

Lesson Study: *Digging Deeply*

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Lesson Study NL

Utrecht, the Netherlands

Aki Murata

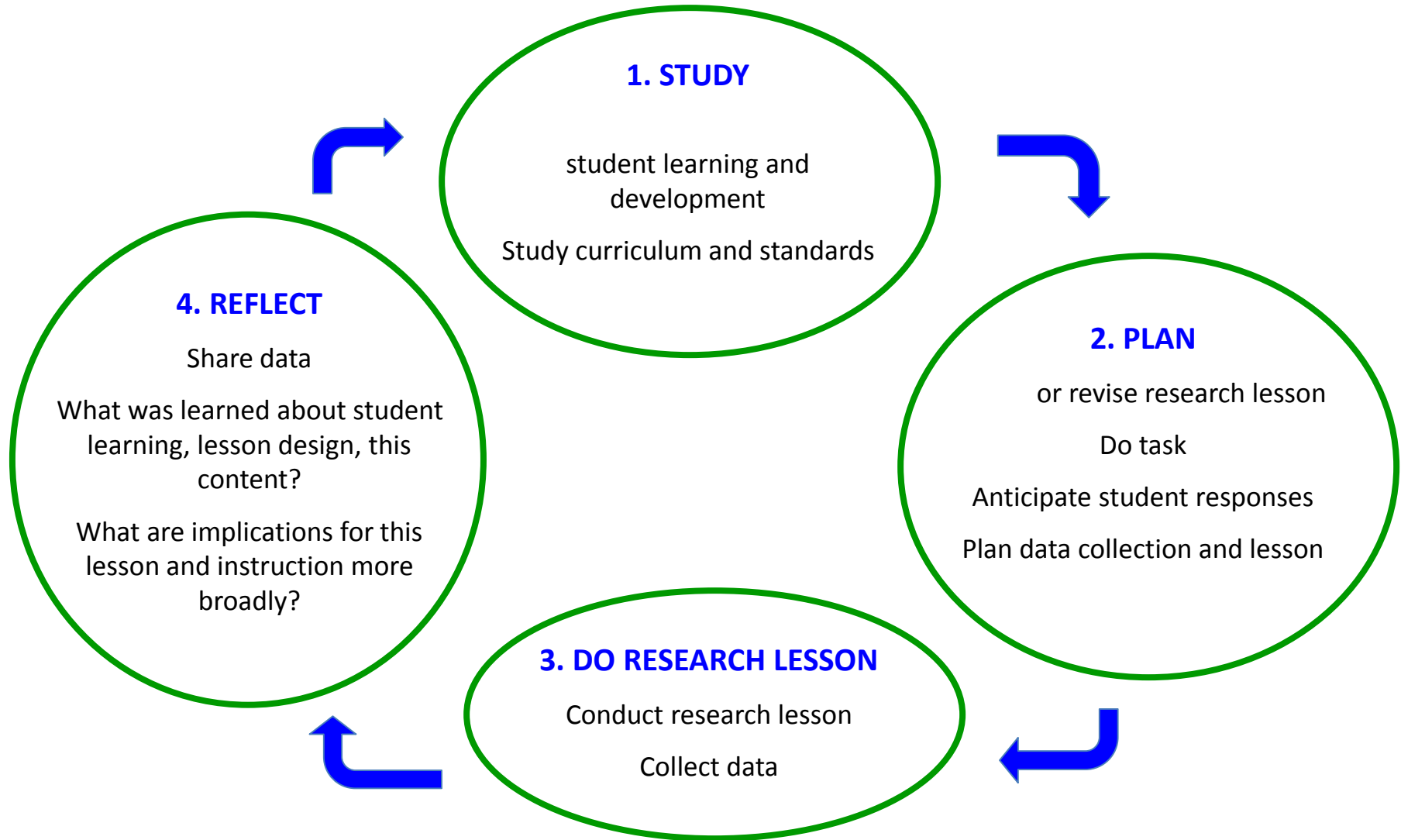
University of Florida

I value different expertise among today's participants ...

In today's session, please imagine you are working with colleagues who are new to lesson study, or working as a mentor teacher to teacher education students, guiding them through lesson study process ...

... in math!

Lesson Study: Basics



Now that you know basic process of lesson study ...

Commonly asked questions:

1. *How do we set different levels of goals for the lesson?*
 - *How do we make the goals relate to the research questions?*
2. *How do we study curricular materials? How do we choose lesson tasks?*
 - *Making student thinking visible.*
3. *How do we anticipate and facilitate student learning in the lesson?*
4. *How do we effectively collect student learning data and use them for debrief?*

Setting Goals

Goal setting

- Long-term goals (developmental, not limited to content learning)
 - *What qualities will students have when they graduate from our school?*
 - *What are the actual qualities now?*
- Lesson goals
 - Content goals
 - “*how*” students learn the content that may relate to your long-term goals

Examples of Goals

- *Big Goals (Development goals)*
 - Take initiative to learn and to support the learning of classmates
 - Are curious, persistent learners
 - Enjoy challenges
- *Lesson Goals (Content goals)*
 - Notice that the area of an unfamiliar figure can be found by transforming it into a familiar figure with the same area
 - Notice that a mathematical pattern can make it easy to solve a problem
 - Discover that it can be convenient to count objects by 2's and 5's
 - Realize that a hidden number in a number chart can be found by looking at the surrounding numbers

Relationship between goals and research questions

Lesson goals must inform research questions

- Lesson/content goals
 - Notice that the area of an unfamiliar figure can be found by transforming into a familiar figure
 - *How do students transfer an unfamiliar figure into a familiar figure, to find the area?*
- Big/development goals
 - Enjoy challenges
 - Indicator of “enjoyment” must be identified in the lesson

Studying Curricular Materials and Planning a Lesson

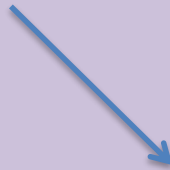
Lesson Planning

Now that you have goals ...

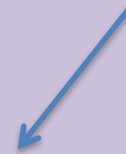
- What is your students' current understanding of the topic?
 - Preassessment?
- How can we bridge the gap between how students are and what we want them to learn?
 - Studying research literature and curricular materials
- Plan a reasonable lesson scenario ...

Theory of Action

1. Classroom Instruction



2. Student experiences



3. Students build mathematical practices,
understanding, and habits of mind

1. Classroom instruction

- Cognitively demanding tasks
 - Open ended problems
 - Requires students to use mathematics to figure out something new
- Emphasizes mathematical practices, not just answer
- Discussion facilitation to connect student ideas
 - Anticipate and select student strategies purposefully
 - Meaningfully use representations to highlight key concepts
- Board shows coherent story of lesson, so students can revisit and make sense of ideas

Curriculum study

- Examine existing curriculum materials
 - Course of study, standards, curriculum
 - Textbooks, online resources, activity plans
- Examine research
 - What research says about student learning of the topic at hand
 - Learning progressions

Cognitive Demand Framework

Low-level: Memorization

- Involves either reproducing previously learned facts, rules, formulas, or definitions or committing facts, rules, formulas or definitions to memory.
- Have no connection to the concepts or meaning that underlie the facts, rules, formulas, or definitions being learned or reproduced

High-level: Procedures with connection

- Focus students' attention on the use of procedures for the purpose of developing deeper levels of understanding of mathematical concepts and ideas.
- Represented in multiple ways, such as visual diagrams, manipulatives, symbols, and problem situations. Making connections among representations helps develop meaning.

Low-level: Procedures without connection

- Are algorithmic. Use of the procedure either is specifically called for or is evident from prior instruction, experience, or placement of the task
- Focused on producing correct answers instead of on developing mathematical understanding

High-level: Doing mathematics

- Require complex and non-algorithmic thinking – a predictable, well-rehearsed approach or pathway is not explicitly suggested by the task, task instructions, or a worked-out example.
- Require considerable cognitive effort and may involve some level of anxiety for the students because of the unpredictable nature of the solution processes required.

2. Student Experiences

- Students “own” the learning process
 - Mathematical practices and prior knowledge help students figure out something new
- Invite productive struggles
 - Effort, revision, comparing different ideas
 - No need to know the answers right away
- Learning together
 - Classmates may offer important ideas and strategies

3. Students Build Mathematical Practices, Understanding, and Habits of Mind

- Students make sense of problems (and math)
 - Exploration and sense making
- Students find and understand how different strategies relate
 - Purposeful use of representations
 - Discussing solutions
- Students understand productive struggle as a part of math learning
 - Cognitively demanding tasks

Lesson (Plan) Format

General Lesson Overview (1)

- Introduction and posing the task
 - Teacher poses the problem, students understand and become interested, relating to prior learning
 - This phase is quick – just enough information, no more!
- Independent problem solving (10 – 20 min)
 - Students bring their own knowledge to bear, and try to develop ways to solve the problem.
 - Independent time before pair or small group share and collaborative work.

General Lesson Overview (2)

- Presentation of students' solution approaches and class discussion (15 – 30 min)
 - Teacher selects and sequences several student strategies to present, according to anticipated student responses
 - Respect and keep the ownership of the ideas to students
 - Ask other students to respond and add to shared ideas
- Connection building

Three-Column Lesson Plan Format

| Lesson Steps (what happens in lesson) | Student responses (what students are doing/thinking) | Points of evaluation |
|---------------------------------------|---|---|
| Introduction | CAREFULLY OUTLINE POSSIBLE STUDENT THINKING, INCLUDING MISTAKES THEY MAY MAKE. FOCUS ON MATH THINKING AND NOT MANAGEMENT ISSUES | MAKE CONNECTIONS TO THE GOALS SET EARLIER IN THE LESSON STUDY PROCESS |
| Independent problem solving | | |
| Sharing of student thinking | | |
| Summary | | |

Facilitating Student Discussions

Five Practices

- Anticipating
 - possible student thinking
- Monitoring
 - what to notice, how to push student thinking
- Selecting
- Sequencing
 - Identify key student strategies and order them
- Connecting
 - Representations

Facilitation Planning

- Envision, play out, and practice different student discussion scenarios
- Practice questioning
 - Drawing out student ideas
 - Helping student articulate and understand different ideas
- Practice representing ideas visually
 - Highlighting math concepts

Sample Lesson Plan

<http://lessonresearch.net/ttp/CPS%20Prieto%202nd%20Grade%20Math%20Lesson.pdf>

- Typical lesson plan for a large lesson study event.
- Topic: Subtraction with unknown change
- Grade 2 lesson

In your small group ...

- Skim the lesson plan
- Discuss in your group what you notice about the lesson plan
- Please focus on the lesson on pages 4 – 6.

Video

<https://vimeo.com/150948964>

Data Collection

Focusing Data Collection

Make plans according to the Research Question of the group

- Through the planning process, the data collection would ideally become very focused and narrow
- In lesson plans, observers will see the *points of evaluation*, that can guide their attention
- Lesson study team may specify and request the observers to collect certain data: e.g., student strategies during independent problem solving, student explanation during discussion

In Lesson Debrief ...

- Facilitator reminds the participants the data collection points again
 - Observers may share their ‘noticings’ on different aspects of the lesson, but the core discussion should be on the particular student learning data
- Lesson study group should reflect and summarize their learning from the teaching, focusing on the data collected and shared.

And moving forward ...

Create and maintain lesson study community where people can share experiences, ask questions, and learn from one another ...!