

Features of Chinese Lower-grade Elementary Mathematics Textbooks in Contrast with Korea's¹⁾

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Under the consideration of Chinese math education tradition and new educational orientation, we compared and analyzed Korea and China's lower-grade elementary school textbooks. The result was that Chinese textbook puts much emphases on practice, skill and repetition, presents condensed contents, provides various learning contents simultaneously, rich humorous expressions, and a lot of implicit representations. From these results, we presented some implications for our mathematics education, future textbook writing, and the follow-up studies.

I. Introduction

China with its huge population and land is now at the center of the world in the economic and political powers. China in the past promoted military and aerospace industries to demonstrate the superiority of the socialist system, but now there is rapid growth in the auto industry, IT, cutting-edge industries such as biotechnology, and almost all commercial business that world's advanced nations are keeping a close watch. Though politics cannot be independent to that of economics, China together with the United States has formed two pillars of the world power in both areas.

The impact on our country economically as well as culturally by China will increasingly expand. With a 1 child policy, most Chinese parents have a special attachment to their children. As with Korea, attitude and expectation to their children's education is high.

And most will be very supportive in using their resources. Both countries are very similar in aspects of daily living and feeling emotions. An understanding of the Chinese education will improve academic and cultural exchanges between the two countries.

There are international comparisons of mathematics curriculums and textbooks, but most are concentrated on U.S., U.K., Japan, and North Korea. Other than two Park's studies(2004a, 2004b), the one by Park(2004a) is a study on mathematics curriculum of China, the other by Park(2004b) is about school mathematics terminology in Korean, Chinese and Japanese, analysis of Chinese mathematics textbooks in elementary school level is yet to be found.

Because the configuration of the mathematics curriculum in China and its development are based on mathematical education theory, a lot of it will be similar to that of South Korea. China's mathematics textbooks probably are much different to that of South

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Korea's in political and cultural aspects. These differences will show more in mathematics textbooks for lower grades than the higher grades. It will be interesting to compare their characteristics of 1st grade through 3rd grade mathematics textbooks of China and South Korea.

As one of the leading paper on comparative study of Korean and Chinese textbooks, this research is to explore overall difference of two country's textbooks rather than analyzing a specific aspect of textbook contents. With old traditional Chinese math education method and new educational reform in process, we focus on analyzing cultural features of textbooks such as contents and roles of illustration, description of learning material, and exceptional external characteristics.

Mathematics Textbooks of Korea used in this study are limited to grade 1 first and second semester, grade 2 first and second semester, grade 3 first semester textbooks revised according to the 2007 National Curriculum, published in 2010. Elementary school mathematics textbooks in China are not national textbooks, but there are 5 main textbooks of which one of the most widely used textbook is the publication by the People's Education Press(briefly PEP). Our comparisons were made using 5 textbooks from grade 1 first semester to grade 3 first semester from this publisher.

II. Characteristics and implementation of the Chinese mathematics curriculum

1. An overview of China's mathematics curriculum changes

The ancient Chinese mathematics education was developed considerably. It reached its peak during Tang and Song Dynasties but declined from Ming Dynasty to Qing Dynasty due to the effect of Imperial examination emphasized writing essay (Zhang, 2003). After the 1911 revolution, which overthrew the Qing Dynasty, followed after Europe and United States's learning model for next 30 years. Then, after 1945 with the establishment of People's Republic of China imitated the learning model of Soviet Union.

They introduced new guideline based on Soviet Union's educational system in 1963. Here they focused on developing skills such as basic computation, spatial imagination, logic and analysis emphasizing basic knowledge and basic skill. From 1966 to 1976, the 10-year Cultural Revolution, was a dark period for studies. Mathematics education was no exception. After the Cultural Revolution ended in 1976, the next 10 years was spent to recover from the damages of the dark period(Zhang, 2005).

In 1986, with the release of the Compulsory Education Act, nine years of compulsory educational period has been set. Since 1990, education reform has become a top priority among the many social problems and thus began the reform and development of educational system. This is when they emphasized ability training. The newest reform promoting such ability training is the eighth reform since the establishment of People's Republic of China.

2. New and old Chinese mathematics curriculum

In September 2001, China conducted a comprehensive reform in its compulsory education and promulgated the new 'compulsory education standards'. And then, new curriculum was initiated in 38

national experimental zones in the same year. In September 2005, all the primary and junior middle schools nationwide implemented new curriculum.

The National Standards for Compulsory Mathematics Curriculum(Trial Edition) indicates that after mathematics learning through the stage of compulsory education(Ministry of Education in People's Republic of China, 2001), firstly, students can have access to necessary mathematical knowledge (including math facts, math activities experience) which helps students adapt to social life and promote further development, as well as the basic mathematical thinking methods and application skills. Secondly, they can initially learn to use mathematical way of thinking to observe and analyze the real world; to solve problems both in daily life and other disciplines; to enhance students' awareness of applying mathematics. Thirdly, they can experience the close relationship between mathematics and the natural & human society; know the value of mathematics; enhance mathematical understanding and confidence in learning mathematics. Finally, they can have initial innovation and practical ability; emotional attitude and general ability can be fully developed.

The old textbook is based on the former syllabus of Primary Mathematics Curriculum, which emphasizes the mastery of certain basic math knowledge and skills as the essential part of math teaching in elementary school. The "Framework" of former syllabus clarifies the following concepts (Ministry of Education, 1993):

① Strengthening the teaching of basic knowledge, including concepts, nature, laws, formulas and problem solving methods, etc, which is the basis for further study of primary mathematics.

② Attaching importance to capacity-building. In addition to strengthening basic knowledge, students' intelligence and capacity-building should be developed

in primary mathematics teaching through all grades.

③ Ideological and moral education is an important task in the teaching of primary mathematics, which should be combined with teaching content and permeated through all levels.

④ Teaching methods advocate the leading role of teachers and the active learning and initiative of students, while opposing just instilling knowledge into students' brain. Accordingly, math evaluation and assessment focuses on mastery of basic knowledge and capability.

From the above all, the old textbooks in primary math teaching pay more attention to basic mathematics knowledge and skills, while valuing the development of students' intelligence and ability. Besides, ideological and moral education should be permeated in math teaching. These above mentioned characteristics of former syllabus are inherited in new standards.

Meanwhile, the former syllabus of math curriculum show some drawbacks, include: the course content is "difficult, complicated, uncommon as well as out-of-date". For example, application items are artificially made and have nothing to do with students' real life; applicable knowledge points such as statistics, data processing, estimation, etc, are overlooked. The course structure is quite single and the discipline system is relatively closed. Student learn mainly by rote rather than self-exploration, cooperative learning and independent access to knowledge; from the students real life, The emphasis is on book knowledge and classic content without focusing on students' application ability, student feelings and attitudes. Evaluation system lays too much emphasis on selection and course management emphasizes reunification, etc.

Compared with the former syllabus, the new math curriculum standards have the 3 merits. Firstly, the

process of learning is put in an important position. The new standards attach great importance to problem solving and enable students to explore mathematical knowledge through observation, hypothesis, verification, reasoning, communication and other mathematical learning activities. By doing so, to involve students in the process of learning mathematics and develop their awareness of applying mathematics.

Secondly, math teaching should be based on students' life. New standards not only value the mastery of basic math knowledge and skills, but also emphasize learning valuable, authentic and real-life mathematical content.

Thirdly, provide sufficient space to develop students' awareness of the problem-posing and problem-solving. The new curriculum standards advocate students to observe their lives and surroundings from a mathematical view, and to discover and extract valuable math problems and to solve them.

3. Features of Chinese mathematics curriculum

According to the research of Park (2004a), the content features of Chinese elementary and junior high are classified as a combined strands of contents, condensed and linear structures of contents, specific statement of learning goal, providing examples for mathematics topics stated in the curriculum, projects suggested in 'practice and integrated application', and enriched contents in some areas. From these the details closely related to the elementary are the first two.

'Combined contents' in the curriculum means that school curriculum of grades 1 to 9 in China is divided in three stages only; lower elementary, higher

elementary and middle school. mathematical contents handled by each stage are numbers and algebra, space and geometry, statistics and probability, practice and integrated applications. And the space and shape area includes measurement.

In 'condensed and the linear configuration', Korea introduces one main mathematical topic and gradually intensifies it to multiple grades, thus more in the spiral configuration.²⁾

In contrast, China introduces one topic intensively in a particular grade to avoid possible duplication in other grade, thus more in the linear configuration.

4. Class hours

Based on physiological and psychological characteristics of child's development, 'New curriculum standards' of the nine-year compulsory education is considered as a whole, and divides study time into three learning sections: the first stage (grades 1~3), the second stage (grades 4~6), the third stage (grades 7~9).

In new curriculum standards, math class takes 13% to 15% of the total class time. If there are 35 weeks per school year, the total hours and week hours of math class in primary school are as follows (Table II-1).

<Table II-1> China's math class hours

Grade		The first stage			The second stage		
		1	2	3	4	5	6
School year	Total hours	910	910	1050	1050	1050	1050
	Math hours	105 140	105 140	140 175	140 175	140 175	140 175
Per week	Total hours	26	26	30	30	30	30
	Math hours	3~4	3~4	4~5	4~5	4~5	4~5

2) Some tend to think that 7th curriculum is a step-wise curriculum deviated away from spiral curriculum, but as shown in the example teaching related statistics in the paper by Park(2004a), spiral curriculum seems to be more adapted to Korean textbooks.

The six-year elementary school math class together will be 780~980 hours. Compared to hours required in the former 'outline of math', there is a slight decrease. Reduction hours are added to the arts, sports and school-based courses. Korea's math class hours on the 7th curriculum were decreased to 4 hours per week compared to 5 hours per week of the 6th curriculum.

III. Features of chinese mathematics textbooks

In 2001, China processed elementary education reform and proclaimed new Compulsory Education Standards for Mathematical Curriculum. According to these standards, an experimented textbook was revised by 'The Curriculum and Teaching Materials Research Institute' and applied to about 5 million students, which is approximately about 25% of the Chinese grade 1's in the August of the same year. The publication by the PEP is one of most widely used textbooks in China. From 2001, they revised one grade per year starting from grade one until 2006 which were then started to use grade six textbooks(People's Education Press, 2010). We analyze PEP math textbooks(People's Education Press, 2009) to compare with Korean elementary math textbooks in this paper.

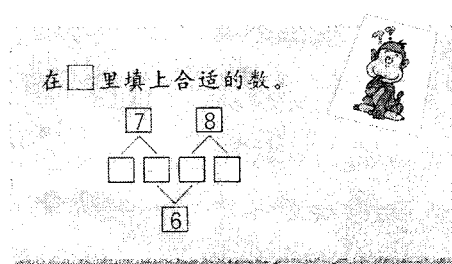
Before going into detailed analysis of PEP elementary school mathematics textbook we would like to mention a bit about its appearance and its overall configuration.

The Chinese edition of the textbook is a small octavo A5 (148 × 210mm), which is the same as the 6th educational curriculum of Korean mathematics textbook. Present day Mathematics textbooks in Korea

is crown 8vo (188 × 257 mm), which is considerably larger than the Chinese textbooks, and prints and pictures contained in it are considerably larger than Chinese textbooks. Both Mathematics Textbooks of Korea and China have about the same number of pages, ranging from 110 to 130.

Korean lower elementary mathematics textbook has about 6~7 units, whereas Chinese textbook has about 9~10 units. Of these units two of them are very characteristic. One unit titled as 'Mathematical wide-angle'. It covers not a formal math topic but a variety of ill-structured problems to broaden students' perspective on mathematics. Wide-angles will be discussed in detail below. The other unit is the last unit of textbooks titled 'total review'. Even each unit has a relatively large amount of exercise, and yet the total review unit presents another practice that covers all the contents in the textbook.

Each unit proposes more than one high-level problem which challenges students' intellectual needs, and here is attached a different character according to each grade textbook(Figure III-1).



[Figure III-1] Challenging math problem (P1-1)³⁾

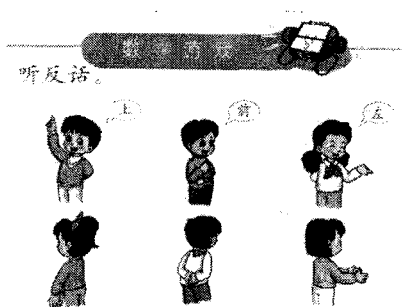
'Real life mathematics' part, which deals with mathematics in everyday life, shows how mathematics learned in school can be applied to daily life through pictures(Figure III-2).

3) By 'P1-1' on Fig.III-1, we mean the picture from the 1st semester of 1st grade PEP textbook.



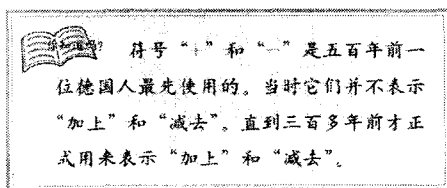
[Figure III-2] Math in everyday life (P1-1)

'math play' is an activity to increase interest in mathematics using contents learned in that unit. Korea's textbook also offers 'enjoyable play' in each unit, which is a kind of math game that will end up deciding winners and losers, and as well evaluates its players. Whereas China's will be more of an authentic play. For example, like Figure III-3, when one student points up the other partner will point down, and when one will point to the right then the other one will point to the left.

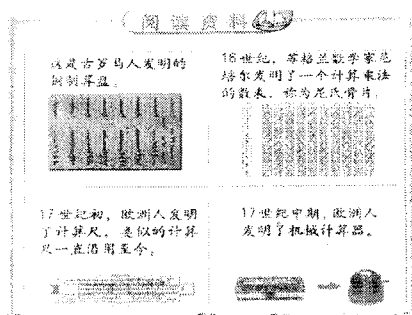


[Figure III-3] Math play (P1-2)

Starting from grade 3 textbook, there is a corner called 'Do you know this?' to introduce an interesting story and history about math(Figure III-4). In addition to this, there are 'reading materials' that is closely related to the lesson(Figure III-5).



[Figure III-4] Do you know this? (P3-1)



[Figure III-5] Reading materials (P4-1)

Overall, these components of Chinese textbooks show the effort to stimulate students intellectually and affectively.

Now we will compare Chinese and Korean math textbooks and analyze in detail the display of contents, the way of stating a problem, and the implication of included pictures. The features of Chinese textbooks can be summarized as follows: emphasis on repetition and skill, concurrent and condensed presentation of learning contents, often use of humor, implicit expressions and special unit for widening perspective.

1. Emphasis on repetition and skill

Chinese math textbooks put more emphasis on repetition and skill compared to Korean textbooks.

The beginning of each unit of the book is similar in both countries. Each page has activities to explain the concept and at the bottom of the page there is a related problem-solving working together with teachers or themselves. However, the latter part of each unit is quite different.

Korea has two pages of exercises 'Let's solve problems' to evaluate each unit whereas Chinese textbook includes much more exercise problems. For example, Chinese grade 2 1st semester textbook has 9 units which includes total review unit and each unit includes 1~4 exercise sessions. A total of 24 exercise

in the textbook sessions takes up 53 pages, which is about the half of 109 page textbook. You can also see a lot of repetition and reviews in Chinese textbook. Some units more than average contents contain summary or review pages in the middle of the unit. As mentioned earlier, the last unit of each textbook is always a total review unit to practice the key concepts learned throughout the semester.

Practice, skill and repetition are regarded as very important in Chinese math education, especially in elementary and middle schools. Most chinese mathematics educators believe that youngers can learn foundational skills and knowledge during his school years, and establishing a good foundation is the main task of mathematics education(Zhang, Li, & Tang, 2004). Li(2006) said that routine or manipulative practice is an important mathematics learning style. 'Practice Makes Perfect' is the underlying belief in chinese people, even many mathematics teachers and also students.

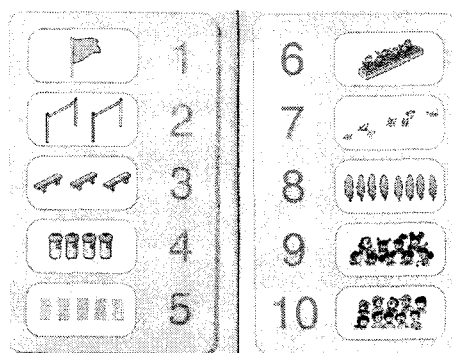
In addition, Tu Rongbao(2010), the chairman of the Chinese Society of Mathematics Education, described about 4 guiding principles of Chinese math education in mathematics education conference speech recently held in Korea. The first of these is 'strengthen the basic knowledge and basic skills'. According to him, the education based on 'two basic' has deep historical roots. "Good foundation is essential for the high building" and in this way basic knowledge and basic skills has always been highly emphasized.

2. Concurrent and condensed presentation of learning contents

You can see the difference in the way the concepts are explained in Korean and Chinese textbooks.

Concepts are presented sequentially in Korean textbooks, but in Chinese textbooks the concepts are concurrently presented and tends to be repeated.

For example, let's look at Korean textbook of grade 1 first semester. First unit is 'number up to 5'. 1st time is trying to find the number through the things in the classroom. 2nd time is looking at number from 1~3, 3rd time is looking at number from 4~5, 4th time is looking at order of number, 5th time is looking at one higher number and one lower number. 6th time is looking at concept of zero, 7th time is looking at comparison of numbers, 8th time is looking at evaluation problems, 9th time is looking at exploration activity. In unit 4, in addition and subtraction unit, 'split 2 numbers', 'add up to 2 numbers' is dealt with.



[Figure III-6] Number sense (P1-1)

Corresponding contents in Chinese textbook is dealt in unit 1 'numbers' and unit 3 'number concepts 1~5', 'addition and subtraction'. Unit 1 is primarily for forming number sense. For 1st time, one looks at examples of numbers 1~10 through the things in the school campus(Figure III-6). For 2nd time, one learns a preliminary counting. Unit 3 deals with formal number concepts. 1st time, they learn numbers 1~5 and one higher number concept. 2nd time, they learn order and comparison of numbers. Also at this time equal

and unequal signs is introduced. 3rd time, they learn splitting and collecting of numbers. 5th time deal with addition of numbers under 5 and 6th time deal with subtraction of numbers under 5 and 8th time deal with number 0, 4, 7 and 9th time is practice exercises.

An introduction of number concepts in both countries are summarized in Table III-1.

<Table III-1> Comparing Introduction of Counting Number

(unit-time) Chinese textbook	(unit-time) Korean textbook
(1-1) Counting things in campus	(1-1) Counting things in classroom
(1-2) Foundation of counting number	
(3-1) number 1 up to 5, one higher number	(1-2) number 1, 2, 3
	(1-3) number 4, 5
	(1-5) one higher number, one lower number
(3-2) comparing numbers, ordering, equality and inequality symbols	(1-4) ordinal number
	(1-7) comparing numbers
(3-3) splitting number, collecting numbers	(4-1), (4-2) splitting into two numbers, collecting two numbers
(3-5) addition under 5	(4-5) introduction of addition
(3-6) subtraction under 5	(4-7) introduction of subtraction
(3-8) number 0	(1-6) number 0
(3-7) exercise	(1-8) evaluation (1-9) exploration activity
(3-4) exercise	
(3-9) exercise	

Simultaneous presentation of the learning materials are consistent with previous study of emphasis on review exercises and skill. We can see that they put together a variety of materials for students to practice it repeatedly. As you can see from Park(2004a, 2004b) research studies, there is a tendency to focus one topic in a certain grade but you can also see they focus on teaching and practicing several concepts at the same

time within one unit. Gu, Huang, & Marton(2004) emphasized variations to introduce the essence of new knowledge to the students of which characterizes the mathematics teaching in China. There are two types of variations: one refers to conceptual variation and the other procedural variation.

The emphasis of this variation supports our research analysis results that Chinese textbooks simultaneously and intensively present materials to teach one concept.

3. Humor and Interest

When we compare pictures used in both countries, we can find explicit differences. Korean textbooks use photos richly and most of these photos show students activities related to textbook contents. Whereas Chinese textbooks rarely use photos, and the activities of students are presented in illustrations rather than photos.⁴⁾ We can find a lot of animals as main characters in the illustrations, which are much more comical than Korean ones.

For example, let's look at an illustration in Figure III-7 about a boy dividing 18 bananas to the monkeys from a division unit⁵⁾. The 6 monkeys already there are waiting with happy faces but the 3 other monkeys who were late are running in a hurry with a worried faces. When 3 more monkeys come, the number of bananas the monkeys will receive will reduce from 3 to 2 and the waiting monkeys who are already there won't be very pleased. The text tries to show nature of division that when divisor increases the quotient decreases, by portraying humorous illustrations showing people's feelings.

4) Most of the photos in Chinese textbooks are of architectures, transportations and everyday goods.

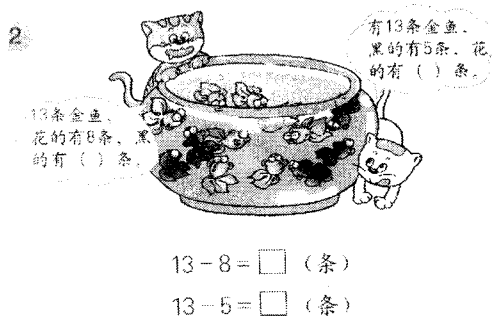
5) (1) It says, 'There are 18 bananas. When 6 monkeys share bananas equally, each will have () bananas. (2) When 9 monkeys share bananas equally, each will have () bananas.'



- (1) 平均分给 6 只小猴, 每只小猴分()个。
 (2) 如果平均分给 9 只小猴, 每只小猴分()个。

[Figure III-7] Sharing bananas (P2-1)

In another example of subtraction in Figure III-8 where subtrahend and the result can be exchanged, the two cats are slaving at a fish bowl with 8 red goldfishes and 5 black goldfishes.



[Figure III-8] Subtraction (P1-2)

These features of the Chinese textbook reflect effort for linking their (assumed) experiences to the mathematical knowledge that is presented in the illustrations and provides fun besides.

In Korean textbooks these kind of humor and portrayal of sentiments are very rare. As in example of Figure III-9 of division unit, pictures reminding students of their own experience are often found but there are no aspects that are humorous nor expose the characters' emotions in the pictures.

In addition, when Chinese textbooks present exercise that can be a bit boring, they try to motivate students through these interesting situations. For example, the

어린이 4 명이 초약돌 16 개를 똑같은 나누어 가지려고 합니다. 어린이 한 명이 초약돌을 몇 개씩 가지게 되는지 알아보시오.



* 구하는 식을 꼭 보시오.

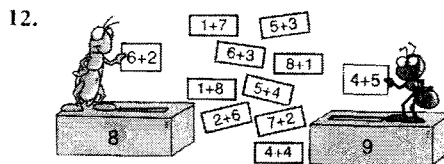
* 초약돌 16 개를 정지 4 개에 똑같은 나누어 보시오.



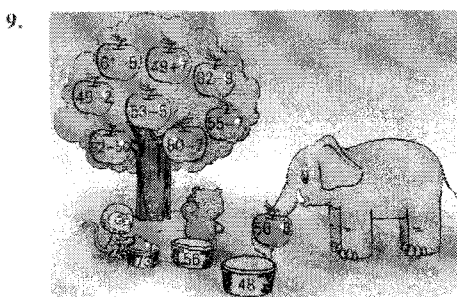
* 어린이 한 명이 초약돌을 몇 개씩 가지게 됩니까?

[Figure III-9] Sharing pebbles (K3-1)⁶⁾

following Figure III-10 and Figure III-11 are examples of problems judging right answer for sums and differences of given two numbers. One can pick a card (apple) to put it to a right box (basket).



[Figure III-10] Card addition (P1-1)



[Figure III-11] Card addition and subtraction (P1-2)

This kind of work is presented continuously in after grade 1 semester 1 addition and semester 2 subtraction to multiplication, division and complex arithmetic. So the same pattern of problems are presented through

6) By 'K3-1' on Fig.III-9, we mean the picture from the 1st semester of 3rd grade Korean textbook.

several grades to help the student to familiar with problems. It reflect the feature of repetition in Chinese textbook, as mentioned before.

The use of two characters Chongchong and Myungmyung⁷⁾, respectively male and female angel is quite impressive(Figure III-12, III-17). They appears throughout the entire books to ask question, to encourage deep thinking or to explain in more detail. It's somewhat different with Korean textbooks. For example, a character Pinocchio in the Korean textbooks appears only for ornamental purpose.



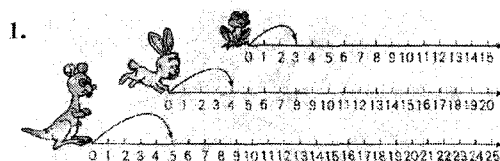
[Figure III-12] Chongchong and Myungmyung

Meanwhile, we can find many topics and pictures of their national flag, the selection of Beijing as the Olympic venue, medal order of China in the Chinese textbooks. This is probably done to give students a sense of nationalism as well as to draw their interest.

4. Implicit representation

In the Chinese textbooks, there are a lot of cases where the problem is implied in the pictures.

For example, in Figure III-13, the picture itself represents a problem. The students need to find out what the question is about by looking at the picture.



[Figure III-13] Problem without words (P2-1)

7) The chinese word, 'chongmyung(聰明)' means smart.

8) There were 31 cars in the parking lot. 15 cars left, and then 26 cars came in.

9) How many cars are finally left in the parking lot?

And, in another problems, as shown in Figure III-14, some information is presented in words but the rest is still in the picture. We can find that the explanatory text comments in the figure are only 'Make circles and explain.' over the picture and '() rabbits can share equally.' in the picture. The students themselves should count the number of carrots and figure out how many carrots each rabbit should take with looking at the picture where a rabbit is taking 4 carrots.

4. 圈一圈，说一说。



[Figure III-14] Problem with few words (P2-2)

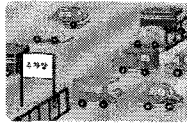
By contrast, in Korea, the problems are usually fully described in words not in the pictures. To see the differences of both countries clearly, it will be helpful to compare two similar problems, one from a Korean textbook and one from a Chinese textbook.

In the Korean problem(Figure III-15), the condition⁸⁾ and also the question⁹⁾ are presented explicitly in the text. The picture is only to show a parking lot, and the numbers of cars have no relation with the numeric conditions in the problem.

On the other hand, In the Chinese problem(Figure III-16)¹⁰⁾, the picture itself provides the information about answering the question. The students can make various explanations of this picture themselves to get some different expressions such as 58-6-7, or 58-7-6, 58-(6+7), but to come to a same conclusion.

We can also see traces of detailed care taken by

주차장에 자동차가 31대 있습니다. 자동차가 15대 빠져나가고 26대가 더 들어왔습니다. 지금 주차장에는 자동차가 몇 대 있는지 알아봅시다.



구하려는 자동차의 수를 식으로 나타내어 보시오.

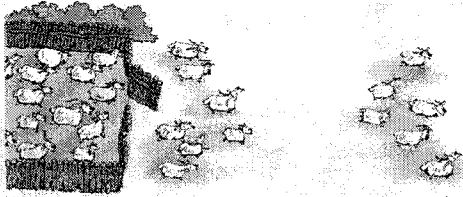
31대 있던 주차장에서 자동차가 15대 빠져나가면 몇 대가 됩니까? $31 - 15 = \square$

자동차가 26대 더 들어오면 몇 대가 됩니까?

$$\square + 26 = \square$$

[Figure III-15] The Korean problem (K2-1)

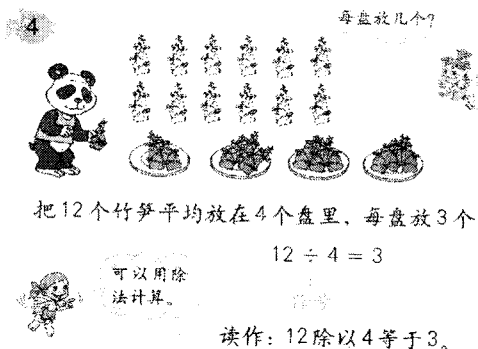
3. 羊圈(juàn)里原来有 58 只羊。



现在羊圈里面有几只?

[Figure III-16] The Chinese problem (P2-2)

educational stances over all the pictures. For example, in Figure III-17, the panda is dividing equally the bamboo shoots and the last one is putting on a plate. This will perhaps make students imagine possible mathematical ways of dividing 12 bamboo shoots equally on 4 plates.



[Figure III-17] Quotient in division (P2-2)

We can find these implicit representations all over

Chinese textbooks. This feature may cause students to misunderstand the situation, but also can facilitate students' communications with themselves or teachers.

On the other hand, we can conjecture that this feature of Chinese textbooks will make the teacher's role more heavier in curriculum planning and content explanation. In contrast to Korea, there is a separate teacher for each subject in China. So the discussions about the role of a teacher in teaching with their textbooks should be made in consideration of this difference between the two teaching institutions.

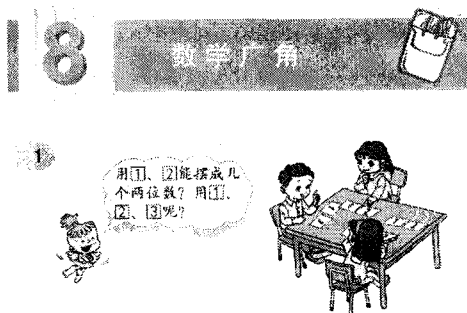
5. Special unit for widening perspective on mathematics

There is a special unit titled mathematical wide-angle in all new PEP elementary textbooks. The National Standards for Compulsory Mathematics Curriculum (Ministry of Education, 2001) clearly points out that: on the bases of students' existing experience, characteristics of their psychological development as well as the learning content, a number of important mathematical concepts and mathematical thoughts should be arranged in a gradually infiltrated and spirally deepened way. Therefore, to improve the capacity of mathematical thinking through some simple and authentic examples is the main teaching objective of mathematical wide-angle in PEP experimental math textbook.

The topics and contents of mathematical wide-angle of PEP math textbook vary by its volume. For example, the unit subjects of grade 1 first and second semester are 'Classification' and 'Explore regular patterns' respectively; for grade 6 first and second semester the subjects are 'Chickens and rabbits within the same

9) It says, 'There were 58 sheep inside the fence.', 'How many are inside the fence now?'

‘Principle of drawer’. As you can see, all the topics of mathematical wide-angle units are from students’ real lives.



[Figure III-18] wide-angle unit (P2-1)

Problems in mathematical wide-angle unit are quite open-ended and challenging (Figure III-18)¹¹⁾. To solve these problems, students should come up with various ideas rather than solely relying on rote learning and memorization. This leads students’ mathematical creative thinking.

Korean textbook has ‘Mind-opening’ at the very beginning of each unit that encourages the students’ mathematical interests, but doesn’t have such a separate unit corresponding to the mathematical wide-angle.

IV. Conclusions

In this research, we compared and analyzed Korean and Chinese lower grade elementary school textbooks under the consideration of Chinese math education tradition and new educational orientation. The result was that Chinese textbook puts much importance on practice, skill and repetition, presents condensed contents, provides various learning contents simultaneously, rich humorous expressions, a lot of implicit

representations, and mathematical wide-angle.

The first thing to note is that in the Chinese textbooks, practice and repetition exercises are not a goal, but a carefully developed way to understanding. This finding is also supported by the literatures of Chinese mathematics education.

Chinese textbooks have better consistency in textbook’s organization, method of explanation, types of problems, and especially style of pictures. When we look at the Korean textbooks, we can find variety among the pictures rather than uniformity. There are various styles of illustrations within a textbook, and this styles of illustrations even change in every grades. Whereas, in China, the illustrations are consistent throughout all the textbooks as if one artist drew them all. We need to study on educational effects of both styles, Korea’s variety and China’s consistency of pictures.

The Chinese textbook’s pictures and the way of presenting problems are deeply impressive. One had to look at the picture to get information about understanding the question. Moreover, in some other cases, the question itself is presented in the picture. This way of presenting a problem gives students a chance to interpret the problem by themselves. So pictures seem to be essential factors of the textbooks content structure. Especially to lower grades elementary students who would have hard time understanding long and wordy text, it would be helpful. On the contrary, in Korea, questions and information of problems are usually presented in the text and the pictures are just there for an ornamental purpose.

Emotional elements the illustrations portrays made deeper gaps between two countries. The humor in the Chinese pictures gives the students some inspiration

11) In Figure III-18, it says, ‘How many ways are there to make two digit numbers using cards ①, ②, and how about with cards ①, ② and ③.’

for the learning contents. Furthermore, we can observe in this humor the close cooperation between the author and the illustrator. These are probably the advantages of Chinese textbooks.

There are large common part that cultures of China and Korea can share with. Each country's research on each other's textbooks will bring much progress on development of both country's mathematics education. We hope for some follow-up studies on higher grades and each curriculum contents. This study is confined to literature analysis of textbooks in both countries. We also look forward to comparative studies on ways of how the textbooks are taught in classroom.

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중국 초등학교 저학년 수학교과서의 특징

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이 연구에서는 중국 수학교육의 전통과 새 교육과정의 취지에 대한 고려 하에, 중국 초등학교 저학년 교과서의 특징을 한국 교과서와 비교하여 분석하였다. 그 결과 중국 교과서는 연습과 기능을 중요시하고, 개념을 통합적으로 제시하고, 다양한 학습내용을 동시에

제시하고, 곳곳에 유모어려스한 표현을 담고 있으며, 문제의 조건을 함축적으로 제시하는 등의 특징이 있는 것으로 드러났다.

이러한 분석 결과로부터 우리나라 교과서 집필과 수학교육 전반에 대한 시사점을 제시하였으며 후속연구의 방향을 제안하였다.

* **Key Words** : China's mathematics education(중국 수학 교육), China's mathematics textbooks(중국 수학 교과서), Comparative study of textbooks(교과서 비교연구)

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