# *Lesson Study: Planning for/as learning*

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# *Lesson Study: Planning for/as learning*

- Lesson Study (teachers)
  - Collaboration
  - Lesson Plan
  - Inquiry
  - Practice
  - Learning
- Problem Solving (students)
  - Culture
  - Inquiry
  - Propose
  - Communication
  - Learning

# *Lesson Study: Planning for/as learning*

1. Japan and the US
2. Around the world (Canada)
3. Teacher and student's role

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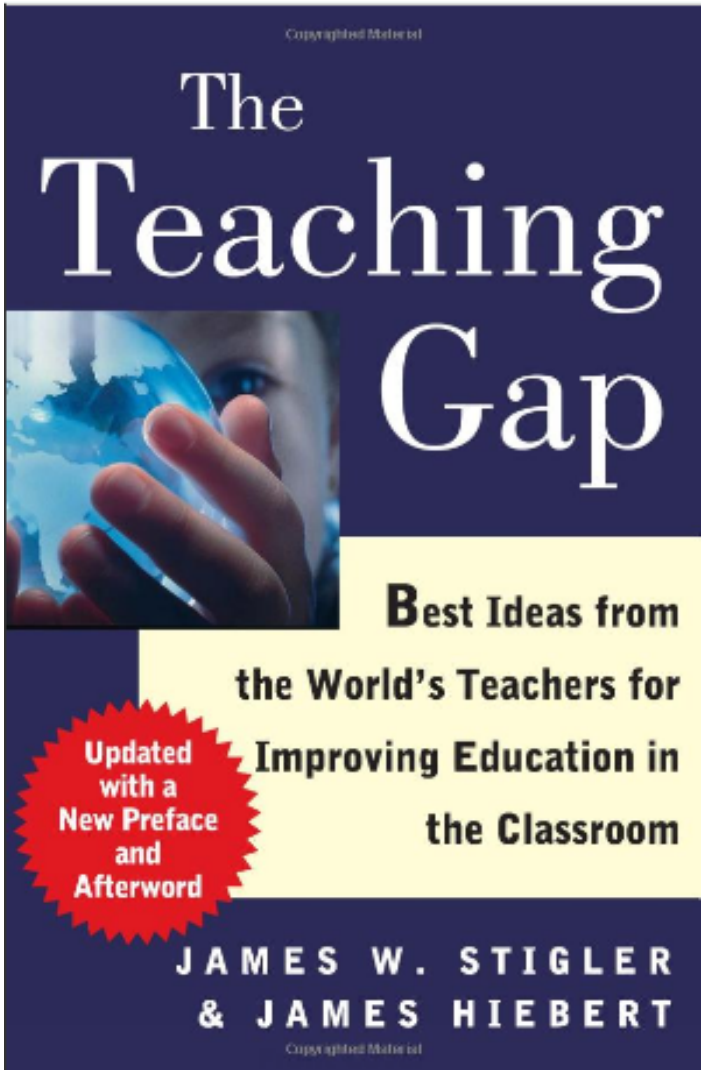
# *TIMSS video study 1995*

Comparative study (Grade 8)

- US
- Japan
- Germany

Lesson Study




Stigler, J., & Hiebert, J. (1999). *The teaching gap: Best ideas for the world's teachers for improving education in the classroom.* New York: The Free Press.

# *TIMSS 1995*

Comparing teaching between

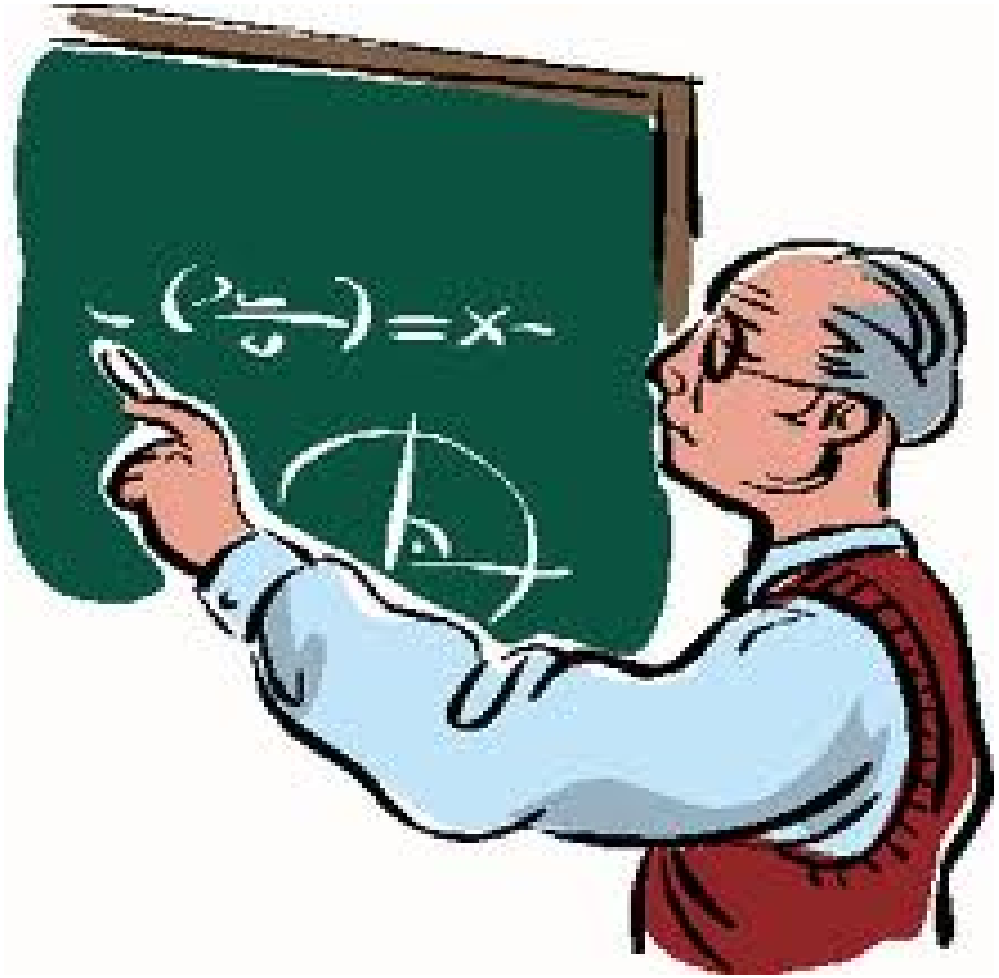
US

and

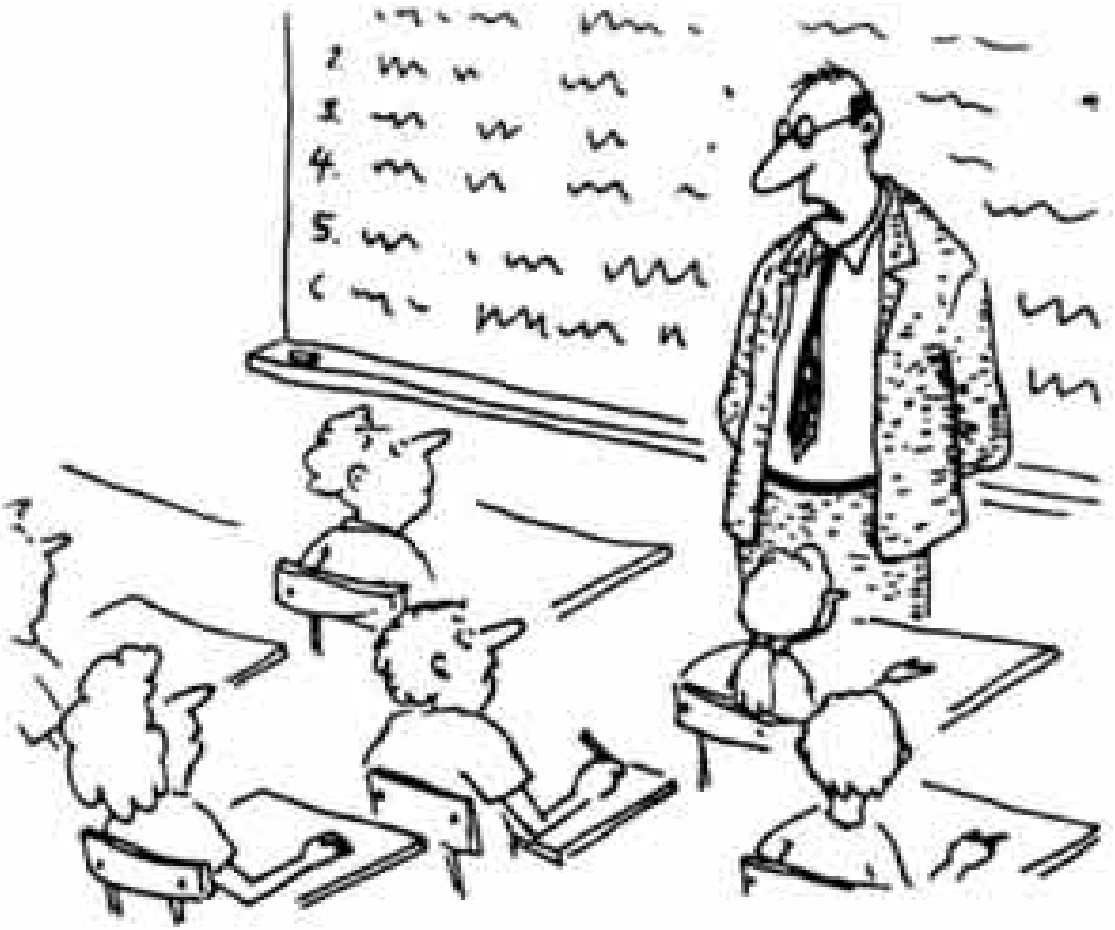
Japan

## *US. Lesson starts with:*
## *Teacher instructs students in a concept or skill*

# *US. Teacher solves example problems with class*



## *US. Students practice on their own while the teacher assists individual students*



*"I expect you all to be independent, innovative, critical thinkers who will do exactly as I say!"*

***Japan. Lesson starts with:***
***Teacher poses complex thought-provoking problem;***
***students approach the problem***

# *Japan. Class discusses the various students' solution methods*

# *Japan. The teacher summarizes the class' conclusion and students practice similar problems*

# *Mathematics Lessons*

US

1. Teacher instructs students in a concept or skill.

2. Teacher solves example problems with class.

3. Students practice on their own while the teacher assists individual students.

JAPAN

1. Teacher poses complex thought-provoking problem.

2. Students struggle with the problem.

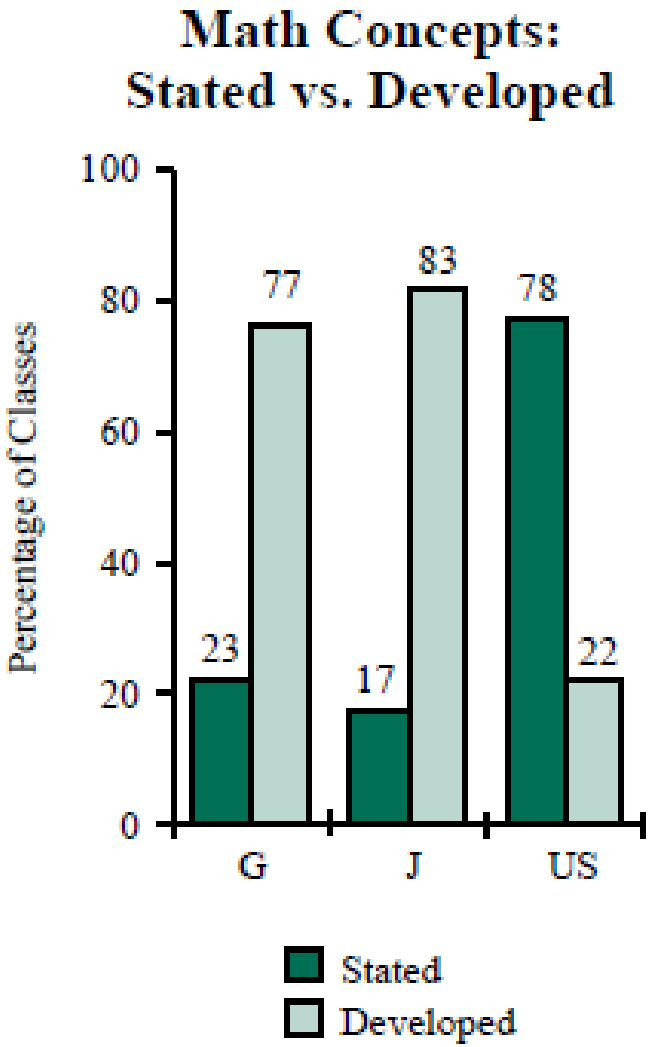
3. Various students present ideas or solutions to the class.

4. Class discusses the various solution methods.

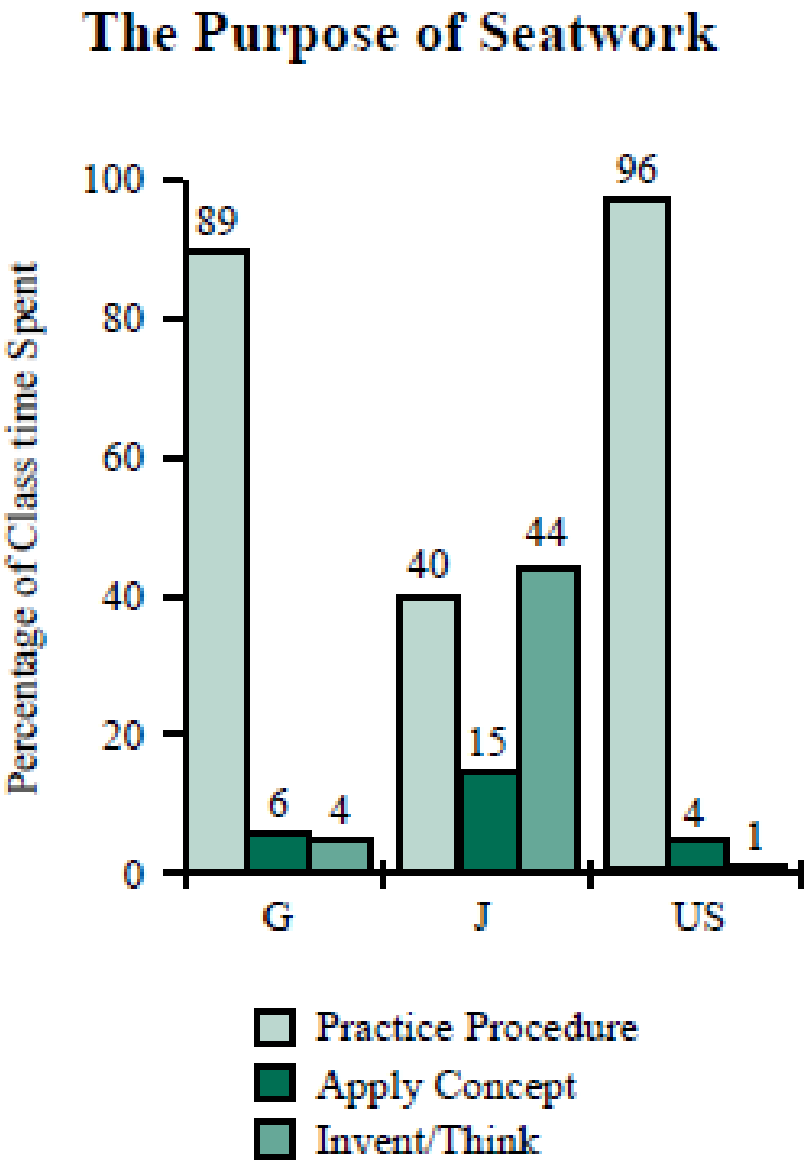
5. The teacher summarizes the class' conclusions.

6. Students practice similar problems.

# Stating vs Developing



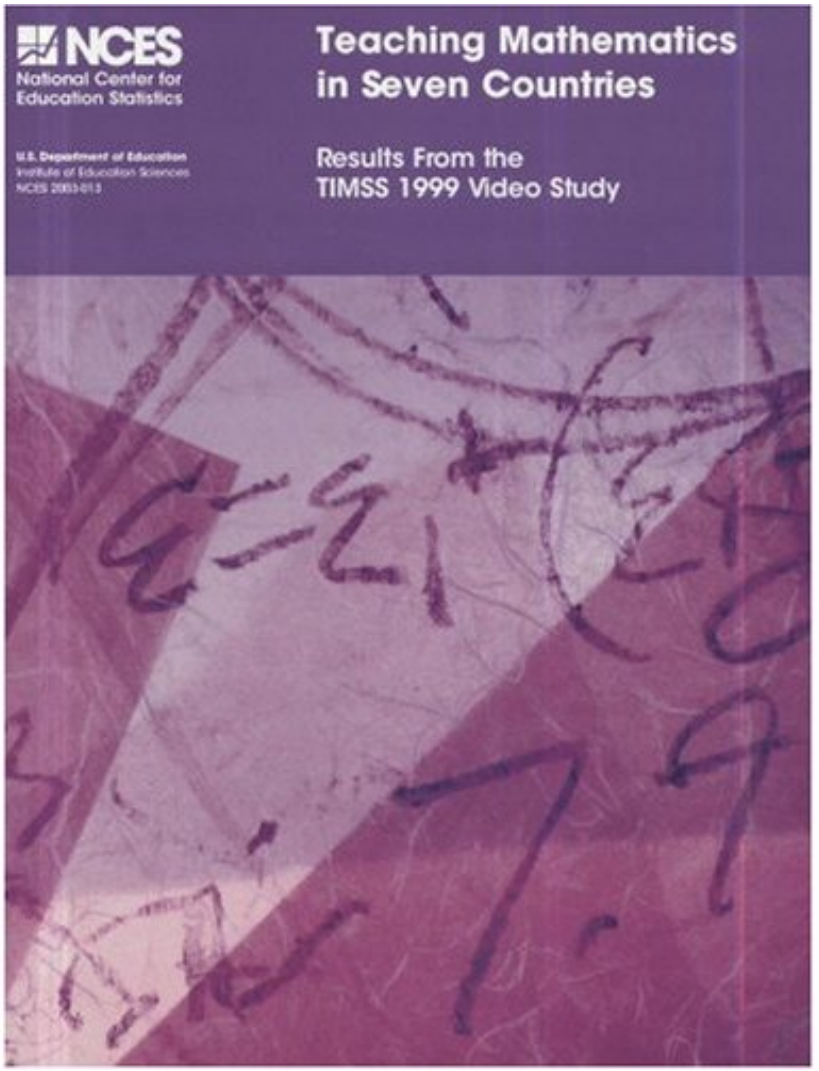
# Students' activity



# *TIMSS video study 1999*

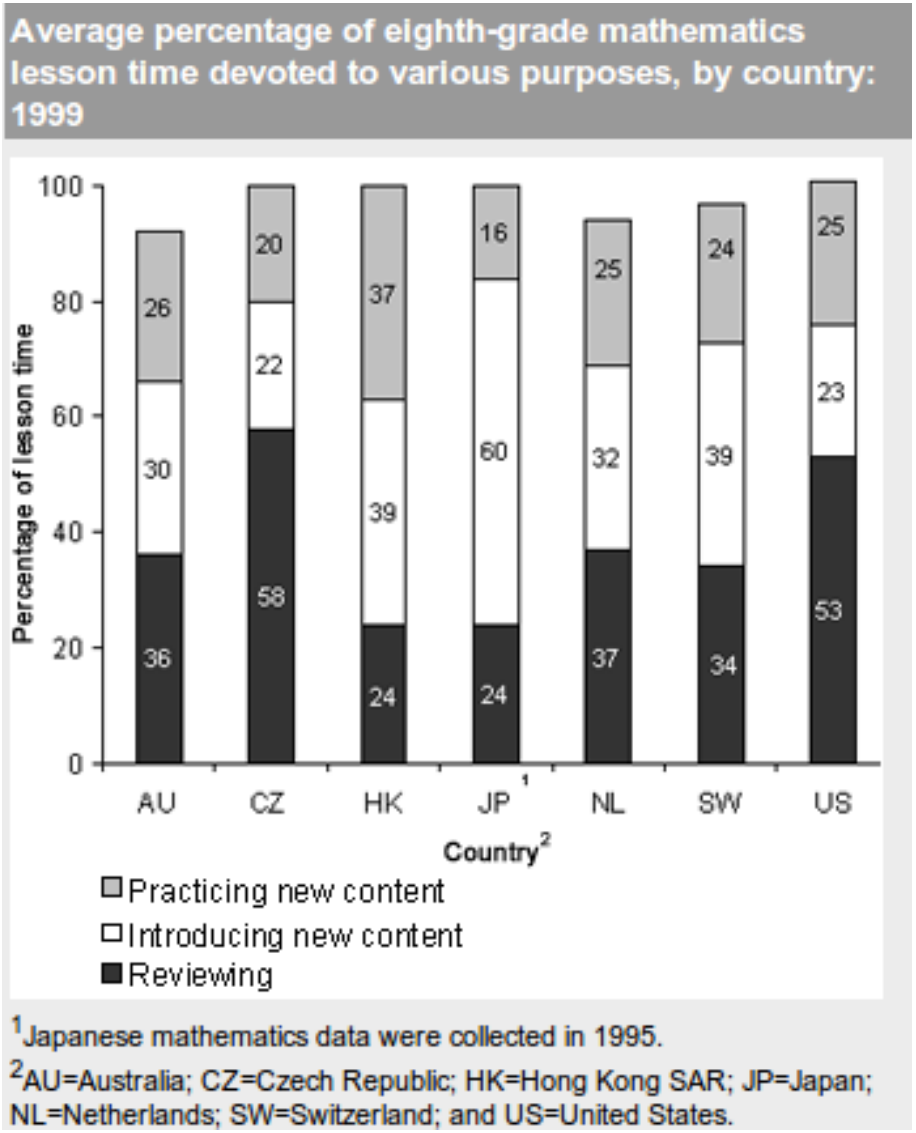
Comparative study
Grade 8

US
Japan
Hong Kong
Netherlands
Australia
Czech Republic
Switzerland




Hiebert, J., et al. (2003). *Teaching Mathematics in Seven Countries: Results from the TIMSS 1999 Video Study,* NCES (2003-013), U.S. Department of Education. Washington, DC: National Center for Education Statistics.

# Comparing seven countries




"no single method of teaching eighth-grade mathematics was observed in all the relatively higher achieving countries"

# *Conclusions*

In the TIMSS 1999 Video Study, the U.S. displayed a unique system of teaching, not because of any particular classroom feature but because of a constellation of features that **reinforced attention to lower-level mathematics skills**.

Hiebert et al. (2005). Mathematics teaching in the United States today (and tomorrow): Results from the TIMSS 1999 Video Study. *Educational Evaluation and Policy Analysis, 27,* 111-132.

# *Constellation*

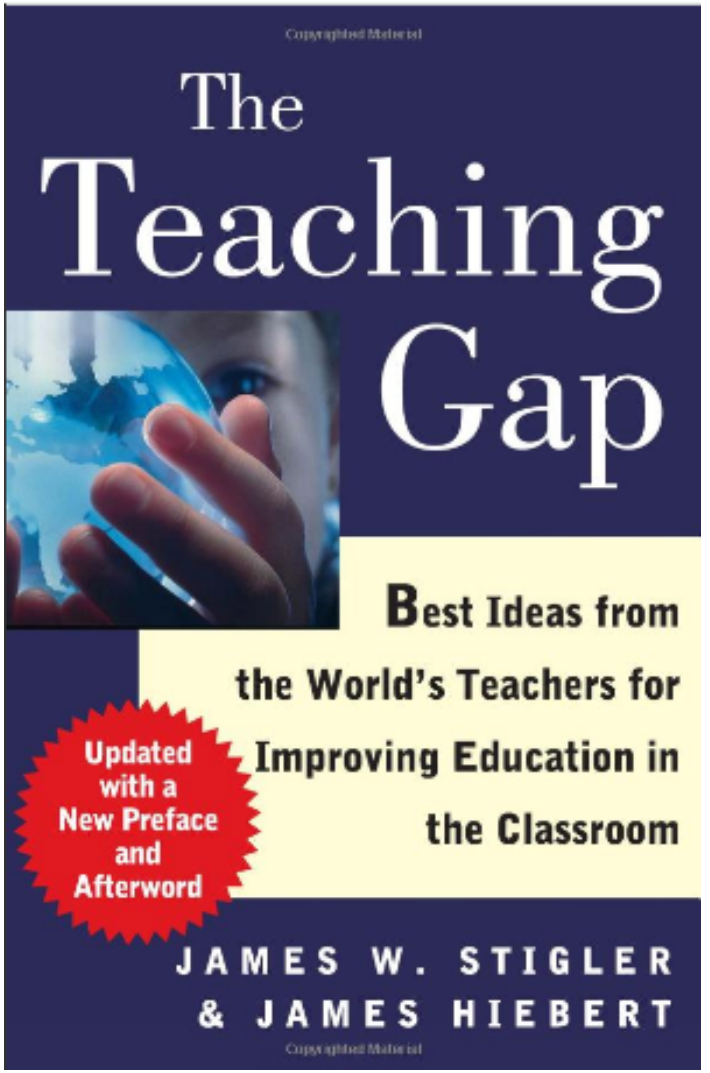
1. Low level of mathematical challenge
   - Prevalence of routine exercises
   - Practicing familiar procedures
   - Relatively elementary content
   - Absence of mathematical reasoning
2. Emphasis on procedures
3. Emphasis on review
4. Fragmented lessons: Mathematically and pedagogically

# Lesson Study

Comparative study (Grade 8)

- US
- Japan
- Germany

Lesson Study

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# *Lesson Study (kenkyu jugyo)*

1. Define goals (**School mission** and goals for the lesson)
2. Lesson plan designed collaboratively
3. Implementation of the lesson (observed by the team)
4. Debriefing
5. Redesigning of the lesson
6. Second implementation (observed by the team, the school and external guests)
7. Debriefing (all observers participate)
8. Publishing the experience nation-wide

# School mission statement
(example)

1. Fostering knowledge—Students who study hard.
Students who seek wider knowledge, have the desire to learn autonomously, who understand and learn from others, and who are sensitive to others.

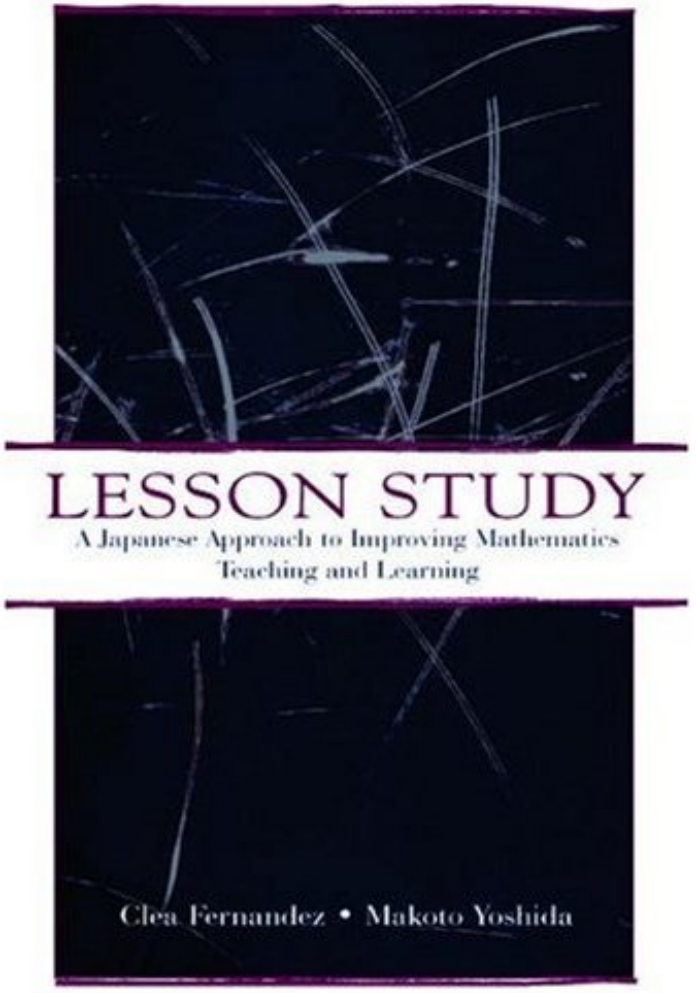
2. Fostering healthy hearts and minds—Students who can help others.
Students who encourage other students, who can think about other people's point of view and feeling, and who can help others in order to grow together.

3. Developing a healthy body—Students who have strong/healthy bodies.
Students who have a strong willpower and bodies and who are tenacious in accomplishing their goals.

# *Lesson Study in Japan*

Description of lesson study in Japan.

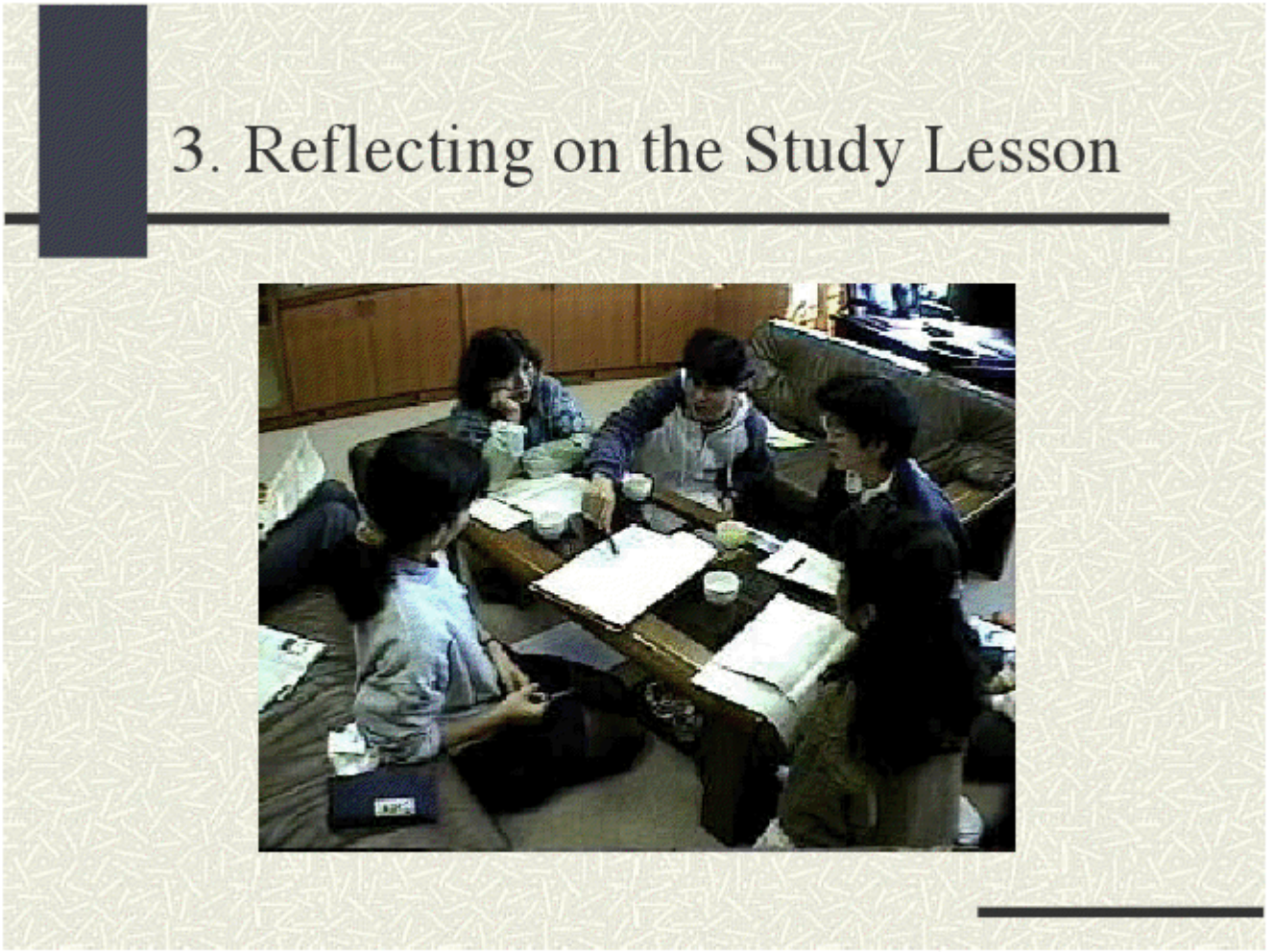
Detailed presentation of one cycle of Lesson Study




Fernandez, C., & Yoshida, M. (2004). *Lesson Study: A Japanese approach to improving mathematics teaching and learning*. Mahwah, NJ: Lawrence Erlbaum Associates.

# *A team in lesson study*

| |
|---|
| **2 first grade teachers** |
| **2 second grade teacher** |
| **The vice-principal** |

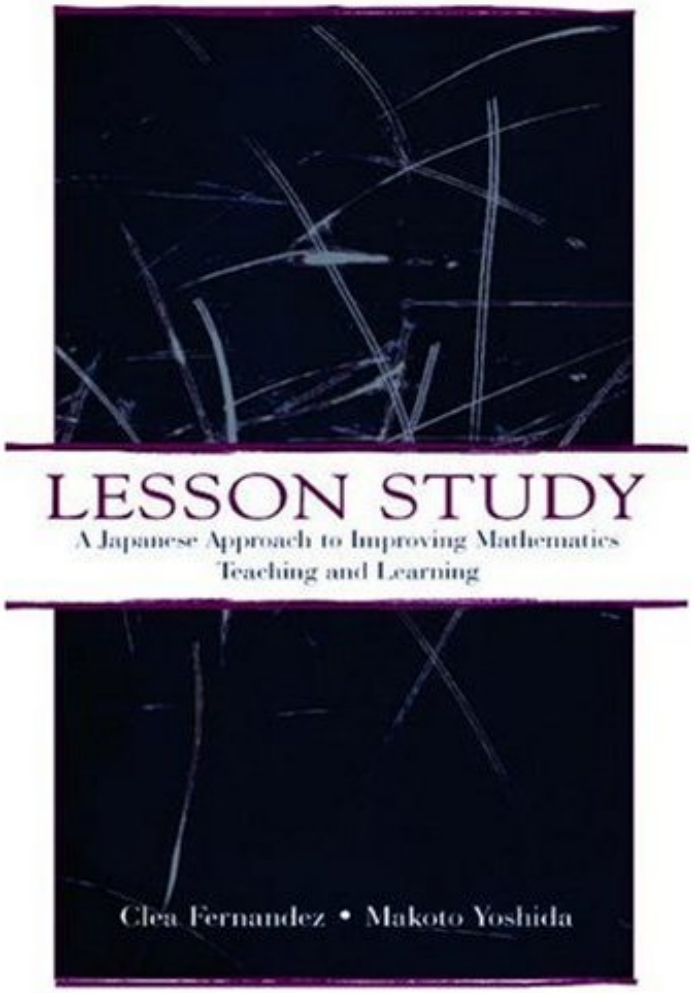


# *Planning the lesson*

Detailed lesson plan

Creation of manipulative tools

Rehearsal of the lesson



# *Lesson Study: Planning for/as learning*

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2. **Around the world (Canada)**
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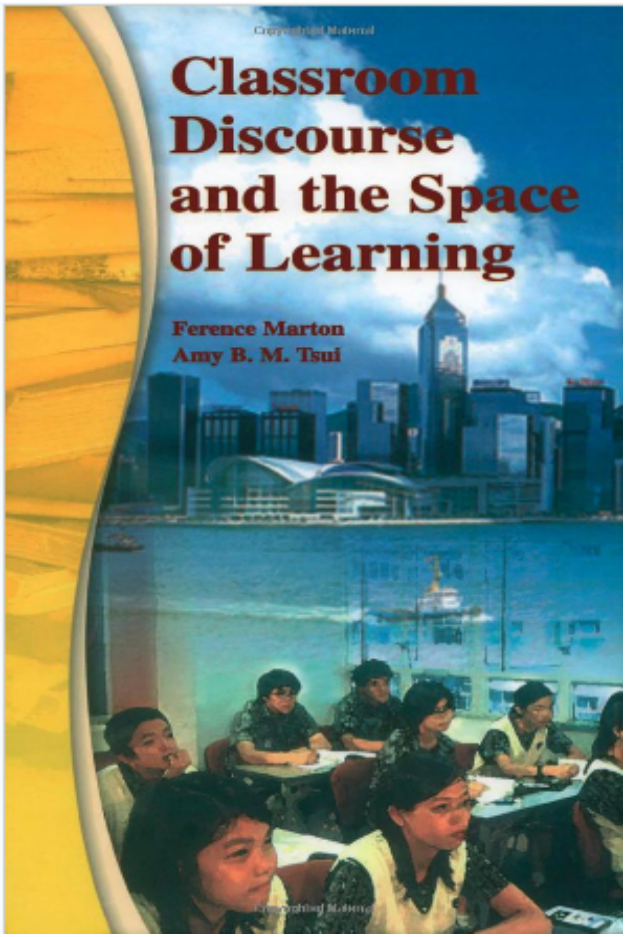
# Learning Study (UK and Hong Kong)

Pre-test and Post-test

Variation theory




Marton, F., & Tsui, A. B. M. (Eds.). (2004). *Classroom discourse and the space of learning*. Mahwah, NJ: Erlbaum.

# *World Association of Lesson Studies*

Annual meetings in Hong Kong since 2005-2010. Japan 2011.

International Journal (coming soon)

# *Lesson study in Canada*

Calgary Regional Consortium

PIMS — Alberta & British Columbia

Galileo Educational Network

- Larger group with regular meetings
- Participants solve mathematical problems
- Lessons are designed in smaller groups
- Lessons may not be observed
- Results of the lessons are shared with the larger group

# *Teacher's collaborative design*

Lesson Study (Japan, US, Canada, ...)

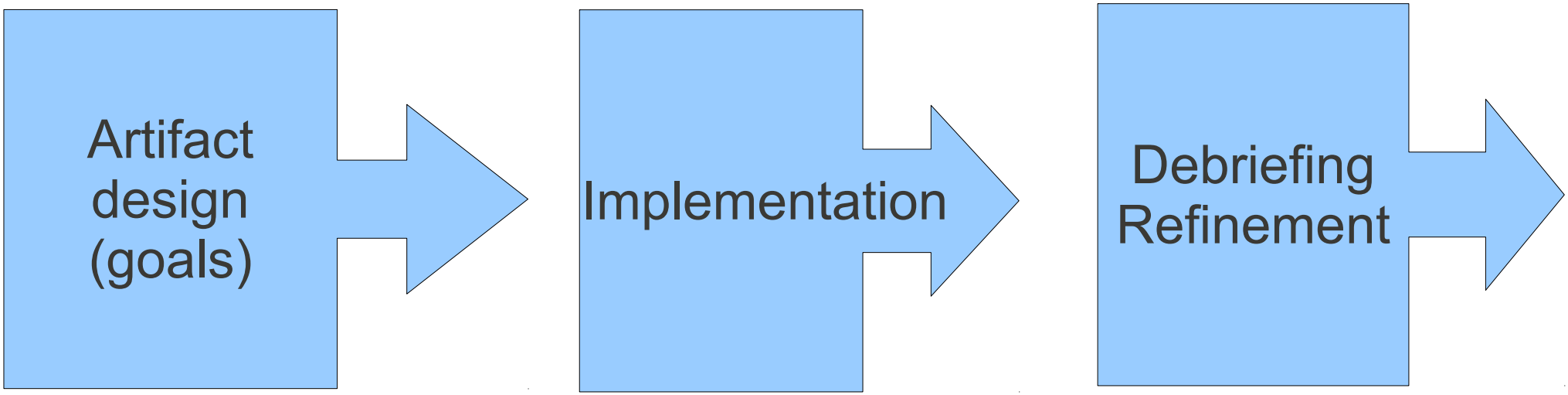
Learning Study (UK, Hong Kong, ...)

Communities of Inquiry (UK)

Supported teachers collaborative inquiry (US)

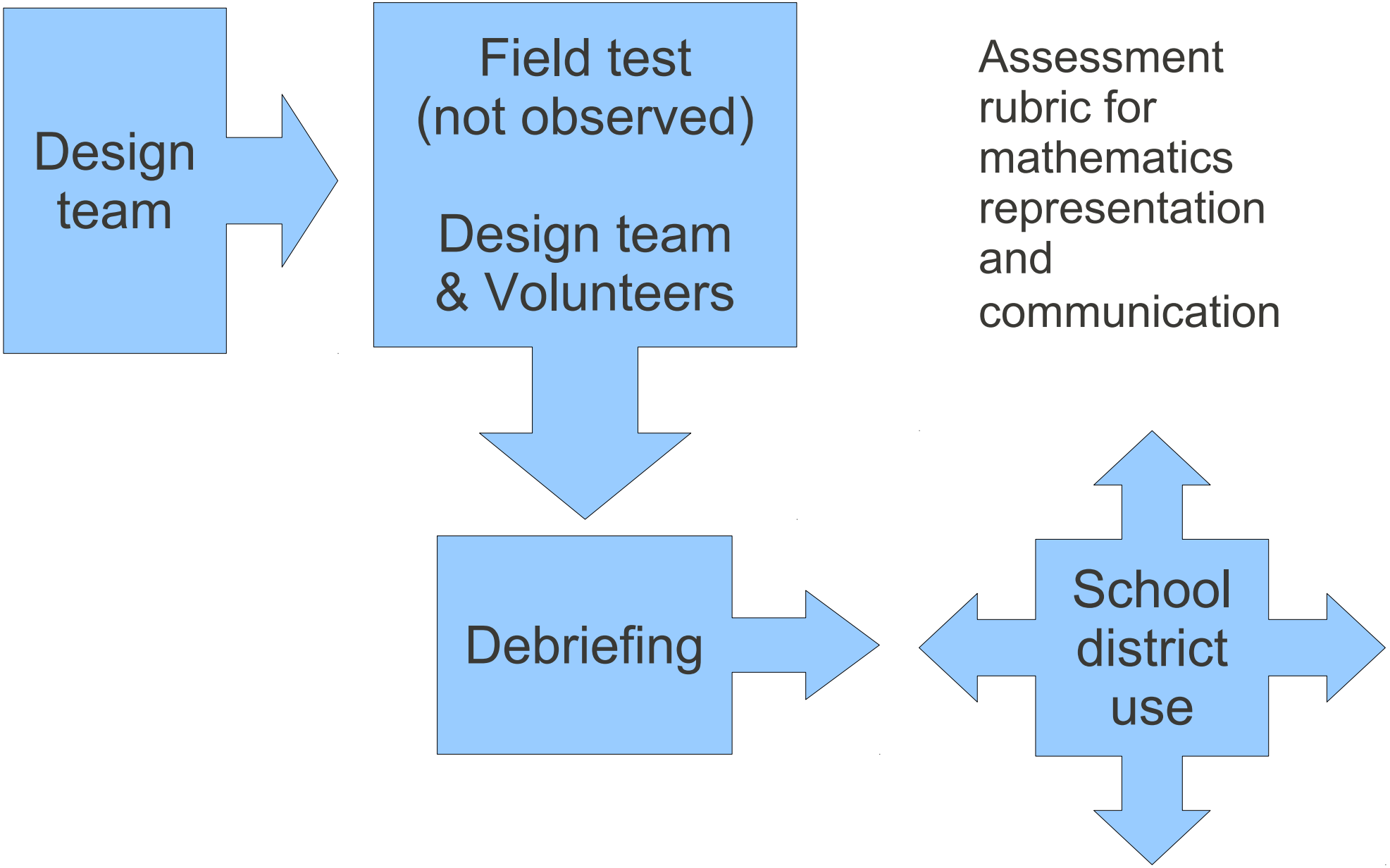
Concept Study (Canada)

# *Teachers' collaborative design*




Artifact: Lesson plan, assessment rubric, mathematical task, class project, etc.

# *Example: School district initiative, BC*




Assessment rubric for mathematics representation and communication

# *School district initiative, BC*

In five years, it came from fifty six percent to eighty four percent. ... And the grade fives were doing much better ... they were about seventy and now they are about ninety percent. ...

[Teachers] changed their teaching practices, the kids have gone better because they are incorporating teaching representation and communication into their math. ...

I would say this type of model, although [some teachers] are not part of the team, the effects of the team are the change in [teaching] practice more widely than I think it was anticipated.

Professional Development Coordinator

## *Summary*
## *Teachers' collaborative design*

- Different forms of design for teaching and learning in mathematics — e.g. lesson study, learning study, concept study, etc.

- Problem solving as a means to develop mathematical concepts is present in all these forms.

# *Lesson Study: Planning for/as learning*

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## *Find the sum of the numbers inside the rectangle*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |

## *Find the sum of the numbers inside the rectangle*

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| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
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| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
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| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |

# *Mathematical content*

## Concepts

- Arithmetic properties
- Average

## Processes

- Conjecture
- Deduce
- Verify
- Explain

# *Problem solving*

Teaching **for**

Teaching **about**

Teaching **through**

# *Teaching **for** Problem Solving*

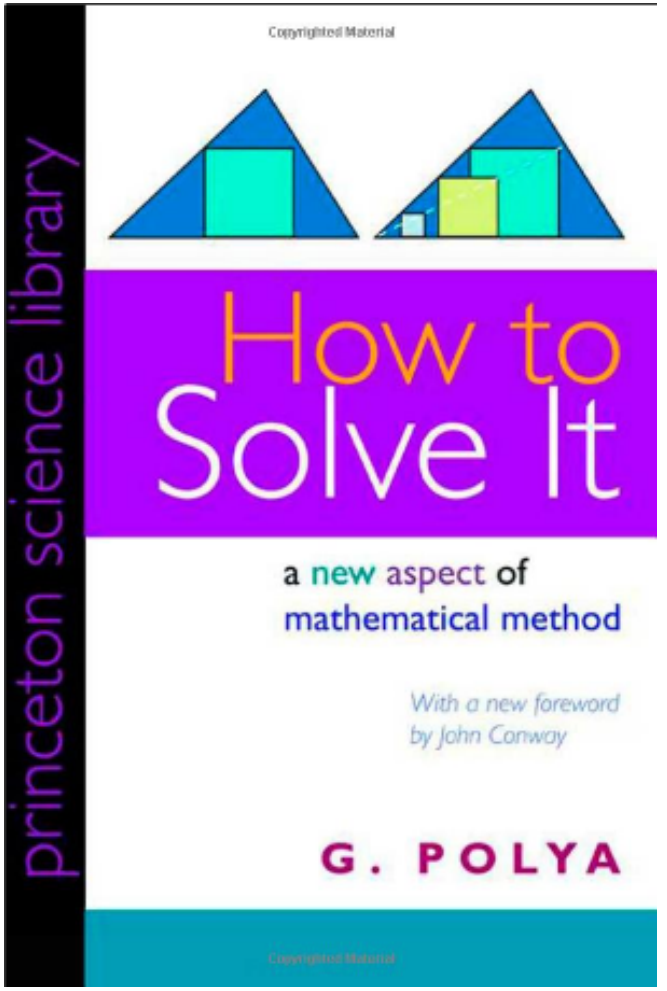
Students must know hot to solve the problem in advance.

This often entails mastering of given procedures and methods before start solving the problems.

# *Teaching **about** Problem Solving*

Polya's "How to Solve it"

1. understanding the problem,
2. devising a plan,
3. carrying out the plan, and
4. looking back.



# *Teaching **through** problem solving*

1. Students solve a problem in order to discover/use a mathematical principle—deliberatively selected by the teacher.

2. The main idea is stressed by comparing different form of solving the problem.

3. When summarizing, the concept is introduced based on the experience of had solved/approached the problem.

# *Lesson Study (teachers' collaborative design)*

Problem solving as a means to develop mathematical concepts

Students generate their own solutions

Students compare/discuss different solutions

# *Three-phase lesson: Suggestion for lesson planning*

1. **Introduction**. It may include motivation and review.

2. **Main task**. Students focus on one problem. They struggle and share different solutions/approaches. They may generalize some results.

3. **Conclusion.** Teacher summarizes the lesson stressing the main ideas used during problem solving (introduction of mathematical concepts).

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