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RTMaC Lesson Study of Mathematics Education in Japan

Now, there are many problems on teaching mathematics in school. So, many teachers must improve their teaching. But it is difficult for them to do it, because they don't know various methods and theories. Therefore we have tried to teach public schools teachers RTMaC (Right Teaching Mathematics Cycle) Lesson Study. So, we would like to present this current year's our practice in this paper.

1. Introduction

Today many teachers are very busy to handle many chores except teaching for children in Japan. Therefore they hardly take part in study meetings undertaken outside a school. So, they study about teaching mathematics in their schools by themselves. The study is named Lesson Study of a school in Japan. But, the study has not very well, because children's mathematics achievement has not improved. The reason is as follows. Many teachers want to study only teaching methods, because they believe school textbooks. Therefore they don't study essential (correct) contents of mathematics (mathematical knowledge for teaching) in school textbooks. And they don't study children's cognition concerning the contents too.

We can notice the next contents from above situation, too. Teachers need to make a teaching plan when they teach mathematics. The teaching plan mainly consists of a view of teaching materials, children, and teaching and so on. Few teachers can write correct contents of a view of teaching materials and children, because they have not understood essential contents of mathematics and they don't research children's cognition. Therefore they usually write only general stats and their experiences without studying.

Strictly speaking, teachers must understand essential contents of mathematics and children's cognition when they teach mathematics, because they must change children's cognition from native cognition to correct cognition. But many teachers can not notice above contents, because they think that they have only to teach only new knowledge in school textbooks.

Therefore, we think that they must get the ability by RTMaC Lesson Study.

2. RTMaC Lesson Study

RTMaC (Right Teaching Mathematics Cycle) is Fig.1. The cycle is as follows. 1st step is that teachers create a “Cognition Test”. 2nd step is that they do it for children and analyze the result. 3rd step is that they make teaching contents and teach children it. 4th step is that they analyze the result. And they improve them.

Strong points of this study are as follows. They can study essential contents of mathematics and children’s cognition for teaching contents of mathematics, when they create a cognition test and they get results of it. Furthermore, all teachers in a school can do it together. And both only one teacher and some group of teachers can do it too. So each elementary, junior high and high school teachers can do it.

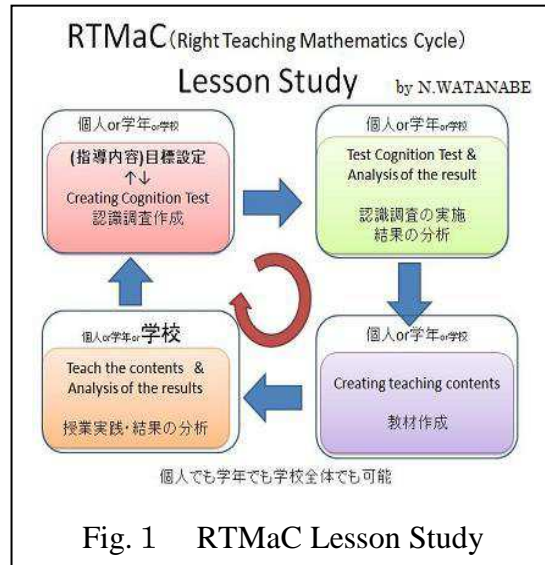


Fig. 1 RTMaC Lesson Study

3. Cognition Test

We think that creating a “Cognition Test” is very effective for the study. The test is as follows. For example, when teachers will teach a unit of “A” (A is weight, length, number, fraction, and so on), they need to grasp children’s cognition for A. So, they must create a test to clear the cognition. Then the test consists of essence of mathematics contents of A. So the test will clear children’s native cognition for A.

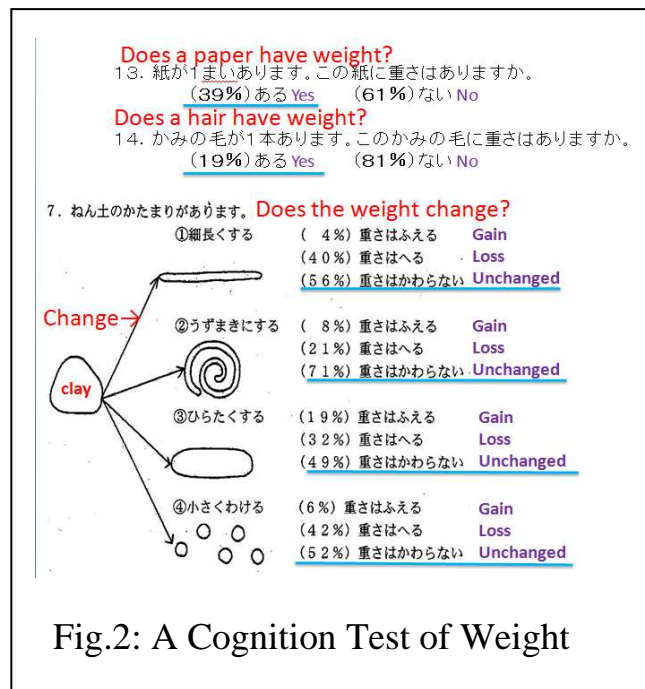


Fig.2: A Cognition Test of Weight

Therefore the test is different from a review test. If they do the test for children, they can grasp real children's cognition. Fig.2 is a sample of a cognition test and the result. The content is "weight" for 3rd grade.

But, we think that many teachers cannot create the test. The reason is those teachers have not grasped essential contents of mathematics.

We think if teachers can create the test, they have understood essential contents of mathematics. Furthermore, they can catch children's cognition if they will do the test. Therefore they need to create cognition tests and they need to do the test.

4. Practical side of RTMaC Lesson Study

So, we tried the lesson study for two public elementary schools in this current year 2012.

4-1. Public elementary schools

The study was done at Kusunoki elementary school (Osaka, Japan) and Kujokodo elementary school (Kyoto, Japan). There were 3 demonstration lessons in Kusunoki elementary school. And, there were 7 demonstration lessons in Kujokodo elementary school.

We investigated their impressions after their lessons by a questionnaire. Their impressions of teachers and a principal about the lesson study are as follows.

[Teacher's comments]

For teaching contents; "I found that we need to study to create a cognition test." "I became to study teaching contents in detail before I teach them." "I became to study essential contents of mathematics for teaching."

For children; "I have become to be able to grasp children's stumbling based on objective data through the test now. I was determining them by my images and experiences until now." "I noticed that we had been able to grasp children's cognition. So our images were different from children's cognition too much."

For teaching; "I can plan our teaching plan easily because I understand children's cognition by a test." "I became to be able to change the contents of school textbooks because I could grasp children's cognition."

[A principal's comment]

“Professional attitude of the teacher has changed. Some teacher started the study on their own initiative at another unit and the other subjects.”

It is cleared that next points by the comments. Teachers have become to study essential contents of mathematics for teaching before they teach it. They have become to be able to grasp children’s cognition. And they have become to be able to plan their teaching plan based on correct mathematics and children’s cognition. So they could understand necessity to study it.

And, some teachers tried to do a post-test after their teaching to clear changes of children’s cognition in the 4step on RTMaC Lesson Study. The post-test is almost same the cognition test (pre-test). So, we can notice that children's mathematics achievement has been improving gradually (Fig.3).

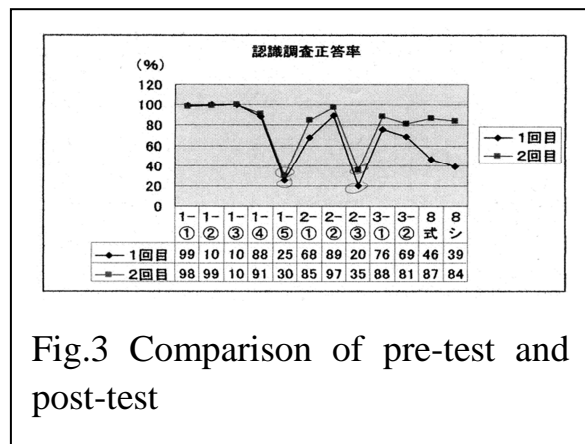


Fig.3 Comparison of pre-test and post-test

Therefore it is cleared that the study is very useful for teachers.

5. Conclusion

It is cleared that RTMaC Lesson Study is worth for teachers. The points are as follows. Teachers have been to be able to teach mathematics based on essential contents of mathematics and children’s cognition. So their teaching attitude and thinking has changed well. Furthermore children's mathematics achievement has been improving gradually.

Acknowledgment

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Literature

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