A Shift to Teaching mathematics through problem solving (TtP)

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Focus of discussion:

- More examples of teaching through problem solving
- Group activity
- Identify a sub-topic to teach through problem solving

Sequence of teaching through PS (TtP)

Reviewing the previous lesson is not an important activity from Japanese teachers' point of view

I. Pose the problem, helping pupils understand the problem (5-10 min)
II. Work independently/pair(10-20 min)
III. Whole class discussion (10-20 minutes)
IV. Summarise (5 minutes)
V. Consolidate learning through an additional problem (5 minutes)

1. Presenting the problem for the day (abt. 5-10 minutes)

1. Begin with a challenging word problem or a practical problem/open-ended problem.
2. Teacher determines whether the students understand the problem/task well.
   - ❑ Students read the problem again
   - ❑ Ask questions to help clarify the problem
   - ❑ Ask a few students to show their initial ideas on how to approach the problem

2. Students solve problem on their own (abt. 10-20 mins.)

1. Individual, pairs or small groups.
2. Teacher moves around classroom.
   - ❑ To observe the students as they work
   - ❑ Give suggestions or help students having difficulty
   - ❑ Looks for 'good' ideas with the intention of calling them in a certain order during whole class discussion
   - ❑ Encourage alternative method for solving the problem (those who have a solution)
   - ❑ Analysing student's thinking to solve the problem

3. Whole-class discussion-comparing & discussing (abt. 10-20 min)- neriage

1. Presume students will arrive at different solution methods
2. Students present their method/solution on the board (in a particular order).

3. Teacher encourages students to explain their thoughts using the logical steps with words (first, next, because), manipulative, graphs, and mathematical expressions.

4. Praise students' thinking

3. Whole-class discussion-comparing & discussing (abt. 10-20 min)-neriage

5. Asking questions (examples):
   - ❑**Who can explain this solution?**
   - ❑**How did you think?**
   - ❑**Do you agree with A's way of solving the problem?**
   - ❑**Do you understand B's explanation?**
   - ❑**Can you solve the problem differently?**

3. Whole-class discussion-comparing & discussing (abt. 10-20 min)

6. Comparing solution methods (to realise the differences and similarities between their own ideas and others.

- Teacher do not tell students if their method is right or wrong, instead let students discuss among themselves the validity of different solutions & always looking for a better way of thinking (e.g. faster, easier, and precise)
  - Asking questions (examples):
  - ✓ Where is the same ….and where is the different….?
  - ✓ Is there a relationship among the methods used?
  - ✓ Which solution method is simpler? Why?
  - ✓ Which is easiest to understand?
  - ✓ Which solution method can be used to solve similar problems?

4. Summary of the lesson (5 mins)

1. Teacher leads students to reflect on what they have learned (What do you understand from today's lesson?).
   - which strategy may be most sophisticated and why?
   - the mathematical and educational values of the task(Fujii et al.,1998)

2. Write conclusion(s) on the board

3. Students write the journal, example:
   - I can make sense of my friend's idea
   - Some ideas are simpler to use …

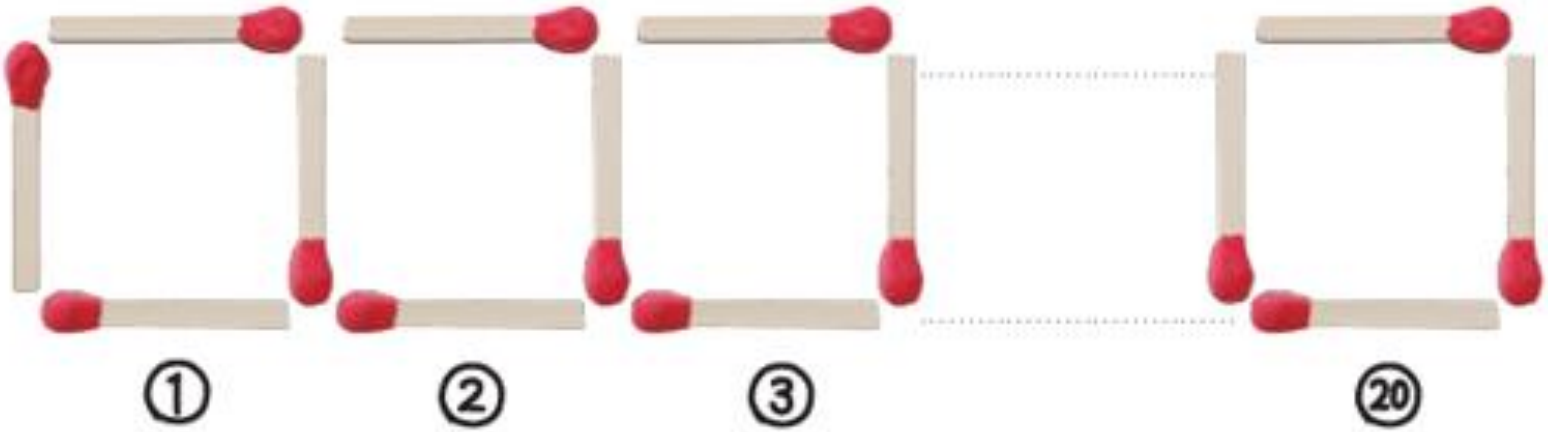
More Exercise on TtP
-Refer to hand-outs

Activity 1: Letters in algebraic expression

Work individually.

Squares are made by lining the match sticks as shown below.

How many matchsticks are needed to make 20 squares?



Tasks: Think about how to find the number of matchsticks.

Exercise 2: Assuming a situation of Linear function

Prob. 3 Atushi wondered how long it would take for a mosquito repellent coil to burn. So, he measured the length of time it took until the length of the remaining coil was 70 cm, 65 cm, 60 cm, and 55 cm.

Remaining length (cm)	70	65	60	55
Time (min.)	38	63	89	113

(1) Predict about how much longer the coil will burn.

(2) About how long was the original length of the coil?