

 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 14: What is multiplication and How to introduce it
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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 • Measurement	• Number & Algebra

We are seeking the 1P (lesson) by using terminology to explain to distinguish every 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 (Mangoa, Ahmad, Isoda; 2017))

HOTS is Math. T.
 Those terminology distinguish tasks and explain task sequence for the preparation of future learning.
 MATHEMATICAL THINKING
 Review

Review Using what you already knew on the past 11 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	
	L6: How to introduce subtraction	L7: What is subtraction	
TOPIC 4: EXTEND NUMBER WITH ADDITION AND SUBTRACTION USING COLUMN FORM	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
TOPIC 5: MULTIPLICATION	L14: How to introduce multiplication	L15: How to develop multiplication table	
	L16: What is the multiplication table	L17: How to introduce column multiplication	

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? We usually teach:

- Existence and necessity
- Order/Larger or Smaller/ Greater or Less
- Operations

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

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What is multiplication?
 How do you introduce it?


- Multiplicative situations (Vergnaud)
 - Isomorphism of measure
 - Product of measure
 - Unique measure space
- Binominal operation
 - Multiplier x Multiplicand
 - Factor x Factor
- Repeated Addition VS Attribute
- Definition by measurement: to get the total quantity when the unit quantity and the number (amount) of unit are given.
 - Area
 - Cartesian Product
 - Combinatory
 - Tree Diagram
 - Splitting
 - Operator
 - Multiple from two side

$4 \text{ (dishes)} \times 3 \text{ (apples/dish)} = 12 \text{ (apples)}$
 $\neq 3 \text{ (apples/dish)} + 3 \text{ (apples/dish)} + 3 \text{ (apples/dish)} + 3 \text{ (apples/dish)}^3$
 $\neq 12 \text{ (apples/dish)}, \text{ or } \neq 12 \text{ (apples)} / 4 \text{ (dishes)} = 3 \text{ (apples/dish)}$
 However, in mathematics textbooks, it will be as follows.

$3 \text{ (apples)} + 3 \text{ (apples)} + 3 \text{ (apples)} + 3 \text{ (apples)} = 12 \text{ (apples)}$

4 (dishes)

Descartes 1637
 $BE \cdot BC = BD \cdot BA$, then $BE \times BA = BC \times BD$.
 If BA is a unit, it can be seen as $BE = BC \times BD$.

Teaching Multiplication with Lesson Study
 Open Access


Problem of English Notation

Which one is operator in English?
 Add **a** to **b**: $b + a$, **b** is addend and **a** is **augend**
 Subtract **a** from **b**: $b - a$, **b** is minuend and **a** is **subtrahend**
 Multiply **a** by **b**: $a \times b$, **a** is **multiplier** and **b** is multiplicand
 'a times b': $a \times b$ looks '(a x b)'
 Divide **a** by **b**: $a \div b$, **a** is dividend and **b** is **divisor**

Find the answers

$1 \rightarrow (x2) \rightarrow$
 $1 \rightarrow (2x) \rightarrow$
 $1 \rightarrow (+2) \rightarrow$
 $1 \rightarrow (x\frac{1}{2}) \rightarrow$
 $1 \rightarrow (2\div) \rightarrow$
 $1 \rightarrow (\frac{1}{2}x) \rightarrow$

Give me the situation (story problem) for the following compound expression
 1) $(3+2) \times 2 \div 5$
 2) $2 \times (3+2) \div 5$

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Gakko Toshō: Study with your friends: Mathematics for Elementary School Series

2005 Edition

Isoda, M., Tall, D. (2019). Junior High School Mathematics Textbook, Gakko Toshō

NEWEST EDITION

QR Code

10 Editions

4 Editions

2005 English Edition

2010 Thai Ed.

2012 Mexico Ed.

2019 Chile Pro. Ed.

2011 Curriculum

2011 Japanese Edition

2011 English Edition

2019 Papua N.G. Ed.

2020 Indonesian Ed.

2020 Chile Ed.

2019 Japanese Edition

2016 English Edition

2020 Curriculum

2020 Japanese Edition

2020 English Edition

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