

DG7: IMPROVING TEACHER PROFESSIONAL DEVELOPMENT THROUGH LESSON STUDY

Co-Chairs:

Toshiakira Fujii, Tokyo Gakugei University, Japan

Akihiko Takahashi, DePaul University, U.S.A.

Team Members:

Susie Groves, Deakin University, Australia

Yo-An Lee, Sogang University, South Korea

THE PURPOSE OF DG 7

- The purpose of the DG7 is to facilitate discussion and initiate collaborative research with colleagues around the world

to seek effective ways to improve teacher professional development through Lesson Study.

The key questions to be addressed by DG7

- A. What are the key elements of Lesson Study that can help teachers gain mathematical knowledge for teaching?
- B. What are the key elements of Lesson Study that can help teachers develop expertise in teaching mathematics effectively?
- C. How can an established effective professional development model such as Lesson Study be translated for use in different cultures?
- D. How can a professional development model such as Lesson Study be adapted for use in pre-service teacher education?

Session 1 (Tuesday, July 10)

Key Questions

- A. What are the key elements of Lesson Study that can help teachers gain mathematical knowledge for teaching?
- B. What are the key elements of Lesson Study that can help teachers develop expertise in teaching mathematics effectively?
 - Chair: Toshiakira Fujii (Tokyo Gakugei University, Japan)
 - Discussant: Susie Groves (Deakin University, Australia)
 - Panel:
 - Jennifer Lewis, Wayne State University, U.S.A.
 - Yoshinori Shimizu, University of Tsukuba, Japan
 - Akihiko Takahashi, DePaul University, U.S.A.
 - Tad Watanabe, Kennesaw State University, U.S.A.
 - Nobuki Watanabe, Kyoto University of Education, Japan
 - Reporter: Yo-An Lee (Sogang University, South Korea)

Session 2 (Saturday, July 14)

Key Questions

- C. How can an established effective professional development model such as Lesson Study be translated for use in different cultures?
- D. How can a professional development model such as Lesson Study be adapted for use in pre-service teacher education?
- Chair: Akihiko Takahashi (Co-Chair)
- Discussant: Lim Chap Sam, Universiti Sains Malaysia, Malaysia
- Panel:
 - Kouichi Nakamura, Tokyo Gakugei University, Japan
 - Anika Dreher, Ludwigsburg University of Education, Germany
 - Don Gilmore, The Metropolitan State College of Denver, U.S.A.
 - Berinderjeet Kaur, Nanyang Technological University, Singapore
 - Thomas E. Ricks, Louisiana State University, U.S.A.
- Reporter: Yo-An Lee (*Sogang University, South Korea*)

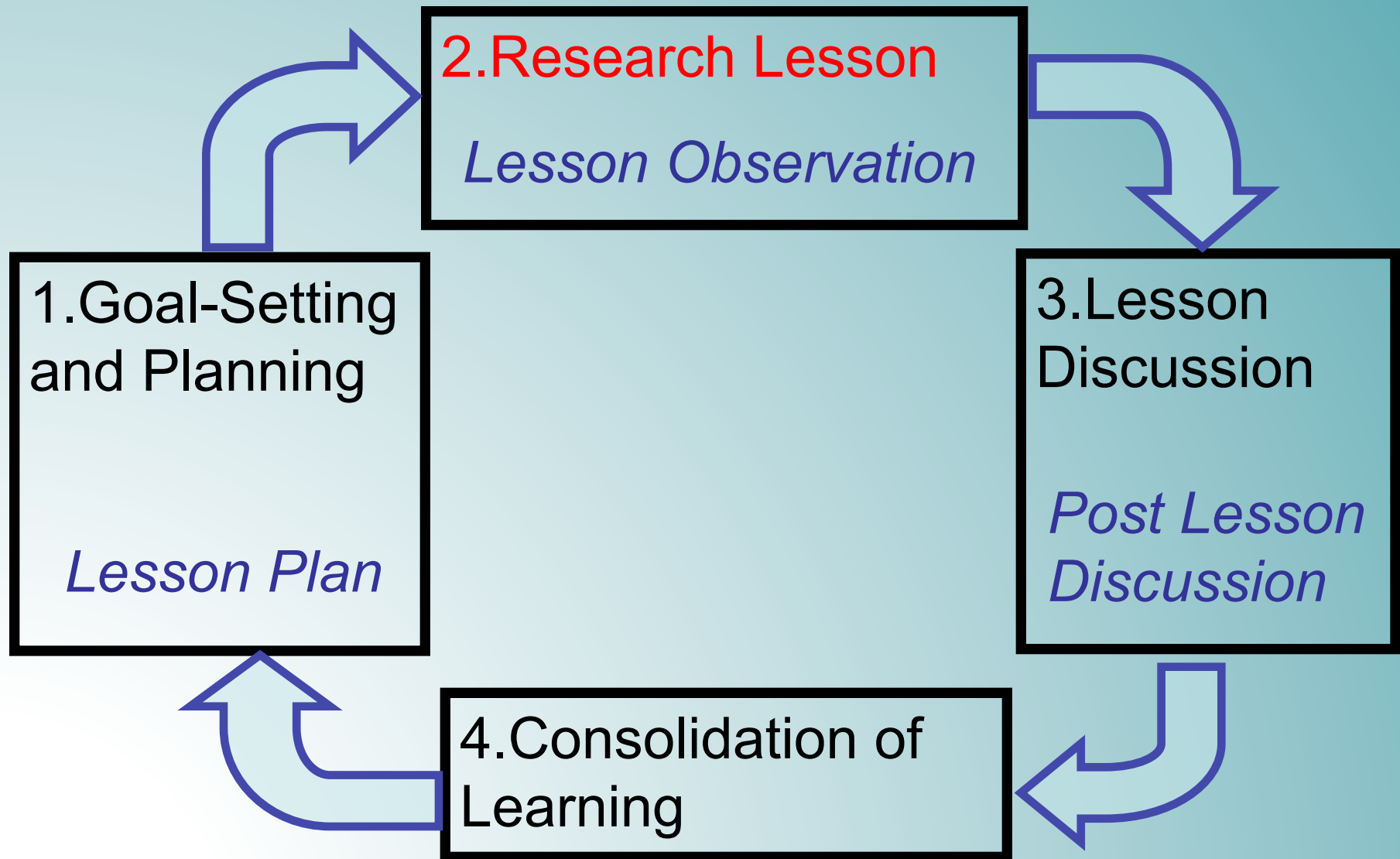
TODAY WE ARE FOCUSING ON:

- A) What are the key elements of Lesson Study that **can help teachers gain mathematical knowledge for teaching?**
- B) What are the key elements of Lesson Study that **can help teachers develop expertise in teaching mathematics effectively?**

Session Schedule

- Introduction –
Explanation of goals & structure of the sessions (10 min)
- Comments addressing Key Questions by the panel (5 min each, total 25 min)
- Discussion (20~30 min)
- Summary and proposals for action (10 min)

Lesson Study Cycle (Lewis (2002))



Lesson Study Cycle

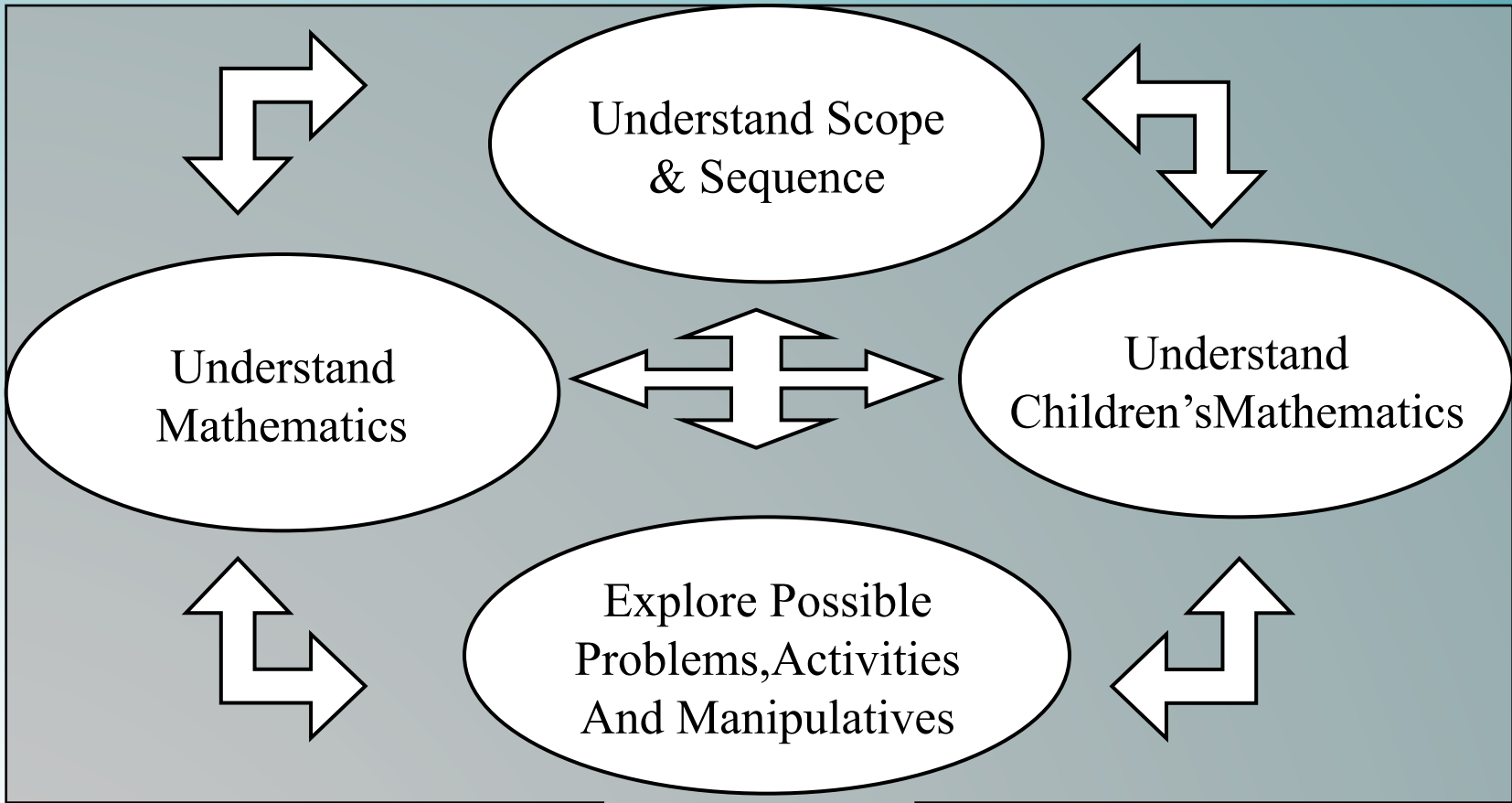
Lesson study is **not** just
about improving **a single**
lesson.

It's about building
pathways for ongoing
improvement of
instruction.

In lesson study, teachers must attend to a very important step in the **research process** called *kyozaikenkyu*

(rough translation = research on teaching materials)

kyozaikenkyu is both study
and research on teaching
materials
from mathematical
and educational point of view
as well as
from the students' point of
view



Tad Watanabe, Akihiko
Takahashi and
Makoto Yoshida(2008)



国際算数数学授業研究プロジェクト
International Math-teacher Professionalization Using Lesson Study

Pedagogical Values

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graph TD; A([Pedagogical Values]) --- B([Understand Scope & Sequence]); A --- C([Understand Children's Mathematics]); A --- D([Understand Mathematics]); A --- E([Explore Possible Problems, Activities And Manipulatives]); B --- C; D --- E;
```

Understand Scope
& Sequence

Understand
Children's Mathematics

Understand
Mathematics

Explore Possible
Problems, Activities
And Manipulatives

教師は授業で勝負する

**A lesson is
the proving
ground for
teachers**

Lesson Study: Discussion Group 7

12th International Congress on Mathematics Education
July 2012
Seoul, South Korea

Jennifer Lewis
Wayne State University, USA



What are the key elements of Lesson Study that can help teachers gain mathematical knowledge for teaching?

- Curriculum study
- Voices of other teachers
- Contributions of “outside expert”



What are the key elements of Lesson Study that can help teachers develop expertise in teaching mathematics effectively?

- **Research lesson**
 - puts ideas to the test of practice
 - opens up disclosive space for teachers
 - both levels the playing field and acknowledges expertise
 - conceives of teaching as a complex package
- **Occupational crossroads**
 - puts instruction as object of study
 - maintains the complexity of the work
 - poses teaching as collaborative



Two major types of professional development (Takahashi, 2011)

- Phase 1 professional development focuses on developing the knowledge for teaching mathematics,
 - through reading books and resources, listening to lectures, and watching visual resources such as video and demonstration lessons.
- Phase 2 professional development focuses on developing expertise for teaching mathematics
 - teachers should plan the lesson carefully, teach the lesson based on the lesson plan, and reflect upon the teaching and learning based on the careful observation. Japanese teachers and educators usually go through this process using **Lesson Study**



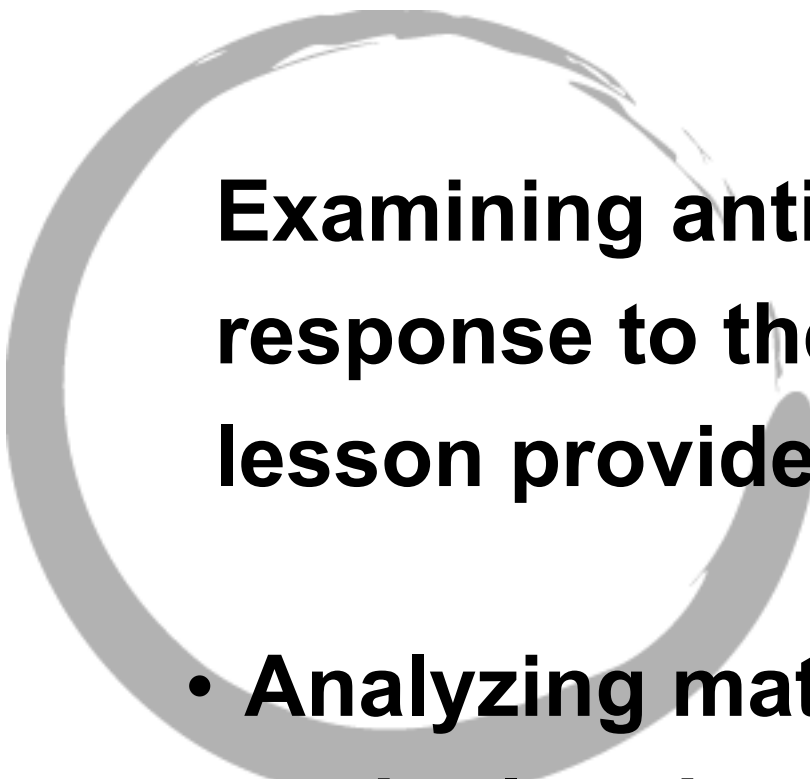
Key Question A

What are the key elements of Lesson Study that can help teachers gain mathematical knowledge for teaching?


Yoshinori Shimizu
University of Tsukuba, Japan

DG7, ICME12
Seoul, July 10, 2012






Examining anticipated students' response to the task in planning a lesson provides opportunity for

- **Analyzing mathematics involved in and related to the task to achieve the goal of the lesson**
 - **Doing mathematical exploration by the teacher him/herself**
- 



**In the post-lesson discussion
mathematical knowledge for teaching
can be facilitated by**

- **A Self-Reflection by the Teacher**
 - **Participants' Questions and
Comments on the Research Lesson**
 - **Comments by the Outside Expert**
- 

Improving Teacher Professional Development through Lesson Study

Key Questions

- A. What are the key elements of Lesson Study that can help teachers gain mathematical knowledge for teaching?
- B. What are the key elements of Lesson Study that can help teachers develop expertise in teaching mathematics effectively?

Observation of live lessons

- Observation of mathematics teaching – i.e., interaction of mathematics, students, and teacher.
- Reflection on practices – to improve practice, i.e., to develop expertise, teachers must reflect on their own practices.

Examination of the whole process of teaching

- Lesson Study provides opportunities for teachers to “slow down” the whole process of teaching and examine it carefully.

Question A

[What are the key elements of Lesson Study that can help teachers gain mathematical knowledge for teaching?]

Making a **Cognition Test** in Lesson Study

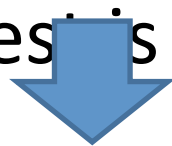
Nobuki WATANABE
Kyoto Univ. of Education
(Japan)

What's a Cognition Test ?

- When teachers will teach a unit of “A”, teachers need and want to gain **children's cognition** for “A”.



- Teachers must make a test to clear the cognition in advance. (The test is a cognition test.)



- The test **consists of** essence of math contents of “A”. Therefore, the test consist of background and between the lines of school textbooks.

↳ But many teachers can't make a cognition tests

Examples of a Cognition Test (Questionnaires and the results)

- Now, **some public schools** are **tackling** to make a cognition test in their lesson study with us.
- And I would like to introduce some cognition test (and the results) that were **made by a public school teachers** in their **lesson study** with us. (The school tackled the lesson study for **3years.**)

Cognition Test

(Children responded them before their studying of the unit.)

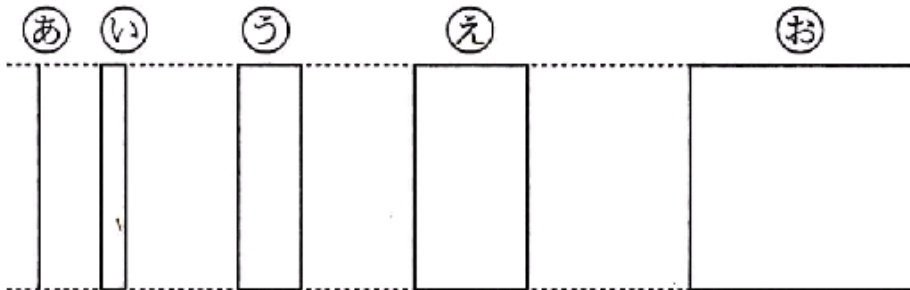
Length (1st grade)

Area (4th grade)

いろいろもんだい<4>

1ねん くみ(全問正解 6%)

(1) つぎの(あ)から(お)の たての ながさは、おなじです。



Which is the most longest?

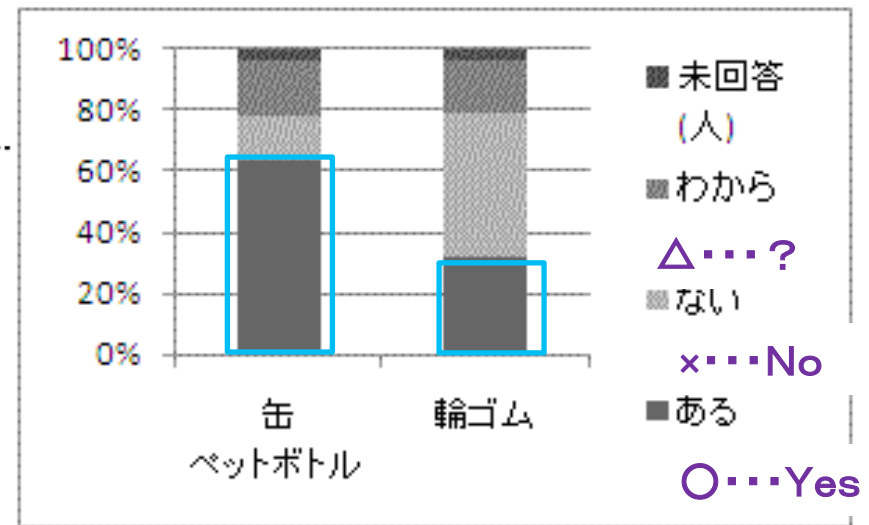
- (あ) (17%) (あ)の たてが ながい
- (い) (13%) (い)の たてが ながい
- (う) (9%) (う)の たてが ながい
- (え) (4%) (え)の たてが ながい
- (お) (24%) (お)の たてが ながい
- (34%) どの たても おなじ ながさ

same

※無答 2%
複数回答あり

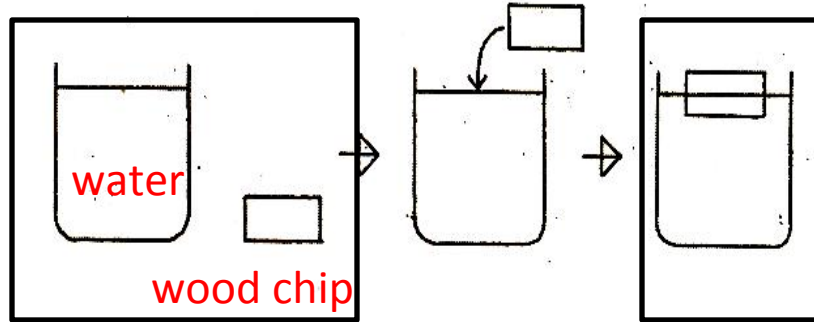
①缶・ペットボトル, ②輪ゴムに, 広さはありますか。
(ある・ない・わからない)

Does ①,② have area?



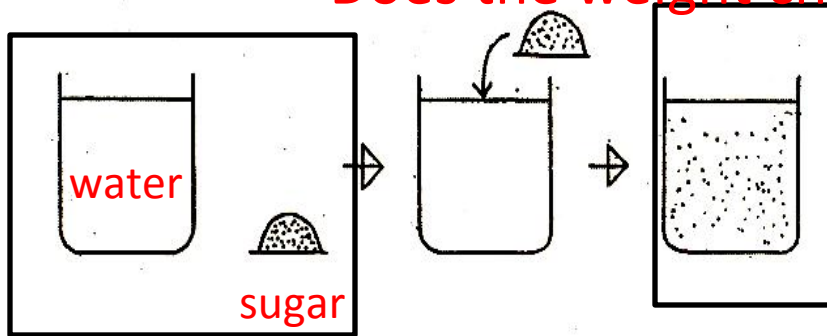
• Weight (3rd grade)

15. 水そうに水が入っています。この水そうに「木」を入れると重さはどうなるでしょう。 **Does the weight change?**



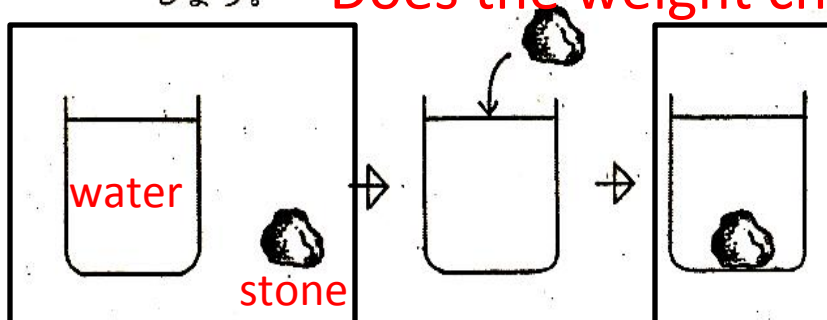
- (32%) ふえる **Gain**
- (2%) へる **Loss**
- (66%) かわらない **Unchanged**

16. 水そうに水が入っています。この水そうに「さとう」を入れると重さはどうなるでしょう。 **Does the weight change?**



- (21%) ふえる **Gain**
- (14%) へる **Loss**
- (65%) かわらない **Unchanged**

17. 水そうに水が入っています。この水そうに「石」を入れると重さはどうなるでしょう。 **Does the weight change?**



- (88%) ふえる **Gain**
- (2%) へる **Loss**
- (10%) かわらない **Unchanged**

Our Proposal

Let's make a cognition test for each units in their Lesson Study.



- Many teachers think that making a cognition test **is very hard work**.
- But when they notice that they **can get a children's cognition**, they make a cognition test **on their own initiative**.



- When they make a cognition test they must study **background and between the lines** of school textbooks for teaching contents.



- So, teachers can gain mathematical knowledge for teaching.

Improving Teacher Professional Development Through Lesson Study

Susie Groves
Deakin University

Key questions

- A. What are the key elements of Lesson Study that can help teachers gain mathematical knowledge for teaching?
- B. What are the key elements of Lesson Study that can help teachers develop expertise in teaching mathematics effectively?

Mathematical Knowledge for Teaching

Careful planning of lesson

- *Kyozaikenkyu* - detailed examination of
 - curriculum
 - mathematical content
 - students' mathematical development & anticipated responses to proposed tasks
- selection of tasks for diagnostic teaching (c.f. Schoenfeld)
 - not just for engagement - need to match aim
 - same aim - different tasks
 - same task - different aims

Expertise in Teaching Mathematics

Research Lessons & post-lesson discussions

- ❑ not about teachers researching & perfecting the lesson
- ❑ teachers research practice *through* lessons
 - puts ideas to the test of practice
- ❑ opportunities for reflection
 - slow down the whole process
 - many fresh eyes
 - contributions of outside experts

From the discussion

Critical research needs

- Knowledge of adaptation of Lesson Study outside Japan
- Explication of mechanisms through which lesson study results in improvement in practice
 - Do we have a model?
 - How do we provide evidence?
- Design-based research cycles

Lewis, Perry & Murata, 2006
