

Research Theme	Feel For the New Way of Teaching Mathematics – Proposition for Developing Lessons As Drama Serial
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### **1. Subject : the mystery of numbers and figures**

#### **2. About the research theme**

Is problem solving learning becoming a mere shell? The problem solving learning that should be completed by only one lesson, the learning which must have a “goal” at the beginning, and a “summary” at the end. Under the situation of a growing attainment gap happens in the classroom, saying “must do” is nothing else but a sign of mere shell.

In recent years, big value has been putted on making students “able to do” and “understood”, and researches are focused on the teaching method for that. There are only a few lessons seeking for the “essential interest of mathematics”. And as everyone is aiming at developing lessons after the manual, lessons which can impress the students are becoming fewer and fewer. Now is the time to change the concept of teaching from developing “able to do” and “understood” lessons to developing “lessons for appreciating the merit and beauty of mathematics, the pleasure of thinking and expressing”

#### **(1) Proposition for a new way of developing the problem solving learning**

When making a lesson plan, first of all I will reveal the “objective”. Then I will think of the “summary” which could match that objective. That is to say, reveal the ability that you would like to be acquired by the students in this lesson and set up the “summary”. The “summary” is not only about the knowledge, understanding and skill, but also about the way of thinking and the attitude. (Make clear that what is the foundation and what is the objective.) Then, think of the teaching materials which could lead the students to do that “summary”. Of course we should develop teaching materials which are close in the objective, but we should also devise the way of presenting the materials in order to make students willing to tackle the problems by themselves. (Develop the teaching materials, problems and devise the way of presenting them.) After that, think of how to develop the lesson from presenting the teaching materials to the summary. Think about the “introduction, development, turn and conclusion” so as to create lessons which could appreciate “the merit and beauty of mathematics, the pleasure of thinking”. (Devise the way of developing the lesson.)

The foundation of these ways of developing lessons is the problem solving learning. However, to meet the actual condition of students and the situation, the ways of developing lessons is always being devised and changed. As a result, several effective ways of developing lessons have been recognized.

- develop learning completed by only one problem
- develop learning like a drama serial
- develop learning for concept acquisition
- develop learning for proficiency
- develop learning for bringing up the ability of application

Mathematics is interesting. Its true nature is full of mystery and beautiful. To make students appreciate it, I am willing to develop the way of teaching and spread to others. This lesson is based on the way of developing lessons like drama serial. Following are the points I kept in mind when developing this lesson.

**(2) Treat the development of a lesson which could raise inductive thought, deductive thought and the thought of analogy as one pack**

Let the students to find the sum of three consecutive numbers on the calendar. Then the rule will come into view (inductive thought). Make them think why the rule exists (deductive thought). And use “if, ...” to extend the problem and solve it(thought of analogy). I wish the students would feel enjoyable during these activities of thinking.

**(3) Let students appreciate the delight of inquiry while developing the lesson like drama serial**

After solving one problem, finish the first lesson just at the point that extended stage has been showed. With the summary of this problem, next problems come into being, so we could finish the lesson with the students’ willingness to continue. Students could appreciate the delight of inquiry which is difficult to appreciate in the learning completed by only one lesson.

**(4) Attach importance to the activities of writing, reading and transforming mathematical expressions**

If students could explain clearly by using figures, symbol, expression, and the rules of calculation, along with the knowledge which has been learned, they would be able perceive and appreciate the merit and beauty of mathematics. Moreover, as this period of time is connected with secondary school, I would like to pay attention to the following abilities of students.

- ability to write, read and transform mathematical expressions
- ability to use symbol
- ability to apply the rules of calculation
- ability to explain deductively

**(5) Create situation for extension, make students able to appreciate the delight of application**

I would like to make sure how the students would extend the situation, whether they could apply what they have learned to solve the problem, and whether the students feel enjoyable through these activities.

### **3. Lesson plan**

Although I can also design a special unit with several lessons like “expression and calculation”, “symbol and expression”, I set the topic as “the mystery of numbers and figures” for this special situation.

#### 4. Learning for this lesson

##### (1) Objective

• Through the activity for finding the rule of calendar problem and thinking of the reason of its existence, develop students' abilities to think inductively and deductively, and make them able to enjoy the activities of thinking and inquiring.

##### (2) Development

learning activities	notes of teaching
<p><b>1. have a clear grasp of the problem</b></p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">           What is the sum of three horizontally consecutive numbers on the calendar?         </div> <p> <math>2 + 3 + 4 = 9</math>  <math>10 + 11 + 12 = 33</math>            the answer is the multiples of three            -“Really?”            -“Absolutely?”         </p> <p><b>2. think of the reason that the answer is multiples of three</b></p> <p>-“if the first number is <math>n</math>, ...”</p> <p><math>n + (n + 1) + (n + 2) = n \times 3 + 3</math></p> <p>-“if the second number is <math>n</math>, ...”</p> <p><math>(n - 1) + n + (n + 1) = n \times 3</math></p> <p><b>3. review what has been learned in this lesson and create new problem by changing some conditions</b></p> <p>①three → four consecutive numbers</p> <p>②horizontally → vertically consecutive numbers</p> <p>③calendar → number table, multiplication table</p>	<ul style="list-style-type: none"> <li>• Make the students grasp the problem by hiding the three numbers on the calendar.</li> <li>• Let the students to write down the things that they realize. Make sure they use the right words.</li> <li>• Use questions like “really?”, “absolutely?” to bring out the deductive thought like “because, ...”.</li> <li>• If various expressions are created by the students such as using symbol or using mathematical expression, display them to the hole class.</li> <li>• Pick up the mathematical expression, make the students able to realize the merit in explaining with mathematical expression, and develop the ability to apply it through the activity of reading mathematical expression.</li> <li>• Review activity 1 and 2 find the rule → think of its reason write, read and transform mathematical expressions</li> <li>• Set up a activity of creating new problem by changing some conditions of the original problem, using “if, ...”.</li> <li>• Make the students have their perspective of new problems and solve them in next class.</li> </ul>