


 Free Program for SEAMEO School Network
 from the University of Tsukuba, Affiliate Member of SEAMEO

**Teaching Mathematics to Develop Mathematical Thinking as Higher Order Thinking:
 How do you teach? Why?**

Lesson 13: How to extend column addition and subtraction

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Adopting a 21st Century Curriculum



Revitalizing Teacher Education

Mathematical Values, Attitudes and Habits for Human Character

Mathematical Values: Generality and Expandability Reasonableness and Harmony Usefulness and Efficient Simpler and Easier Beautifulness	Mathematical Attitude attempting to: See and think mathematically Pose question and develop explanation such as why and when Generalize and extend Appreciate others' idea and change representation to conceptualize	Habits of mind for Citizen to live: Reasonably and critically with respecting and appreciating others Autonomously Creatively and innovatively in harmony Judiciously using tools such as ICT Empowerly in imagining the future through lifelong learning
Mathematical Thinking and Processes		
Mathematical Ideas for: Set, Unit, Compare, Operate, Algorithm, Fundamental principle, and Varied representation such as table, diagram, expressions, graph and translations.	Mathematical Thinking: Generalization and Specialization Extension and Integration Inductive, Analogical and Deductive reasoning Abstracting, Concretizing and Embodiment Objectifying by representing and symbolizing Relational and Functional thinking Thinking forward and backward	Mathematical Activities for: Problem Solving Exploration and Inquiry Mathematical Modeling Conjecturing, Justifying and Proving Conceptualization and Proceduralization Representation and Sharing
Content		
• Numbers & Operations • Quantity & Measurement	• Extension of Number and	• Number & Algebra

We are seeking the IP textbook by using terminology to explain to develop each content of learning and sequence of content for knowing the way to develop children who learn and think by and for themselves through the preparation of future learning.

Curriculum Standards: SEABES-CCRLS (by SEAMEO-RECSAM (Mangao, Ahmad, Isoda; 2017))

Appreciations

Reflection

Acquisition

HOTS is Math. T.

Those terminology distinguish tasks and explain task sequence for the preparation of future learning.

Review Using what you already knew on the past 12 lessons!

TOPIC 1: INTRODUCTION	L1: Introductory discussion to develop mathematical thinking		
TOPIC 2: NUMBERS	L2: How to introduce number	L3: What is number	
TOPIC 3: ADDITION AND SUBTRACTION	L4: How to introduce addition	L5: What is addition	
TOPIC 4: EXTEND NUMBER WITH ADDITION AND SUBTRACTION USING COLUMN FORM	L6: How to introduce subtraction	L7: What is subtraction	
	L8: How to extend number to more than 10	L9: How to extend addition	L10: How to extend subtraction
	L11: How to extend number to more than 100	L12: How to introduce column addition and subtraction	L13: How to extend column addition and subtraction

□ Participants need to consider **what's new.**

□ Participants of this program are able to **imagine the ways of learning from the past process of learning.**

What is the number? review

We usually teach:

- Existence and necessity
Cardinal (Set) Number
- Order/Larger or Smaller/
Greater or Less

How do we extend column addition and subtraction?

How do we teach the number more than ten?

How do we teach the number more than hundred?

• Operations

How do we teach addition more than ten?

How do we teach subtraction more than ten?

How do we teach column addition and subtraction?

How do you teach?
Make sense?
Acquisition of proficiency?

For what?
Number sense?

In Japan:
Make sense (understand meaning)

I think about how to calculate/operate/find the easier way to answer

Acquisition of proficiency

Try to teach how to extend the number

Review

Composition of number

Decomposition of number

Skill: Proceduralization

Make sense: conceptualization by using already learned

Skill: Proceduralization

Simple, Easier & Beautiful

Review

For Making 10, decompose and then compose

Decompose 10 and then compose

Skill: Proceduralization

Make sense: conceptualization by using already learned!

Skill: Proceduralization

Simple, Easier & Beautiful

How do you plan the task sequence for column subtraction based on addition?

Produce the base for meaning

Produce the algorithm using the base

Extend it for carrying/regrouping

Extend it for carrying/regrouping

Conceptualization **Proceduralization** **Review**

Mathematical Values: Generality and Expandability, Reversibility, and Memory.

Experiences and Choices: Simpler and Easier, and Informal.

Think about how to calculate!

How do you plan the task sequence for column subtraction by using terminology?

Left situation
Whole-part part relationship
It was decomposition of number

Set of 10: regrouping
Bar for 10 blocks and block for ones; Semi concrete object for base 10 place value system.

Translation!
"Remove 1 bar from 2 bar" means $20 - 10$ and $2-1$ on tens place.

Thinking about Calculations

Homework!

4 Subtraction in Vertical Form

1 Samson and his friends picked 38 strawberries. They ate 12 of the strawberries. How many strawberries are left?

2 Let's think about how to calculate in vertical form.

3 Let's explain how to calculate $38 - 12$ in vertical form.

4 Let's explain how to calculate $40 - 6$ in vertical form.

Homework!

Then, borrowing/regrouping

Homework!

2 Let's think about how to calculate $20 - 8$ in vertical form.

3 Let's think about how to calculate $20 - 8$ in vertical form.

4 Let's think about how to calculate $20 - 8$ in vertical form.

Homework!

Subtraction from Numbers That Are More than 100

1 There were 120 sheets of colored paper. The students used 35 sheets. How many sheets are left?

2 Let's think about how to calculate.

3 Let's explain how to calculate in vertical form.

4 Let's explain how to calculate $120 - 35$ in vertical form.

5 Let's explain how to calculate $120 - 35$ in vertical form.

Homework!

Relation between Addition and Subtraction

1 There were 36 students. 17 of them went outside to play. How many children are left in the classroom?

2 If 17 of the students outside come back, how many children are there in the classroom?

3 Let's get the answer.

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