The Conceptualization and Research of “New Ideas” Elementary Mathematics Curriculum in China

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In this talk, we are going to share our experiences in conceptualizing this series of “new ideas” elementary mathematics textbooks, together with the findings from research conducted to investigate its effectiveness. It consists of four sections.

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1. The characteristics of “new ideas” elementary mathematics:

Problem-based content introduction, mathematical model construction, and open-ended instruction approach.

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1. The characteristics of “new ideas” elementary mathematics

Through the way of problem-based content introduction, the “new ideas mathematics” combine the daily-life experiences with the school mathematical knowledge organically.

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1. The characteristics of “new ideas” elementary mathematics

It links up the mathematical content with the real life which pupils were familiar with, so as to constitute colorful situations.

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1. The characteristics of “new ideas” elementary mathematics

There are 41 unit pictures in the “new ideas mathematical ” textbooks, each formed an vivid situation to encourage pupils to raise questions.

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1. The characteristics of “new ideas” elementary mathematics

By asking questions , pupils get to know what they will learn in maths. And each class have a class topic, also pupils will find mathematics in these practical problems, they will try to convert the practical problem to mathematical problem.

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Such as:

Unit picture 《Go to school》 of G1

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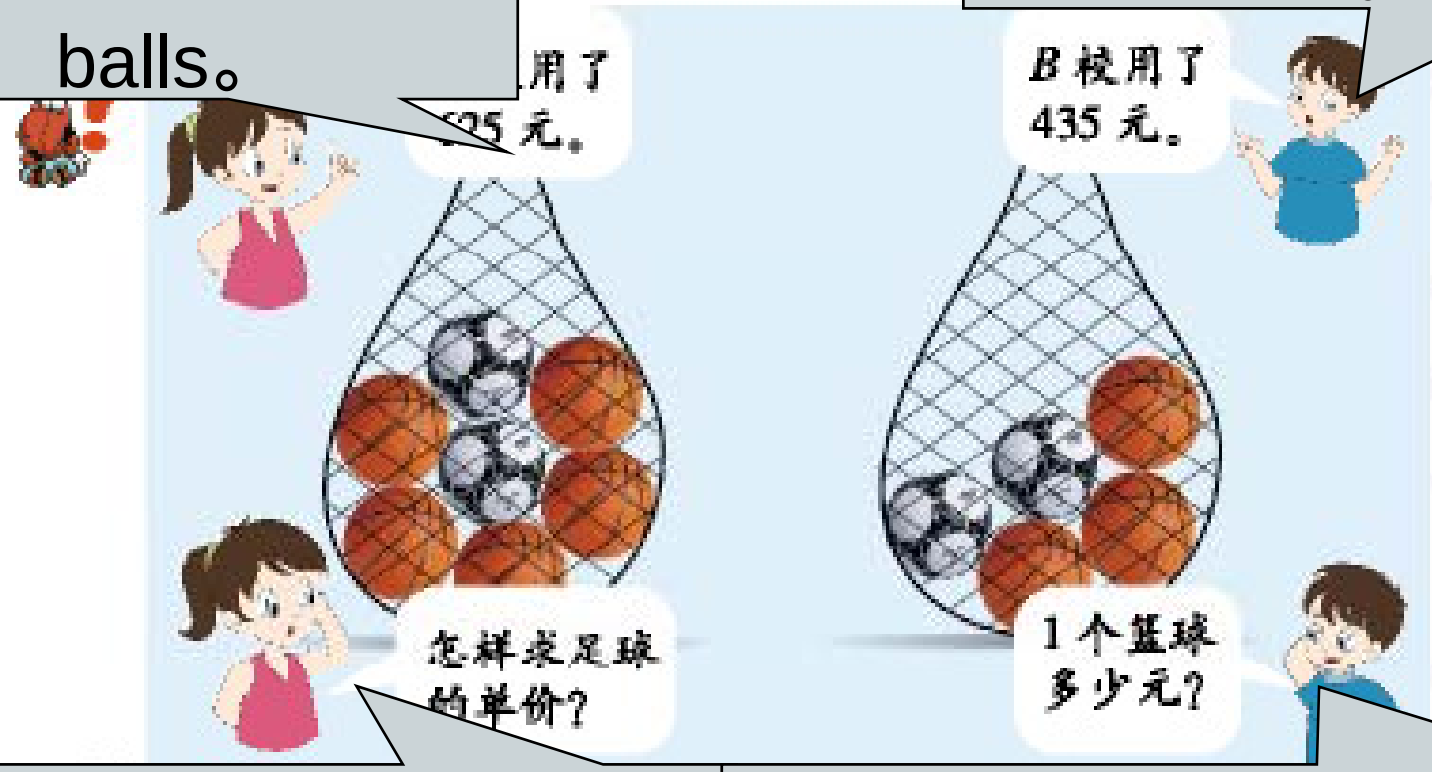
Such as:

School-A spend RMB625 on these balls。

School-B spend RMB435 on these balls。



How can I know the price of football?

How much is the basketball?

class topic 《3-steps computation》 of G4

1. The characteristics of “new ideas” elementary mathematics

“New ideas mathematics ” advocates mathematical modeling on pupils’ own initiative. We try to guide pupils in creating problems, solving problems with their own thinking and understanding so that they will become a happy owner of study, not slave.

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1. The characteristics of “new ideas” elementary mathematics

Specifically ,“new ideas mathematics ” help pupils to construct mathematical concepts, methods, thoughts on their own by “knowledge-question” and “question-knowledge”.

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1. The characteristics of “new ideas” elementary mathematics

“knowledge-question” means do not tell the knowledge to pupils directly , but implicit in questions. The key of “knowledge-question” Is to design problem circumstance , stimulating pupils to observe, to think, to convert the practical problems to mathematical problem.

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1. The characteristics of “new ideas” elementary mathematics

“question-knowledge” is a internalization process based on pupils’ experiences and comprehension. In this process, pupils try to solve the problem they have found from the situation.

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1. The characteristics of “new ideas” elementary mathematics

They were lead by teacher to operate, experiment, compute, map, discuss, argue, communicate, cooperate, etc.

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1. The characteristics of “new ideas” elementary mathematics

They experience mathematics, realize mathematics, master good tactics to solve the problems, and finally, grasp mathematical concepts, principles, methods, and so on.

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1. The characteristics of “new ideas” elementary mathematics

Open-ended instruction approach consists theme open and space-time open. Theme open refers to well ordered exercises, diversified forms , nonroutine problems , etc.

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1. The characteristics of “new ideas” elementary mathematics

space-time open means expanding the learning space, give pupils enough elbowroom, let pupils develop their personality, each pupil was allowed to state his opinion, and comment on other’s answers.

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2. How can we develop children's thinking?

There's no question about the thinking training's importance. But it is as difficult as arranging the generic sequence for us to design a pre-sequenced thinking training materials.

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2. How can we develop children's thinking?

So "new ideas mathematics" pay more attention to organize the thinking training exercises. It is covered four main areas of primary mathematics. For example, in the "number and algebra", it emphasizes on cultivating the "number sense", in other words, it stresses on the training of thinking in the computation.

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2. How can we develop children's thinking?

In our opinion, "number sense" mainly reflected in the following: first, understand the relationships among numbers; second, to resolve or reorganize numbers if necessary.

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2. How can we develop children's thinking?

Such as "386", not only can be expressed as "300+86", but also "400 - 14" , "55×7 + 1""90×4 + 26"……In the computation of three-digit divided by single figures, according to the divide number, we can resolve the 386 to "360 + 26""350 + 36""320 + 66" ;

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2. How can we develop children's thinking?

and in an addition as "386+275", apart from the regular procedure, pupils can use other ways to get the result as follows:

86-25 = 61
300×2 + 61 = 661

400 + 275 - 14
= 400 + 261
= 661

380 + 270 + 11
= 650 + 11
= 661

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2. How can we develop children's thinking?

"New ideas mathematics" textbooks try to express a number by different forms, and arrange a certain amount of exercises of find the relationships among numbers in a quantity state, so as to develop the number sense of pupil.

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2. How can we develop children's thinking?

Having a good sense of number, children can turn the "step-by-step" rote computation into "modular" quick-witted computation.

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2. How can we develop children's thinking?

If we refer to a digit corresponds to another follows a specific rule as "step-by-step" computation, then we can call the correspondents between a block which is composed of several numerals to another as "modular" computation. "modular" computation contributes to the furtherance of children's thinking.

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2. How can we develop children's thinking?

In the process of developing pupils' logical thinking, the "new ideas mathematics" textbook designed a series of thinking training material, such as "digit puzzle", "figure equation", "combine number with shape", "write a formula cleverly", "the arrangement of number and formula" "the number series reasoning", etc.

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2. How can we develop children's thinking?

To cultivate pupils' algebraic thought through the translation of symbolic code and equivalent replacement".

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2. How can we develop children's thinking?

For instance:

Find out value of the figure.

if

如果：▲ × ● + ■ = ★

那么：■ =（ ）

then ▲ =（ ）

求图形表示的数。

■ + ▲ = 530

■ − ▲ = 370

■ = □ ▲ = □

■ × 2 = 530 + 370

求图形表示的数。

200 + ★ = ●

● + ★ = 380

★ = □ ● = □

根据 200 + ★ = ●，

可得 ● − ★ = 200。

According to

Find out value of the figure.

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2. How can we develop children's thinking?

The textbook aimed at improving both arithmetical thought and algebraic thought, express the quantitative relations of the problem in algebraic thinking, and transform the mathematical expression, then, operate in arithmetical thought until work out the result.

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2. How can we develop children's thinking?

In computation teaching, introduce algebraic structural thinking to arithmetical procedural thought in time. Such as:

△ + 2 = 8
△ = 8 - 2
△ = 6

○ + ○ + ○ + 7 = 25
○ ×3 = 25 - 7
○ = □ ÷ □
○ = □

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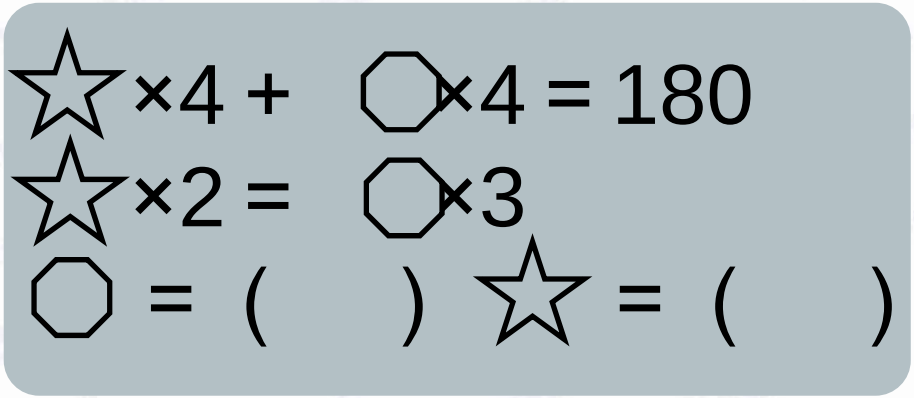
2. How can we develop children's thinking?

In teaching how to solve practical problems, using figure equations to analyze the relations between quantities, and finally solve the problems. Such as:



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2. How can we develop children's thinking?

There are 6 boxes of pears and 6 boxes of apples. They weight 240kg.2 boxes of pears are as heavy as 3 boxes of apples. How heavy is 1 box of pears? How heavy is 1 box of apples?

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2. How can we develop children's thinking?

According to the information that problem shows:6 boxes of pears are as heavy as 9 boxes of apples.

so, 1 box of apples weight:

$240 \div (6 + 9) = 16$ (kg)

6 boxes of apples are as heavy as 4 boxes of pears.

so, 1 boxes of pears weight:

$240 \div (6 + 4) = 24$ (kg)

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3. Which kind of knowledge structure is good for pupils' learning?

Mathematical knowledge in textbook, works as an educational task, its structure is different from the mathematical science's.

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3. Which kind of knowledge structure is good for pupils' learning?

We believe that an ideal textbook should breakthrough the traditional teaching materials' arrange system.

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3. Which kind of knowledge structure is good for pupils' learning?

Integrate diverse fields of mathematical knowledge, such as, "the mathematical problem on the basketball court"(Grade 3), integrated measurement, rectangular perimeter, distributive law in multiplication, rectangular square measure, and 2-digit multiply 2-digit.

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3. Which kind of knowledge structure is good for pupils' learning?

The all knowledge mentioned above is founded on the mathematical model of distributive law in multiplication. Rearrange different content in a new order, such as: what should the beginners in the study of mathematics first learn?

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3. Which kind of knowledge structure is good for pupils' learning?

Count is not the only choice, we decide to learn solid figures at first and then recognize numbers. It is proved to be good for inspire in the pupils a love for learning mathematics, acquire good learning habits.

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3. Which kind of knowledge structure is good for pupils' learning?

Rearrage sections of a same content. such as:$\overline{abc}$÷d, people usually teach the type of $\overline{ab} > d$ first , then $\overline{ab} < d$. but our research points out : in the total 81 table-division (divisible), there are 23 in which dividend is single figure, and 58 in which dividend is 2-digit.

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3. Which kind of knowledge structure is good for pupils' learning?

It means there are 71.6% in which dividend < divisor, and only 28.4% in which dividend > divisor. Hence, it is reasoning to transpose the teaching sequence.

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3. Which kind of knowledge structure is good for pupils' learning?

Our experiment shows: there is no marked difference between the two teaching approach. But the average of the experiment class was little more than the one of comparison class.

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4. Does “problem solving” really solve problems?

In the traditional mathematics system in mainland China, teaching practical problems have a great length in the textbook. Today, affected with the new curriculum, we called it “solving problems”. but does the problems really be solved?

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4. Does “problem solving” really solve problems?

Although, the practical problem has its unique value in teaching and learning, we should accept the good and object the bad, but not discard all.

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4. Does “problem solving” really solve problems?

our experience is : based on the basic character of quantity, let pupils be familiar with the basic quantity relations, master the basic combination of quantity relations, understand the basic structure and change of the relations .

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4. Does “problem solving” really solve problems?

Strive for live materials, diversified forms, algebraic thought , concise structure, and a series of activities.

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4. Does “problem solving” really solve problems?

Introduced by “figure equations”, developed in theme activities, understand the mathematical structure by audio-visual patterns, improve the mathematical thinking with transformation and extension.

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4. Does “problem solving” really solve problems?

To solve a problem, to solve a kind of problem to get the basic tactics of a kind of problem, and finally form a mathematical thought , which is our ultimate goal.

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Thanks!

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