

# From Creating Context to Understanding Word Problem – an inductive approach

BY DR CHENG WING KIN

[WINGKIN3@HKU.HK](mailto:WINGKIN3@HKU.HK), [CHENGWINGKIN@GMAIL.COM](mailto:CHENGWINGKIN@GMAIL.COM)

MAR 6, 2020

## Try out ZOOM

- If you leave the Breakout Room accidentally, you can type your message in the Chat, the Host, Antonia, would help you to re-enter the room.
- You can also use another device to join the meeting for sharing purpose. For example, you can use your computer for the meeting and use your mobile phone to share.
- When you are using 2 devices at the same time, be careful about the echo. It is better that you plug in earphone or headphone to both devices.

# Try out ZOOM sharing

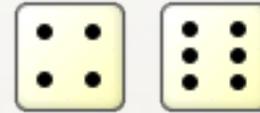
- How to share in ZOOM?
  - Share Application
  - Share Screen
  - Share Whiteboard
  - Share Camera, OR
  - Screen Capture and then share the photo
  - If you would like to capture other's sharing, you can simply capture the screen.

# An inductive approach

- From specific to general / from a few examples to a general rule in mathematics
- Can we start with different specific / simple word problems and come up with general rule in learning word problem?

## A simple task (P1, P2 and/or P3)

- <https://www.random.org/dice/>
- Choose 2 dice.
- For example, suppose we obtain these dice



First, use these two numbers to write an expression, then calculate the result and write down the number sentence.

Next, create a context with the above number sentence and write it as a word problem question.

- Both Chinese and English are fine.
- With the same number sentence and the same context, write another word problem question.

# A task for senior form students

- <https://www.random.org/integers/>
- Generate 4 number between 1 and 50
- For example, 19 4 47 26

First, use these two numbers to write an expression, then calculate the result and write down the number sentence.

Next, create a context with the above number sentence and write it as a word problem question.

- Both Chinese and English are fine.
- With the same number sentence and the same context, write another word problem question.

# Sharing

- 5 minutes for this task
  - 15 minutes sharing
- At least one Chinese example and at least one English example.

How's thing work out?

$$32 \div 4$$

What is in one's mind in getting the answer 8?



## A word problem

- A bag of candies is divided among 8 students. Each student gets 4 candies. How many candies are there in the bag originally?

Quite a lot of students would give the number sentence as

$$8 \div 4 = 2$$

WHY ??? 

# Understanding a number sentence

- From MathisFun.com

Addition:

$$8 + 3 = 11$$

Diagram illustrating addition:  $8 + 3 = 11$ . The number 8 is labeled "Addend" (blue arrow), 3 is labeled "Addend" (red arrow), and 11 is labeled "Sum or Total" (orange arrow).

Subtraction:

$$8 - 3 = 5$$

Diagram illustrating subtraction:  $8 - 3 = 5$ . The number 8 is labeled "Minuend" (blue arrow), 3 is labeled "Subtrahend" (red arrow), and 5 is labeled "Difference" (orange arrow).

We can use same set of numbers of the number sentences  $4 + 6 = 10$  and  $10 - 6 = 4$ .

Is 4 the addend or the difference?

## An example

- The difference of two numbers is 4. The smaller number is 6. What is the larger number?
  
- The difference of two numbers is 4. One of the number is 6. What is the other number?

# Understanding a number sentence

- Image for Mathisfun.com

Multiplication:

$$6 \times 3 = 18$$

The diagram shows the equation  $6 \times 3 = 18$ . A blue arrow points from the label "Factor (or Multiplier)" to the number 6. A red arrow points from the label "Factor (or Multiplicand)" to the number 3. An orange arrow points from the label "Product" to the number 18.

- Can you write similar number sentence for division?

You can use different set of numbers. You can also include the remainder.



## Re-writing the word problem

- Re-write your word problem(s) with the same context so that the number sentence is using another arithmetic operation.

SHARE



## Discussion

- Can your students create similar word problems with the above task?
- Can your students re-write the word problem?
- Should they work in groups?

## Re-writing the word problem by students

- Students may not be able to re-write word problem, but they would provide you with various sentences. Many of them are incorrect.
- From student's mistakes, teachers can help students to correct them. (Assessment for learning)
- From student examples, teacher can help students to compare their sentences with some of the word problem questions in the textbook. (Assessment as learning)

## Introducing abstract number sentence

$$\star + \smile = \text{gear} \qquad \text{gear} - \star = \smile$$

Does it help?

Try it with your word problem.

## Concluding remarks

- I don't think there would be general rule for understanding word problem.
- Teachers should
  - develop students with linguistic cues in understanding word problem
  - help student to understand number sentence and the relationship between different operands
  - equip students with different tools to understand word problem
- See if these can help. 'Creating own word problem', 'Understanding a number', 'Re-writing word problem', 'Working in groups'



## Pros of 'Creating own word problem'

- promotes the sense of ownership of knowledge
- develops student uses of key terminologies
- helps students to contextualize mathematics symbols
- helps students to relate operands

## Pros of 'Re-writing the word problem'

- Re-writing the word problem using the same context
  - helps students to learn the linguistic cues in understanding the word problem
  - helps students relating addition and subtraction and relating multiplication and division.
  - helps students to understand relationship between different operands in a number sentence.
  - allows students to make mistakes and learn from mistakes
  - enhances Assessment for Learning and Assessment as Learning

## Pros of 'Working in groups'

- In this sharing session, we learn in group. The examples has been generated collectively. So, we learn from others' ideas.
- Language abilities develop when children communicates. Students can learn from peers on how to construct a context with different language uses.
- It also helps in developing different generic skills such as collaborative skill, communication skill and creativity.
- The outputs from students can be something in their learning portfolio.