

Grade 1 Mathematics Lesson Plan  
How many are left? What is the difference?

Date: Saturday, June 25, 2016, 9:00 - 9:45  
Multipurpose Room  
Grade 1 Homeroom 3, 35 students  
Teacher: YAMAGUCHI, Kuniyuki

1 About the Unit

So far in Grade 1, students have learned about the size of numbers and what it means to compare numbers through activities such as making one-to-one correspondences between two groups items or representing them using counting blocks. They have also learned about composition and decomposition of numbers through activities using counters, counting blocks, 10-frame cards and number cards. In the unit, Putting Together and Adding To, they have learned that in situations where two groups are combined or more things are added to a group, they use addition to find the total amount. They also learned to represent those situations using addition equations after making connections among drawings, diagrams, and manipulation of counting blocks.

This unit discusses subtraction. The National Course of Study includes the following goals with respect to the study of subtraction: A Numbers and Calculations (2) Students will understand the meaning of subtraction and be able to use those operations appropriately. D Quantitative Relations (1) Students will be able to represent the cases in which subtraction may be applied by using mathematical expressions and will be able to interpret such expressions.

In this unit, subtraction is introduced in Separate-Result-Unknown situations, then students learn that subtraction is also used in Part-Part-Whole-Part-Unknown (PPW-Part-Unknown) and Compare-Difference-Unknown situations as well. The range of numbers discussed in this unit is 10 and less, thus subtraction of 1-digit numbers without re-grouping. The study in this unit will be the foundation for the future study, leading to the study of calculations with 3 numbers and subtraction with re-grouping. Thus, subtraction may be used to find how many is left after some items are removed (Separate-Result-Unknown) or reduced (PPW-Unknown) or to find the difference between two numbers (Compare-Difference-Unknown).

In teaching all subtraction situations, as was the case with teaching of composition and decomposition of numbers, students will engage in activities to represent problem situations given in words into pictures or diagrams then with semi-concrete materials such as counting blocks so that they can physically manipulate those objects. In Separate-Result-Unknown situations, students may represent the subtrahend by using an arrow in a picture or diagram or by actually removing objects using their hands so that they understand what is left will be the result of the calculations. We want students to identify the similarity between Separate-Result-Unknown and PPW-Part-Unknown situations so that they will understand that the latter situations is also a subtraction situation. In those situations, it is easier for students to grasp the minuend and the subtrahend with actions. In contrast, students have more difficulty grasping the minuend and the subtrahend in Comparison-Difference-Unknown situations because the situations involve 2 sets and making a one-

to-one correspondence between the elements of those sets. Moreover, students have difficulty understanding the removal of all of the items in the one-to-one correspondence. Therefore, one of the emphases in teaching this unit is to help students make sense of the minuend and the subtrahend in Compare-Difference-Unknown situations through the use of pictures, diagrams and manipulation of counting blocks.

By recognizing the act of removing counters is in common with Separate-Result-Unknown and PPW-Part-Unknown situations, students can extend the meaning of subtraction to include Comparison-Difference-Unknown. We want them to be able to represent these situations using subtraction equations.

At the end of the unit, students will engage in an activity in which they will create subtraction word problems of all 3 types using items in a given picture. We want to nurture students' mathematical reasoning ability by making mathematical representations using pictures, diagrams, counting blocks manipulation, and equations.

## 2 Goals of the Unit

- Students will understand the meaning of subtraction and think about ways of calculating with the minuend of 10 or less. They will be able to calculate correctly and apply subtraction in problem situations.
- Students will identify Separate-Result-Unknown, PPW-Part-Unknown and Compare-Difference-Unknown situations in their daily lives, and they recognize the merits of representing them in equations and try to apply subtraction. (Interest, Eagerness, and Attitude)
- Students can see Separate-Result-Unknown, PPW-Part-Unknown and Compare-Difference-Unknown situations as subtraction situations. Students can think about and represent ways of calculating subtraction with the minuend of 10 or less by focusing on the structures of numbers and manipulation of concrete objects. (Mathematical Way of Thinking)
- Students can calculate subtraction with the minuend of 10 or less. (Mathematical Skills)
- Students know the situations in which subtraction is used - such as Separate-Result-Unknown, PPW-Part-Unknown and Compare-Difference-Unknown - and understand the meaning of subtraction. (Knowledge and understanding)

## 3 Relationship between the Unit and the Research Theme

### (1) About the dispositions·abilities we want to nurture in this unit

In the mathematics group, in order to realize lessons in which students create their own mathematics, we utilize lessons that focus on problem solving (*mondai kaiketsu gakushu*). In the learning processes in problem solving lessons, the four dispositions·abilities and "questions" are closely related.

In the stage of grasping the learning task, students will have the question, "What have I learned so far?" and put the problem situations from their daily lives onto the mathematical playing field as the first step of problem solving. In the independent problem solving stage of the lesson, students will ask themselves, "Which of what I have learned may be useful in this problem?" and tackle the problem by comparing it to previously solved problems. However, it is not always possible for students to have their own ideas. Thus, their peers will become an important component of their learning. During the comparison and critical reflection stage, students of compare and

contrast their own ideas with those of their peers to generate better solutions, approaching the goals of the lesson. In this stage, students will ask about the rationale, commonality, differences, and generalizability. During the reflection stage, students will ask about the merits and extend ability of ideas so that they can use what they learned in other situations. In mathematics, we believe the engine for learning is "question." In the process of learning, when one problem is solved, a new "question" arises. "Questions" are continuously generated. What support this learning process is students disposition to tackle problem solving autonomously.

In this unit, the main question will be "What calculation do we use?" In the introduction, students will be asked to reflect on their study of addition through the question, "Can you find the answer using pictures or diagrams?" In order to decide which operation is needed, students will represent problems situations in pictures and diagrams to answer the question, "What calculation do we use?" In addition, other questions such as "Are there other ideas?" and "Can we use it in other situations?" will nurture the development of the four dispositions·abilities.

## (2) About strategies for "lessons in which students feel the values of learning"

In the mathematics group, we consider "values of learning" is realized in experiencing the merits of mathematics. In mathematics "lessons in which students feel the values of learning," students will see the merits of mathematics by comparing and contrasting their own ideas with those of their peers, which in turn generate the next "questions." Thus, those are the lessons in which students experience the merits of mathematics and continuously generate "questions. Thus, in order to realize the sequence of "questions," we must carefully devise the problem situations.

As noted, in "lessons in which students feel the values of learning," "questions" are continuously generated. Mathematics is a subject which builds on students' prior learning. When students construct new knowledge, it is necessary to examine on what prior learning it can build and how to sequence "questions."

In this unit, we tried to devise problems and ways of posing the problems so that students will want to draw pictures or organize the given information. When they feel that desire, they will naturally draw pictures or diagrams to understand problem situations and explain how their choice of arithmetic operations using pictures and diagrams.

In the study of addition, students did use pictures and diagrams to decide addition is the appropriate operation in various situations. When comparing the size of two groups, they made one-to-one correspondences using pictures. Thus, we anticipate that the students will continue to make use of pictures and drawing as they make their decisions on which operation to use.

## (3) About methods for assessing the quality of individual student's learning

As a strategy to assess the quality of individual student's learning, we will make use of their notebooks. We have been encouraging students to make their notebooks align with the process of problem solving lessons, " grasping the learning task → independent problem solving → comparison and critical reflection → reflection." Thus, in the independent problem solving stage, students will write their own ideas. In the comparison and critical reflection stage, they try to record their peers' ideas. When they do so, instead of simply writing down the answers, we have encouraged them to include the steps and process of getting the answers, using words, pictures, diagrams and mathematical expressions. By writing their learning journal entries, students can

organize their ideas, reflect on them deeply and make use of the ideas in new problem situations. This way, students can reflect on the development of their ideas. By checking students' entries in independent problem solving/comparison and critical reflection/learning journal against each other, we will know what ideas students initially had, what challenges they faced, and how their ideas evolved. In this way, we want to assess our efforts to increase the quality of individual student's learning.

#### 4 Unit Plan and Assessment (Total of 7 lessons)

	Goals	Learning Activity	Assessment Standards
<input type="checkbox"/> How many are left? (1 lesson)			
L1	<ul style="list-style-type: none"> <li>○ Students understand the meaning of subtraction in Separate-Result-Unknown situations and how to represent the situations using subtraction equations.</li> </ul>	<ul style="list-style-type: none"> <li>• Grasp situations depicted as situations to find the number of items left and represent the situations using blocks.</li> <li>• Judge that they are trying to determine the number of items left and try to think about ways of calculation.</li> <li>• Represent Separate-Results-Unknown situations using blocks.</li> <li>• Represent Separate-Result-Unknown situations using subtraction equations.</li> <li>• Learn the term, "subtraction."</li> </ul>	<p>[Interest] Students identify Separate-Result-Unknown situations in their everyday lives and try to represent them using blocks.</p> <p>[Knowledge] Students understand the meaning of subtraction in Separate-Result-Unknown situations and way to represent them using subtraction equations.</p> <p>[(2) Abilities to compare, identify, and think]</p>
<input type="checkbox"/> What if you subtract? (2 lessons)			
L2	<ul style="list-style-type: none"> <li>○ Students can calculate subtractions with the minuend of 10 or less.</li> <li>○ Students understand the meaning of subtraction in the PPW-Part-Unknown situations.</li> </ul>	<ul style="list-style-type: none"> <li>• Calculate subtractions with the minuend of 10 or less.</li> <li>• Judge that situations given in pictures are situations to find the missing part given the whole and the other part and think about ways to find the answer.</li> <li>• Represent the PPW-Part-Unknown meaning of subtraction using blocks.</li> <li>• Represent PPW-Part-Unknown situations using subtraction equations.</li> </ul>	<p>[Thinking] Students grasp PPW-Part-Unknown situation as a subtraction situation by relating it to Separate-Result-Unknown situation. They can represent the situations using blocks and words.</p> <p>[Skill] Students can represent PPW-Part-Unknown situations using subtraction equations.</p> <p>[(2) Abilities to compare, identify, and think]</p>

L3	○ Extend students' ability to subtract.	<ul style="list-style-type: none"> <li>• Practice subtraction with the minuend of 10 or less.</li> <li>• Grasp a number as a difference of 2 numbers through activities to identify missing calculations from ordered calculation cards or finding the cards with the same answer.</li> </ul>	<p>[Skill] Students can calculate subtraction with the minuend of 10 or less.</p> <p>[(4) Ability to reflect and apply.]</p>
<input type="checkbox"/> Subtraction with 0 (1 lesson)			
L4	○ Students understand the meaning of subtraction with 0.	<ul style="list-style-type: none"> <li>• Represent the situations to find how many is left using subtraction equations with 0 and understand their meaning.</li> </ul>	<p>[Knowledge] Students understand situations involving 0 can also be expressed as subtraction equations.</p>
<input type="checkbox"/> What is the difference? (2 lessons)			
L5	○ Students understand the meaning of subtraction in Comparison-Difference-Unknown situations.	<ul style="list-style-type: none"> <li>• From everyday phenomena, compare two sets by making one-to-one correspondences and think about ways to find the difference.</li> <li>• Think about the meaning of Comparison-Difference-Unknown situations using pictures, diagrams and manipulation of blocks.</li> <li>• Represent Comparison-Difference-Unknown situations using subtraction equations.</li> </ul>	<p>[Thinking] Students grasp Comparison-Difference-Unknown situation as a subtraction situation by relating it to Separate-Result-Unknown situation. They can represent the situations using pictures, words, and block manipulation.</p> <p>[(2) Abilities to compare, identify, and think]</p>
L6	○ Students will deepen their understanding of Comparison-Difference-Unknown.	<ul style="list-style-type: none"> <li>• From word problems and pictures, think about questions like "Which are there more and how many?" and "What is the difference between ○ and △?"</li> <li>• Verify that given situations are Comparison-Difference-Unknown situations and</li> </ul>	<p>[Skill] From word problems, grasp Comparison-Difference-Unknown situations and represent them using subtraction equations to solve the problems.</p>

		<p>represent them using subtraction equations.</p> <ul style="list-style-type: none"> <li>• Verify their answers using methods such as drawing segments to show a one-to-one correspondence.</li> </ul>	
<input type="checkbox"/> Problem writing (1 lesson)			
L7	<ul style="list-style-type: none"> <li>○ Students will deepen their understanding of subtraction by creating own word problems.</li> </ul>	<ul style="list-style-type: none"> <li>• Students will write word problems based on a picture which includes all 3 subtraction situations for <math>7 - 2</math>.</li> <li>• [Let's Try] Represent subtraction situations using equations and pictures and share them with the whole class.</li> </ul>	<p>[Interest] Based on their everyday experience, try to create subtraction word problems. [Thinking] Students can identify subtraction situations in pictures, or create their own situations, and represent them using pictures, diagrams, and words.</p> <p>[(4) Ability to reflect and apply]</p>

## 4 Today's Lesson

### (1) Goals of the Lesson

- Students will grasp Comparison-Difference-Unknown situation as subtraction situations by relating them to Separate-Result-Unknown situations. They can represent the situations using pictures, words, and block manipulation.

### (2) Instructional Intentions

As stated above, the goals of this lesson is for students to grasp Comparison-Difference-Unknown situation as subtraction situations by relating them to Separate-Result-Unknown situations, and for them to be able to represent the situations using pictures, words, and block manipulation.

To support students understand the problem situation and grasp the learning task, we decided to use the situation that is familiar to the students - playing dodge ball. Students will naturally want to know how many members are on each team, so the problems will ask, "How many more people are on the Blue team than on the White team?" It is anticipated that students will use pictures, diagrams and blocks to try to solve the problem as they did with addition and earlier subtraction lessons in which we studied Separate-Result-Unknown and PPW-Part-Unknown situations. It is likely that students will use a variety of strategies: representing the problem situation in a picture or a diagram, making a one-to-one correspondence in a picture or a diagram, drawing an arrow to indicate the movements of objects - as they did with addition, etc..

During the whole class discussion, I will call on students who represented the problem situation in a picture or a diagram first. From their drawing, we confirm that there are 4 more people on the Blue team. Then, I will ask if there are other ideas and discuss better approaches. Here, "better" approaches include those who drew more orderly pictures and diagrams making use of their prior learning of addition and Separate-Result-Unknown subtraction and those who explicitly mark a one-to-one correspondence in their picture or diagram. Next, students will basked to explain why the answer will be 4. As they explain, help students realize that even in Comparison-Difference-Unknown situations, we remove some items like we did with Separate-Result-Unknown and PPW-Part-Unknown situations, therefore, we can think of it as a subtraction situation. In addition, we will represent the situations using a subtraction equation and verify the answer by checking it against the picture or the description in the problem statement.

During the summarizing stage of the lesson, have students orally present what we studied. It is hoped that students will say something like, "I understood a new situation for subtraction," "we studied subtraction that was different from 'How many are left?'" or "I learned that 'how many more' can be solved with subtraction."

(3) Flow of the Lesson

min.	Main Learning Activity, Content Anticipated Responses	Points of Consideration Relationship to Research Theme
<p>5</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);">Grasp</p> <p>5</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);">Think</p>	<p>1. Understand the problem situation</p> <ul style="list-style-type: none"> <li>• Watch a video clip and discuss what they noticed.               <ul style="list-style-type: none"> <li>○ They are playing dodge ball.</li> <li>○ It looks like the Blue team is winning.</li> <li>○ I wonder what the winning margin was.</li> </ul> </li> </ul> <p>2. Grasp the learning task and develop solution approach.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>There are 7 players on the Blue team. There are 3 players on the White team. How many more players are there on the Blue team than on the White team?</p> </div> <ul style="list-style-type: none"> <li>• Think about how we can figure it out.               <ul style="list-style-type: none"> <li>○ Draw a picture.</li> <li>○ Draw a diagram.</li> <li>○ Draw lines to connect them.</li> <li>○ Use counting blocks.</li> </ul> </li> </ul> <p>"I wonder if we can use what we have used before to find the answer?"</p> <p>3. Find "How many more?" using prior learning.</p> <ul style="list-style-type: none"> <li>• Think about how many more by drawing pictures or diagrams.               <ul style="list-style-type: none"> <li>○ Find the answer by drawing a picture or a diagram.</li> </ul> </li> </ul> <p>(Does not make a one-to-one correspondence between the Blue team and the White team.)</p> <ul style="list-style-type: none"> <li>○ Find the answer by drawing a picture or a diagram.</li> </ul> <p>(Make a one-to-one correspondence between the Blue team and the White team.)</p> <ul style="list-style-type: none"> <li>○ Find the answer by drawing an arrow inside a picture or a diagram.</li> </ul>	<ul style="list-style-type: none"> <li>• Help students recall playing dodge ball.</li> <li>• Show the video clip till the end of the game.</li> <li>• Display an enlarged photo.</li> <li>• Make sure students notice that there are more players on the Blue team.</li> </ul> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>In the process of " lessons in which students feel the values of learning"</p> <p>◎Disposition·Ability we want to nurture</p> <ul style="list-style-type: none"> <li>• (2) Ability to Compare, Identify, and Think</li> </ul> <p>◎Students who are feeling the values learning</p> <ul style="list-style-type: none"> <li>• Can represent situations using pictures and diagrams.</li> <li>• Can identify similarities and differences between own ideas and those of their peers.</li> <li>• Realize what operation is needed as they listen to their peers' ideas.</li> <li>• Understand that Comparison-Difference-Unknown situations can be represented by subtraction equations.</li> </ul> <p>◎Strategies</p> <ul style="list-style-type: none"> <li>• Setting up the task</li> <li>• "Questions"</li> </ul> <p>"Can we use what we used before to find the answer?"</p> <p>"Is there another idea?"</p> <p>"What calculation do we need to do?"</p> <p>"Can we use it in other situations?"</p> <p>◎Support</p> <ul style="list-style-type: none"> <li>• Help students have ideas about possible solution approaches.</li> <li>• Write "questions" on the board.</li> <li>• Provide opportunities to interpret other students' ideas.</li> </ul> </div>

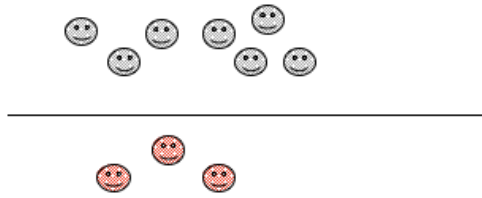


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Dig deeper

4. Share each other's idea.

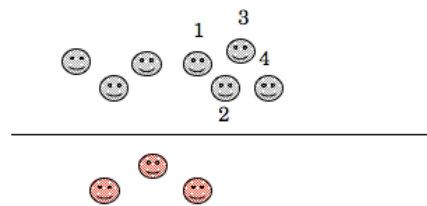
- Explain own ideas.
- Draw a picture.



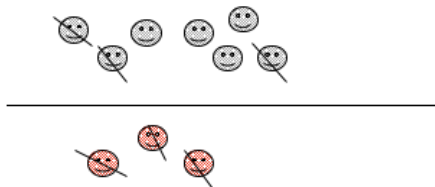
- There are 4 more players.

"How did you find that there are 4 more players?"

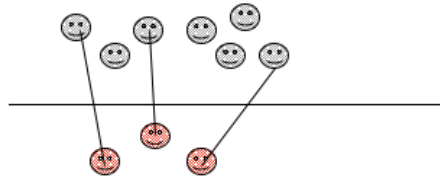
- Write numbers.



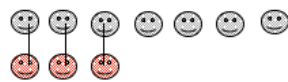
- Cross out.



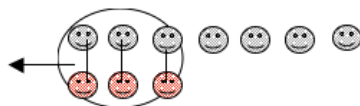
- Draw segments.



- Draw segments.




- Draw an arrow inside a picture or a diagram.



- Use  $7 - 3 = 4$  to find the answer.

- Select a student who just drew a picture of the situation.
- Add own idea to someone else's and explain so that others can easily understand.
- Verify that the answer of "4 more players" can be found from a picture.

- Remind the students that we lined objects up to compare two sets.
- Help students connect to the prior experiences and realize that they can find the answer by making a one-to-one correspondence.
- Some students may find the answer by calculation and draw a picture for the answer of 4 more players. Ask those students how they know that is the answer.
- Judge whether or not equations are valid from pictures and diagrams.

	<ul style="list-style-type: none"> <li>• Write equations. <ul style="list-style-type: none"> <li>○ <math>7 + 3 = 10</math></li> <li>○ <math>3 + 4 = 7</math></li> <li>○ <math>3 + 3 = 6</math></li> <li>○ Addition matches. <ul style="list-style-type: none"> <li>○ <math>7 - 3 = 4</math></li> <li>○ 3 in "<math>- 3</math>" are 3 players on each of the Blue and White teams.</li> </ul> </li> </ul> </li> <li>• Understand that Comparison-Difference-Unknown situations can also be written as subtraction equations just like Separate-Result-Unknown. <p>"Can we write this as a subtraction equation?"</p> <ul style="list-style-type: none"> <li>○ I think it is ok because we are taking away.</li> </ul> </li> <li>• Think about what equation should be used from a picture. <ul style="list-style-type: none"> <li>○ <math>7 - 3 = 4</math></li> </ul> </li> <li>• Think with counting blocks.  </li> </ul> <p>"Can we do the same in other situations?"</p> <ul style="list-style-type: none"> <li>• Have students think whether or not we can use subtraction in other situations.</li> </ul>	<ul style="list-style-type: none"> <li>• Help students recognize that they are removing something in both Separate-Result-Unknown and Comparison-Difference-Unknown situations so that they understand subtraction can be used with both.</li> <li>• Make sure students understand the subtrahend, 3, is the matched pairs when a one-to-one correspondence is made.</li> <li>• Show students photos of other situations and ask them to think whether or not subtraction can be used.</li> </ul>
5 Summarize	<p>5. Reflect on learning in this lesson.</p> <ul style="list-style-type: none"> <li>• Have some students share their journal entries. <ul style="list-style-type: none"> <li>○ I understand the new subtraction problems.</li> <li>○ We did subtraction that was not "How many are left?"</li> <li>○ I learned that we can use subtraction for "How many more?"</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Use students' journals to assess students' learning and the effectiveness of the lesson.</li> </ul>

(4) Observation Points

- Were the strategies to make the lesson a "lesson in which students feel the values of learning" effective?
  - ① Strategies to help students approach the lesson expectantly and with own questions
  - ② Strategies to encourage students to autonomously engage with the task, peers, and self
  - ③ Strategies to reflect on learning so that students can have the sense of accomplishment and satisfaction

(5) References --- omitted