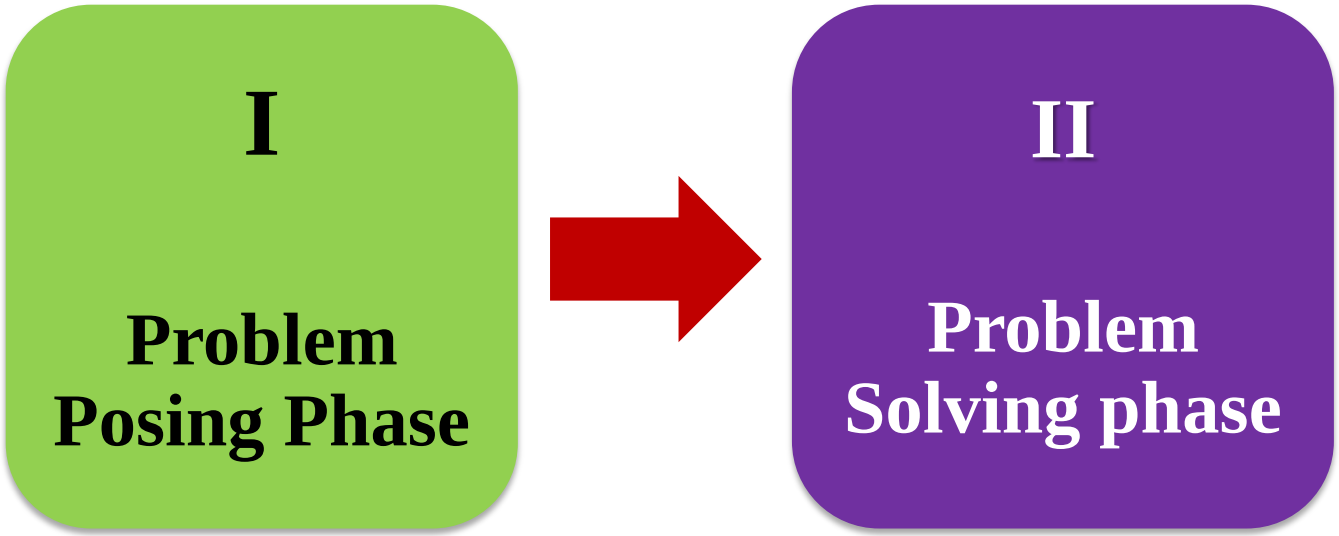
focusing on Problem Solving phase, especially to get right answer"

But

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

New ideas for Teaching mathematics in schools

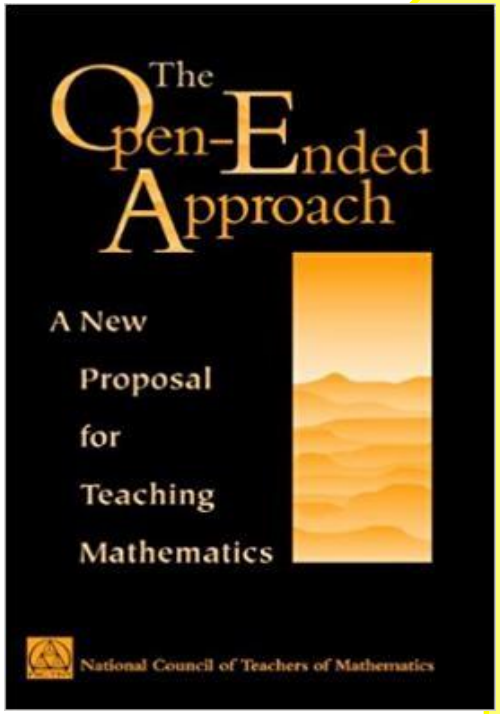
Two Phases of Teaching mathematics



How to develop/pose rich mathematical tasks to students?

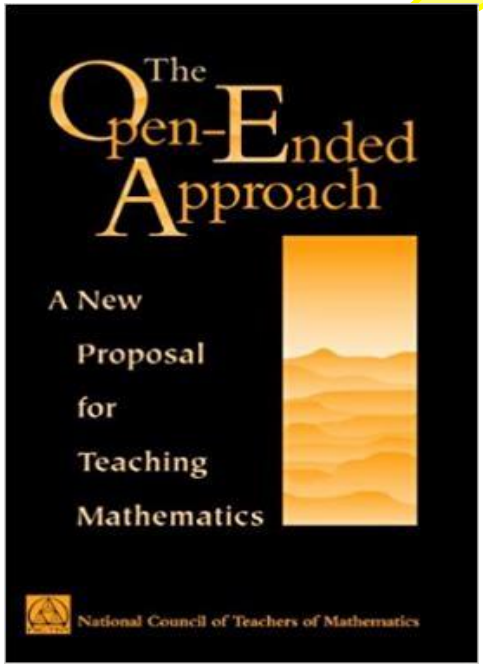
How to provide chances for students to collaboratively solve their own problem in the classroom?

Developing mathematical tasks based on "Open-ended Problems"



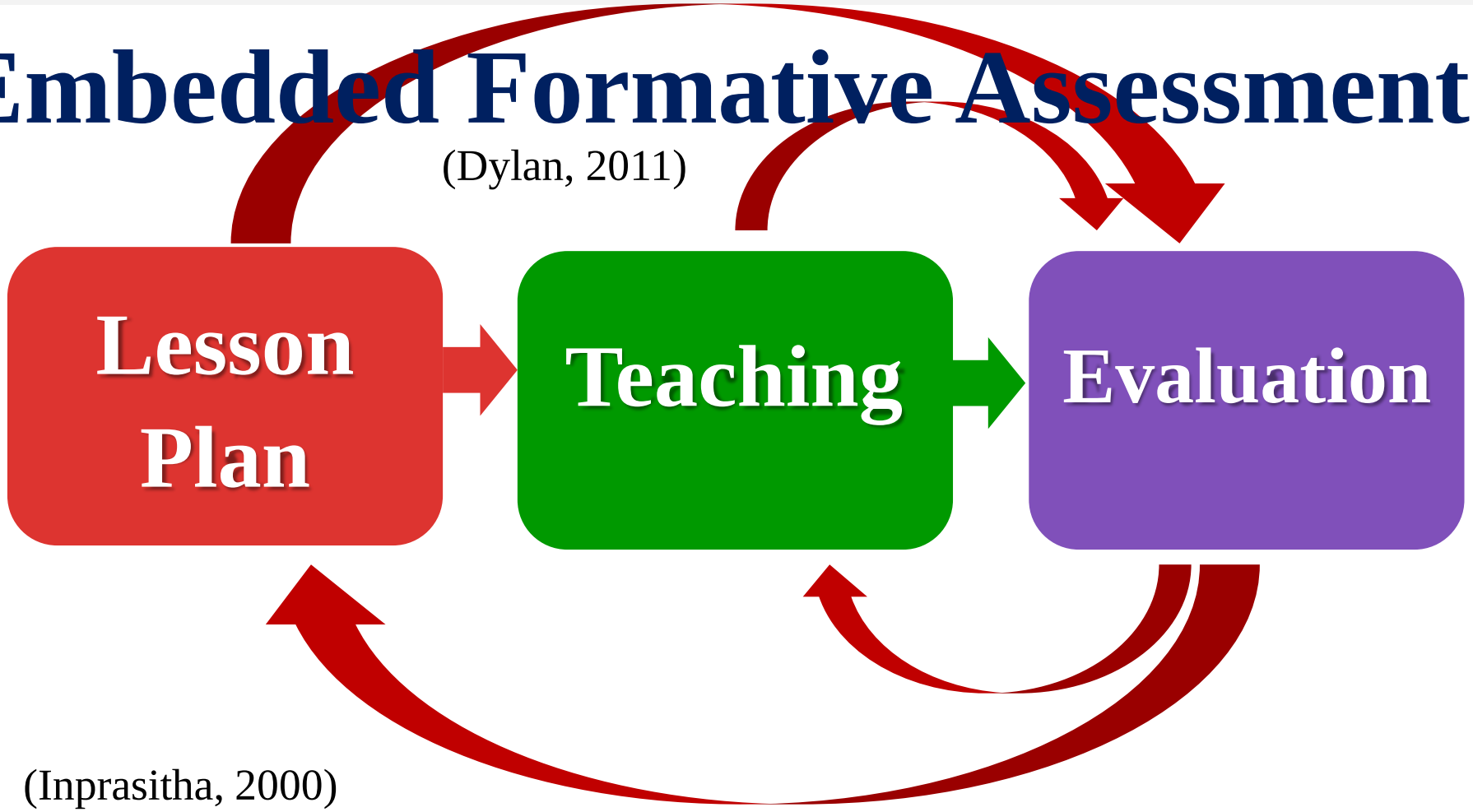
TRADITIONAL PROBLEMS used in mathematics teaching in both elementary and secondary school classrooms have a common feature: that one and only one correct answer is predetermined. The problems are so well formulated that answers are either correct or incorrect (including incomplete ones) and the correct one is unique. We call these problems ***"complete"*** *or* ***"closed"*** *problems.*

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



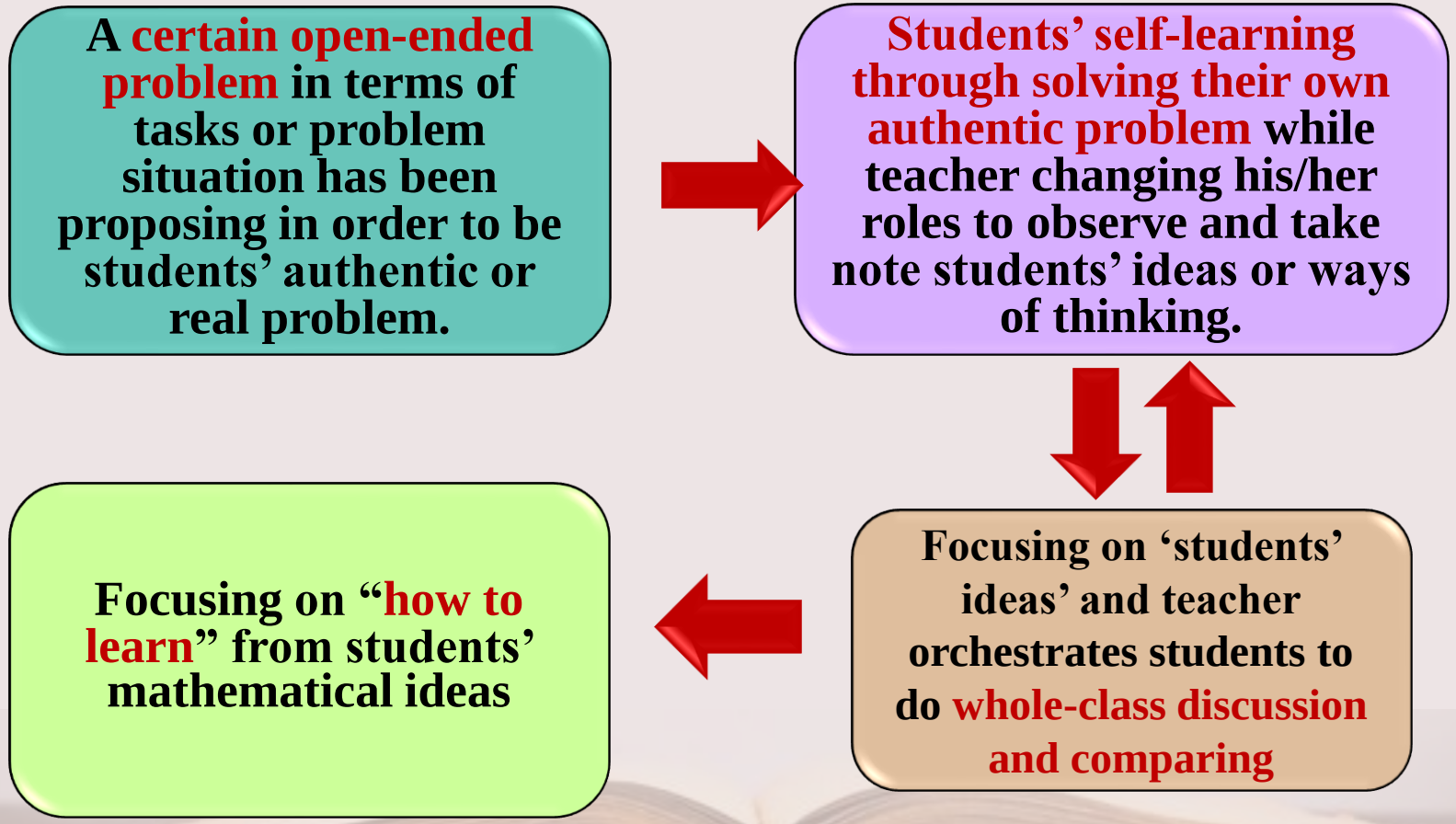
In the teaching method that we call an "open-ended approach," an "incomplete" problem is presented first. The lesson then proceeds by using many correct answers to the given problem to provide experience in finding something new in the process. This can be done through combining students' own knowledge, skills, or ways of thinking that have previously been learned.

Lesson Study bringing 'Assessment' to drive all classroom teaching processes



“Open Approach” as an Innovation for Teaching Mathematics in the Classroom

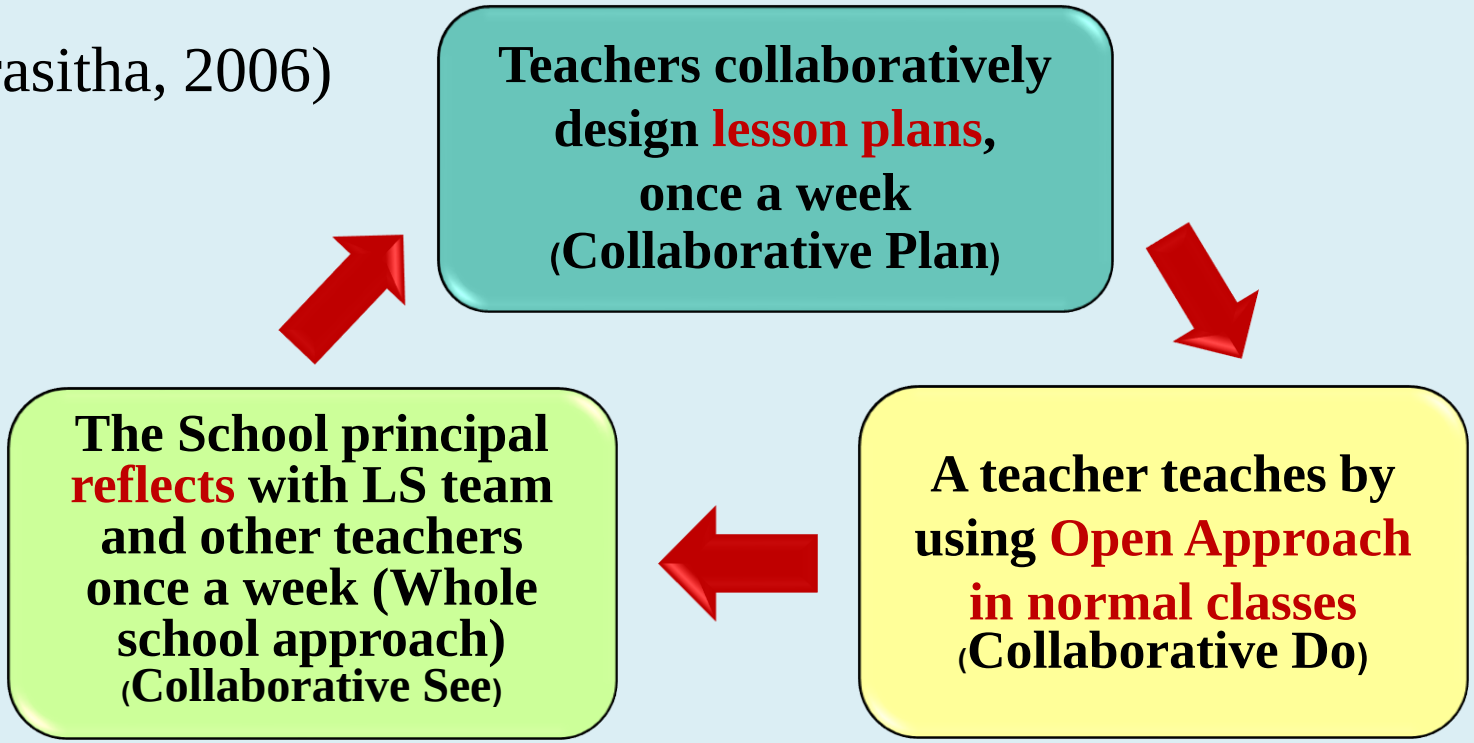
Open Approach



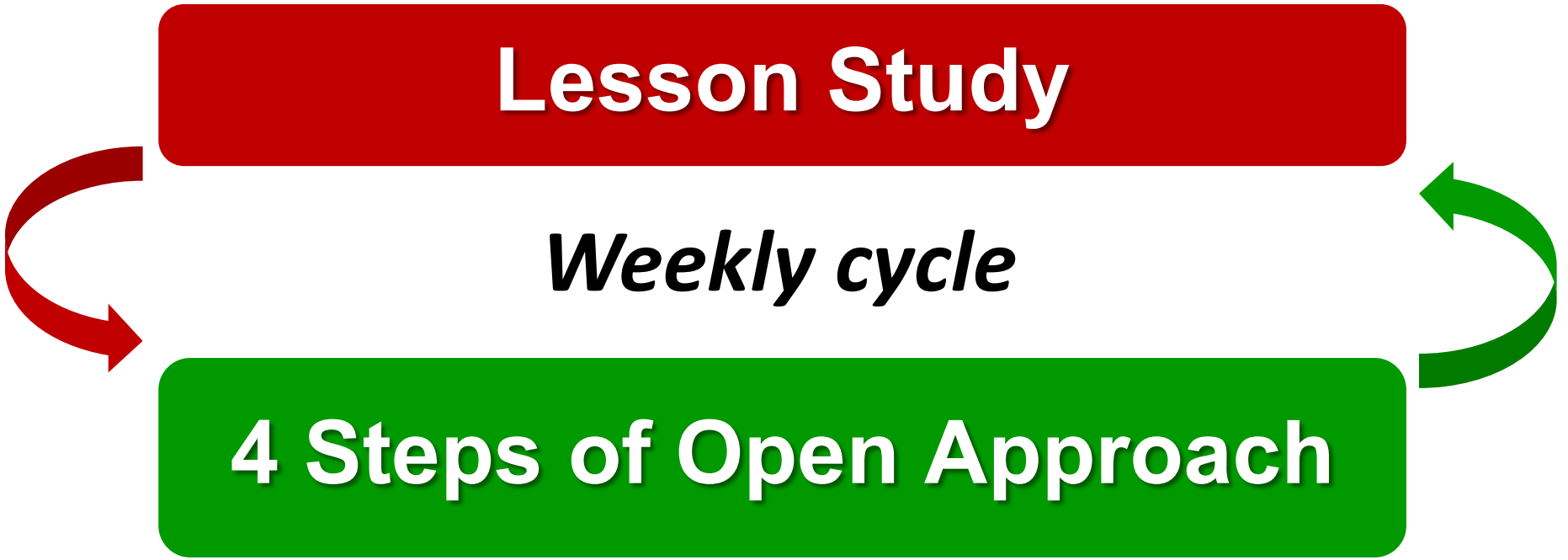
(Inprasitha, 2016)

Weekly Cycle of Lesson Study

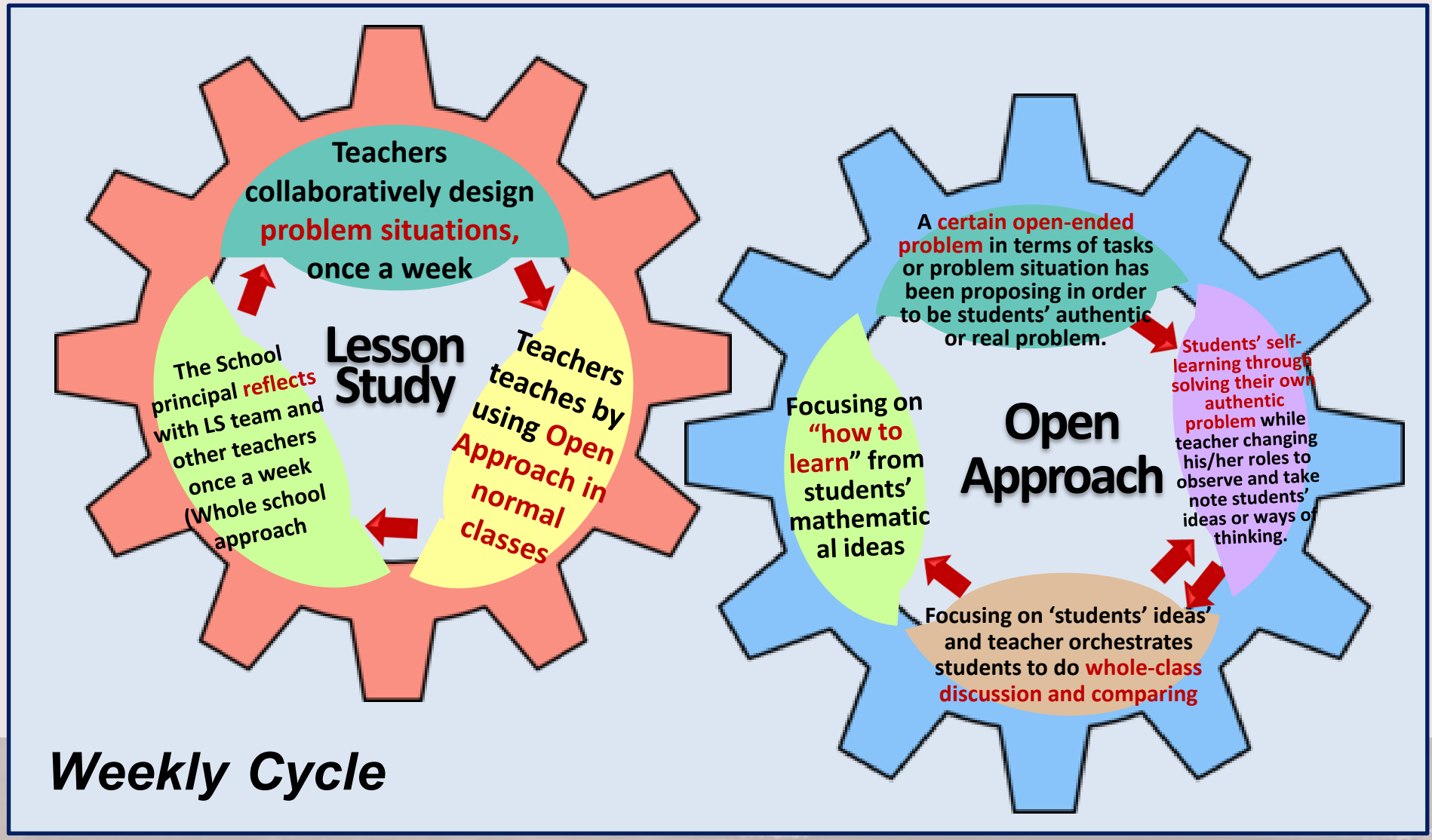
(Inprasitha, 2006)



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



Open Approach Lesson Study:
An Adaptive Innovation for teaching Mathematics



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 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.,