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The Content of Primary Science in the National Curricula of Korea, China, and Japan

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ABSTRACT

The purpose of the study is to analyze and compare the primary science curricula of Korea, China, and Japan. Science textbooks for Korea and China and national science curriculum guides for Korea and Japan were analyzed in terms of the scope and sequence of the topics.

The number of primary science topics dealt with is greatest in China, followed by Korea, then Japan. In addition to the wide range of topics, the Chinese curriculum also shows more in-depth coverage of topics. On the contrary, the Japanese curriculum has the least number of topics and shallowest depth of coverage. Korea seems to be in the middle between China and Japan. The similarities of the curricula in these East Asian countries is greatest between Korea and China, and the least between China and Japan. The similarities between Korea and Japan is somewhere in the middle.

Korean primary science curriculum shows a comparatively even distribution of topics across grades. A relatively smaller number of sub-topics are introduced at each grade level, especially in the area of earth science and physics. On the contrary, in the Chinese curriculum, sub-topics tend to be concentrated at a certain grade level, thus major topics are dealt with in a grade or two. The Japanese science curriculum has fewer topics than those of the other countries, and generally one or two sub-topics appeared in a grade or two.

Key words: primary school, science curriculum, international comparison, Korea, China, Japan

I. Introduction

Recently, many countries have revised their science curriculum to meet the challenges of

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the new era. Many countries also began to pay more attention to the scope and sequence of science curricula in other countries (Klein & Rutherford, 1985; U.S. DOE, 2001). A recent international science comparison study, TIMSS, analyzed and compared the content and level of science curricula of participating countries (Robitaille *et al*, 1993; Schmidt, *et al.*, 1997).

East Asian countries have also concentrated their efforts on science curriculum reform. Japan initiated science curriculum reform in 1996, according to the recommendations of its Central Council for Education. The Curriculum Council of Japan developed a fundamental policy and course of action for the new curriculum in 1998 (Shimizu, 2001). The emphasis of new primary science curriculum is on the relevance of science to children's daily life, and the reduction of content.

The national curriculum of China has also been changing and adjusting since 1980, becoming more flexible and diverse (Luo, 2001). China is currently developing science textbooks according to the 8th national curriculum reform, and the textbooks will be pilot-tested from 2001 to 2004. The emphasis of the new Chinese science curriculum is scientific literacy for all (Luo, 2001).

The experiences of those nations with similar cultural and social backgrounds and educational systems may provide a lot of useful information on the intentions and efforts of China and Japan toward science curriculum reform. They also provide insight about the direction of science curriculum reform in Korea. Some Korean science educators have recently been interested in the primary science curricula of other countries, including China and Japan (Cho & Woo, 1992; Kim, 1993; Kwon & Park, 1996). However, the national curriculum reforms in Korea, China, and Japan during the late 1990s' require another science curriculum comparison study.

The purpose of the study is to analyze and compare the current primary science curricula of Korea, China, and Japan. To achieve this goal, the following research problems were formulated.

(1) When and how much are the topics dealt with in the primary science curricula of Korea, China, and Japan?
(2) What are common and different topics in the primary science curricula of Korea, China, and Japan?
(3) What are the scope and sequence of science topics in the primary science curricula of Korea, China, and Japan?

Ⅱ. Research procedures and methods

To analyze the primary curricula of three countries, the science textbooks from Korea and China and the national science curriculum guides for Korea and Japan were analyzed (Table

1). For China, only 4th-, 5th-, and 6th-grade science textbooks were available for the analysis.

Table 1. The documents analyzed

Grade level	Korea		China		Japan	
	Curriculum	Textbook	Curriculum	Textbook	Curriculum	Textbook
3rd	Korea national curriculum guide (1997)	Gwahak 3-1 (2001. 3), 3-2 (2001. 9)	-	-	Japan national curriculum guide (1998)	-
4th		Gwahak 4-1 (2001. 3), 4-2 (2001. 9)	-	Zi ran 7 (1995. 10), Zi ran 8 (1996. 4)		-
5th		Gwahak 5-1* (2001. 3), 5-2* (2001. 9)	-	Zi ran 9 (1996. 10), Zi ran 10 (1997. 4)		-
6th		Gwahak 6-1* (2001. 3), 6-2* (2001. 9)	-	Zi ran 11 (1997. 10), Zi ran 12 (1998. 4)		-

* field-test version

1. Analysis procedures

To analyze the primary science curricula of Korea, China, and Japan, science curriculum frameworks were developed. The frameworks were based on the Korean primary science curriculum in order to compare the curricula with a Korean perspective. To reflect the characteristics of primary science curricula, unit titles as well as major science themes were included, if necessary, in the framework.

Using the science curriculum framework, the grade level when each topic is introduced was identified for each country. And then the amount of coverage in each country's curriculum was determined. These dual processes provide opportunities to check for errors. If a topic is introduced as a unit or more than a unit, it is represented as bold uppercase. If a topic is introduced over more than one lesson, then it is described as uppercase. If a topic is introduced as a part of a lesson, it is represented with lowercase.

To compare the topics in the primary science curricula of each country, Venn diagram

nalysis was employed. The common topics among the three countries were identified, and the similarities in the curricula among the countries were compared. Finally, the scope and sequence of topics were investigated with major topic analysis. The topics analyzed were categorized into major topics according to the similarities among topics. The number of sub-topics of the three countries were identified across grade-levels to determine their general scope and sequence.

Ⅲ. Results

Three East Asian countries' primary science curricula were analyzed in four content areas: earth science, physics, chemistry, and life science. The results were presented for each research problem.

(1) When and how much are the topics dealt with in the primary science curricula of Korea, China, and Japan?

The grade level when each topic is introduced, and the amount of coverage was investigated (Table 2, 3, 4, and 5). Japan covers only a small number of topics in earth science, such as rock, sand and soil, landscape changes, volcanoes, earth quakes, strata, fossils, water cycle, weather, moon, sunny and shady places, stars, and diurnal motion. Sunny and shady places, stars, and diurnal motion are dealt with only in the Japanese curriculum (Table 2). The sequence of the Japanese curriculum in earth science is the solar system and universe at the 3^{rd}- and 4^{th}-grade level, weather at the 4^{th}- and 5^{th}-grade level, and geology topics at the 5^{th}-, and 6^{th}-grade level. In general, the topics in the Japanese curriculum seem to be more easily observable and accessible to children.

China's primary science curriculum contains more topics than the other two countries in the area of earth science. The topics dealt with only in the Chinese curriculum among the three countries are soil preservation, natural resources, weathering, evolution of life forms through geologic time, the composition of the air, motion of the earth, eclipses of the sun and moon, using solar energy, solar altitude, and galaxies (Table 2). However, weather is not dealt with in the Chinese curriculum. The Chinese primary science curriculum seems to be aimed at promoting the development of the national economy in the units of earth materials and processes, and accept discipline-centered recommendations in earth history, and the solar system and the universe.

The number of topics in the Korean primary science curriculum is greater than the Japanese and less than the Chinese curriculum. Korea is the only country which deals with an oceanography concept, submarine topography. Korea's curriculum is the only one that dealt with folds, faults and earth's shape as topics (Table 2). Korea deals with relatively many earth science topics in the early grades compared to the other two countries.

Table 2. The earth science topics in the primary science curricula of Korea, China, and Japan

	Topics	Grade-Level			
		3rd	4th	5th	6th
Earth materials	Rocks, sand, and soil	**K**			J
	Soil preservation				C
	Igneous rocks		c	K	
	Metamorphic rocks		c		**K**
	Sedimentary rocks		K c		
	Using rocks		C	k	
	Natural resources				**C**
Earth processes	Processes by water	**K**		J	
	Landform changes		**K**	J	
	Weathering				C
	Volcanoes			**K**	C J
	Earthquakes				**K C J**
	Folds/faults				K
	Submarine topography		K		
Earth history	Strata		**K**		C J
	Fossils		**K**		C J
	Evolution of life forms through geologic time				C
Weather	Composition of the air			C	
	The water cycle		J	**K C**	
	Wind			**K C**	
	Air pressure				k
	Weather	**K**		J	
	Weather forecasting			J	**K**
The solar system and the universe	Earth shape	k			
	The motion of the Earth				C
	The shape of the Moon	K	C		
	The motion of the Moon	K	J		
	The phase change of the Moon	K	C		C
	The Sun		C	K	
	Sunny and shady places	J			
	Eclipses of the sun & moon				C
	Using solar energy		C		
	Sun dial			C	
	Solar altitude			C	
	The solar system			**K**	C
	Seasonal change				**K**
	Stars		J		
	Diurnal motion		J		
	Constellations		**K**	C	C
	Galaxies				C

K: Korea, C: China, J: Japan Bold uppercase: topics dealt with more than a unit
uppercase: topics dealt with part of a unit lowercase: topics dealt with part of a lesson

Table 3. The physics topics in the primary science curricula of Korea, China, and Japan

	Topics	Grade-Level			
		3rd	4th	5th	6th
Force and motion	Force			C	
	Elastic force		**K**	C	
	Frictional force			C	
	Balance		**K**	**J**	
	Buoyancy				K
	Pressure in water				K
	Velocity			**K**	
	Action and reaction			C	
	Potential energy		C		
	Simple pendulum			**J**	
Heat and energy	Temperature	**K**	**C**		
	Heat transfer		**K J**	**C**	
	Insulation		k	C	
	Energy & transformation			**K**	
	Simple machines				**K C**
	Volume change by heat		**K C J**	C	
Electricity and magnetism	Electricity (introduction)		C		
	Static electricity			**C**	
	Use of electric energy			**C**	
	Lighting electric bulbs	J	**K**		
	Electric circuit		J C	**K**	
	Insulation/ electric safety	J	C		
	Solar cells		J		
	Magnets	**K J**			
	Electromagnets				**K C J**
Light and waves	Shadow				
	Light path	**K**			C
	Light reflection	J		K	C
	Light refraction			K	C
	Light separation/composition				C
	Light energy	J			
	Making sound	K		C	
	Propagation of sound	K		C	
	Telecommunications				C
Miscellaneous	Technology from organisms				C

K: Korea, C: China, J: Japan Bold uppercase: topics dealt with more than a unit
uppercase: topics dealt with part of a unit lowercase: topics dealt with part of a lesson

The physics topics in the three countries' science curriculum are presented in Table 3. Japan covers a smaller number of topics in physics. The topics, simple pendulum, solar cell and light energy are dealt with only in the Japanese curriculum (Table 3). The sequence of the Japan's curriculum in physics is light and waves at the 3rd-grade level, electricity and

magnetism in the 3rd-, 4th-, and 6th-grade, heat and energy in the 4th-grade, and force and motion at the 5th-grade level.

The China's primary science curriculum deals with more topics than those of other countries in the area of physics. The topics dealt with exclusively in the Chinese curriculum among the three countries are force, frictional force, action and reaction, potential energy, electricity, static electricity, use of electric energy, light separation and composition, telecommunications, and technology derived from organisms (Table 3). The emphasis in China seems to be vocational education related in the units of electricity and magnetism and light and waves, and discipline-centered in force and motion.

The number of physics topics in the Korean primary science curriculum are greater than in Japan and less than the China's curriculum. Korea is the only country which deals with velocity, and energy transformation (Table 3). Korea introduces many physics topics at every grade level.

Table 4. The chemistry topics of the primary science curricula of Korea, China, and Japan

	Topics	Grade-Level			
		3rd	4th	5th	6th
Matter	Matter	k			
	The three states of matter	K	J		
	Gases		J		K J
	Oxygen			C	K
	Carbon dioxide			C	K
	Hydrogen				K
	Liquids	k	K J		
	Solids	k			
	State changes		K J	C	
	Metals		C		
Mixtures & Solutions	Powders	K			
	Dissolving (powder)	K		J	
	Separating a mixture	K	K		
	Solutions			K J	
	Concentration			K	
	Acids and bases			K	J
	Reactions of solutions			K	J
	Solute crystallization			K	
Chemical change	Combustion			C	K J
	Extinction			C	K
	Rust prevention		C		
Miscellaneous	Capillary action		C		
	Volume change by pressure in a gas		J		
	Volume change by pressure in a liquid		J		

K: Korea, C: China, J: Japan Bold uppercase: topics dealt with more than a unit
uppercase: topics dealt with part of a unit lowercase: topics dealt with part of a lesson

The chemistry topics and grades dealt with in the three countries' science curriculum are presented in Table 4. The topics such as volume change by pressure in a gas and liquid are dealt with only in the Japanese curriculum (Table 4). The general sequence of the Japanese curriculum in chemistry topics is matter at the 4th-grade level, mixtures and solutions at the 5th-, and 6th-grade level, and chemical change at the 6th-grade level. Volume change by pressure in a gas and liquid are presented at the 4th-grade level.

Chinese primary science curriculum also deals with a smaller number of topics than those of other countries in the area of chemistry. The topics dealt with only in the Chinese curriculum among the three countries are metal, rust prevention, and capillary action (Table 4). The emphasis in China seems to be closely related with vocational education in the units of metals, rust prevention, and capillary action.

The number of chemistry topics in Korean primary science curriculum is greater than the Chinese and Japanese curricula. Korea is the only country which introduces chemistry topics in the 3rd-grade, and deals with powders, concentration, separating a mixture and solute crystallization (Table 4). The sequence of Korean curriculum is matter, mixtures and solutions, and chemical change as the grades increase.

The life science topics in three countries' science curriculum are presented in Table 5. The topics of fish development and growth, and human development and birth are dealt with only in the Japanese curriculum (Table 5). The general sequence of Japanese curriculum in life science topics is flowers and seeds, and fish and human development at the 5th-grade level, and photosynthesis, respiration, digestion, and circulation at the 6th-grade level. The topic, environment and life, is dealt with from the 3rd- to 6th-grade.

The Chinese primary science curriculum deals with many topics in life science. The topics dealt with only in the Chinese curriculum among the three countries are fruit production, vegetative reproduction, mammals, fishes, reptiles, amphibians, the ear, the eye, growth and development, livestock, endangered species, decomposition, and the cell (Table 5). The emphasis of the Chinese science curriculum seems to be related to agriculture and academic requirements.

The number of life science topics in the Korean primary science curriculum is greater than the Japanese and less than the Chinese curricula. Korea is the only country which introduces concepts such as fruits, plant classification, animal shape and characteristics, animal classification, and animal behavior and mating (Table 5).

Summary

In general, the China's primary science curriculum includes more topics than the other two countries, whereas Japan's curriculum deals with the least number of topics. However, China has the least and Korea the most number of topics in the area of chemistry. China also has many topics related to the development of agriculture, industry, and academic requirements.

Table 5. The life science topics in the primary science curricula of Korea, China, and Japan

	Topics	Grade-Level			
		3rd	4th	5th	6th
Plants	Leaves	K j			
	Stems and role	K j		C	
	Roots and role	j	**K**	C	
	Flowers		C	**K J**	
	Fruits			**K**	
	Fruit production			C	
	Life cycles (bean)	j	K	J	
	Seeds structure		C	J	
	Germination of seeds		k	C J	
	Vegetative reproduction			C	
	Plant classification				K
	Transpiration			K C	
	Photosynthesis			K C	J
Animals	Life cycles	**K** j	C		
	Shape and characteristics		**K**		
	Animal classification				K
	Mammals		C		
	Fishes		C		
	Reptiles		C		
	Amphibians		C		
	Insects	k j	C		
	Fish development & growth			J	
	Human development & birth			J	
	The nervous system				K C
	The ears			C	
	The eyes				C
	Respiration			C	K J
	Digestion			C	K J
	Nutritious substances			C	J
	Circulation			C	K J
	Growth & development				C
	Livestock				C
Environment and Life	Animal behavior/mating		**K**		
	The environment and life	k j	k J	K J	C J
	Ecosystems	k			K C
	Endangered species				C
	Environmental problems & conservation				K C
	Air pollution	k		C	
Miscellaneous	Decomposition		C		
	The cells				C
	Life in a pond	K			
	Small life forms	J		K	

K: Korea, C: China, J: Japan Bold uppercase: topics dealt with more than a unit
uppercase: topics dealt with part of a unit lowercase: topics dealt with part of a lesson

(2) What are the common and different topics in the primary science curricula of Korea, China, and Japan?

To investigate which topics are common and which topics are different in the three Asian countries, Venn diagram analysis was employed. In spite of geographic closeness and similar cultural and educational backgrounds, there is quite a diversity in the science curriculum topics of the three countries.

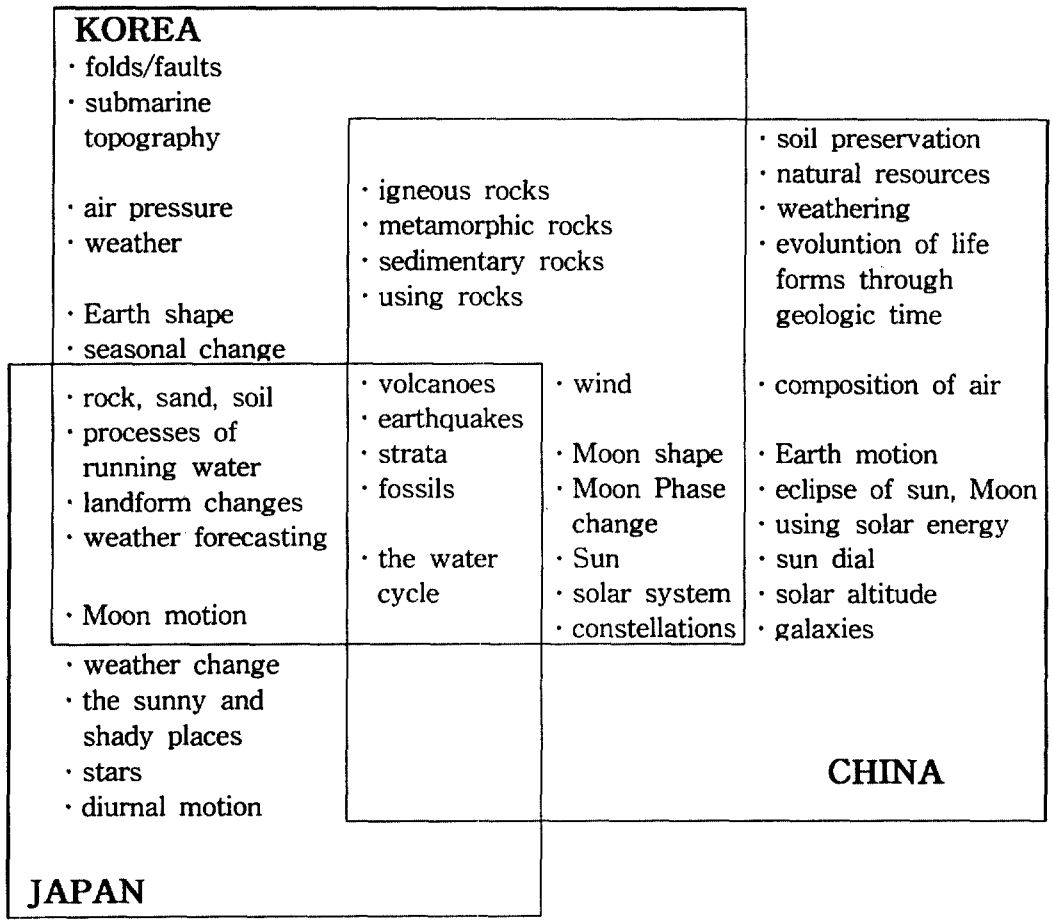

Fig. 1. The Venn diagram of earth science topics in the national curriculum of Korea, China, and Japan

The common topics among the three countries in earth science are volcanoes, earthquakes, strata, fossils, and the water cycle. The common topics in Korean and Chinese curricula are igneous rocks, metamorphic rocks, sedimentary rocks, using rocks, wind, shape

of the moon, lunar phase changes, the Sun, the solar system, and constellations. However, there are few topics in common between China and Japan. Korea and Japan share the topics of rock, sand, soil, processes of running water, landform changes, weather forecasting, and the motion of the moon (Fig. 1). As a whole, in the earth science area, the primary science curricula of Korea and China have more similarities than Korea and Japan, or China and Japan.

The common topics of the three countries in physics are heat transfer, volume change by heat, electric circuits, electromagnets, and light reflection. The common topics in Korea and China are elastic force, temperature, insulation, simple machines, light path, light refraction, making sound, and the propagation of sound. However, only one topic, insulation and electric safety, is common between China and Japan. Korea and Japan share the following topics: balance, lighting electric bulbs, and magnets (Fig. 2). As a whole, in the area of physics, the primary science curricula of Korea and China are more similar than those of Korea and Japan. The primary curricula of China and Japan are the most dissimilar in this area.

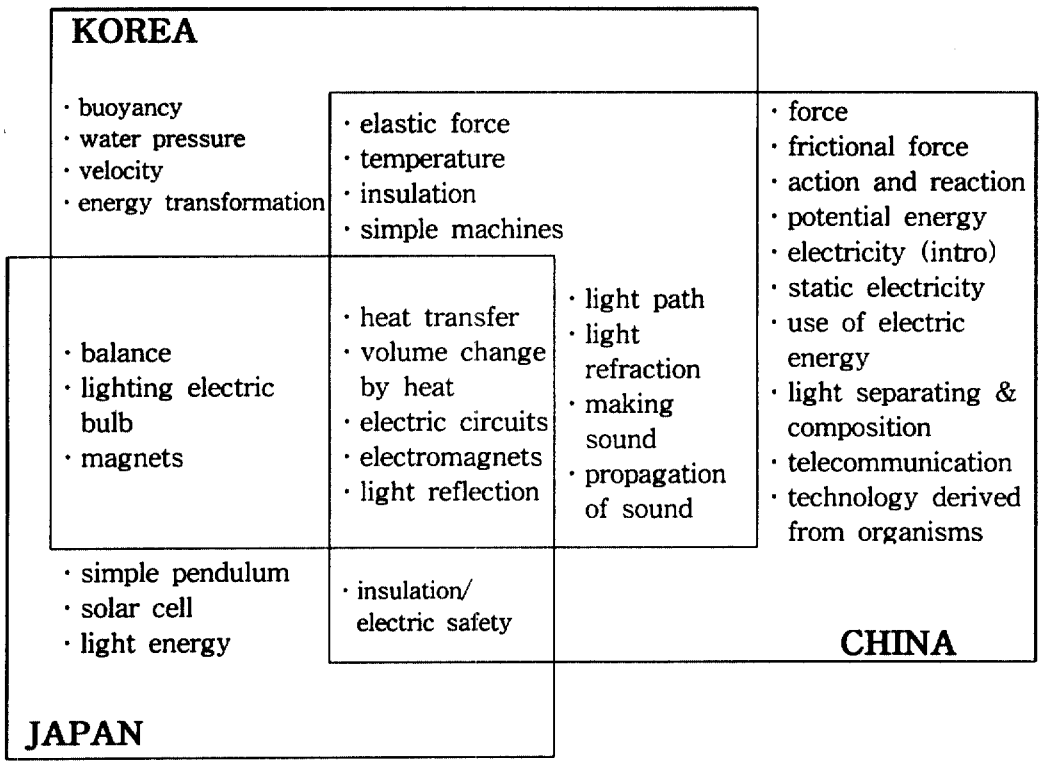

Fig. 2. The Venn diagram of physics topics in the national curriculum of Korea, China, and Japan

The common topics of the three countries in chemistry are state changes, and combustion. The common topics in Korea and China are oxygen, carbon dioxide, and fire extinguishing. However, there are few topics in common between China and Japan. Korea and Japan share these topics: the three states of matter, gases, liquids, dissolving, solution, acids and bases, and reaction of solution (Fig. 3). As a whole, the primary science curricula of Korea and Japan have more in common in the area of chemistry than those of Korea and China, or of China and Japan.

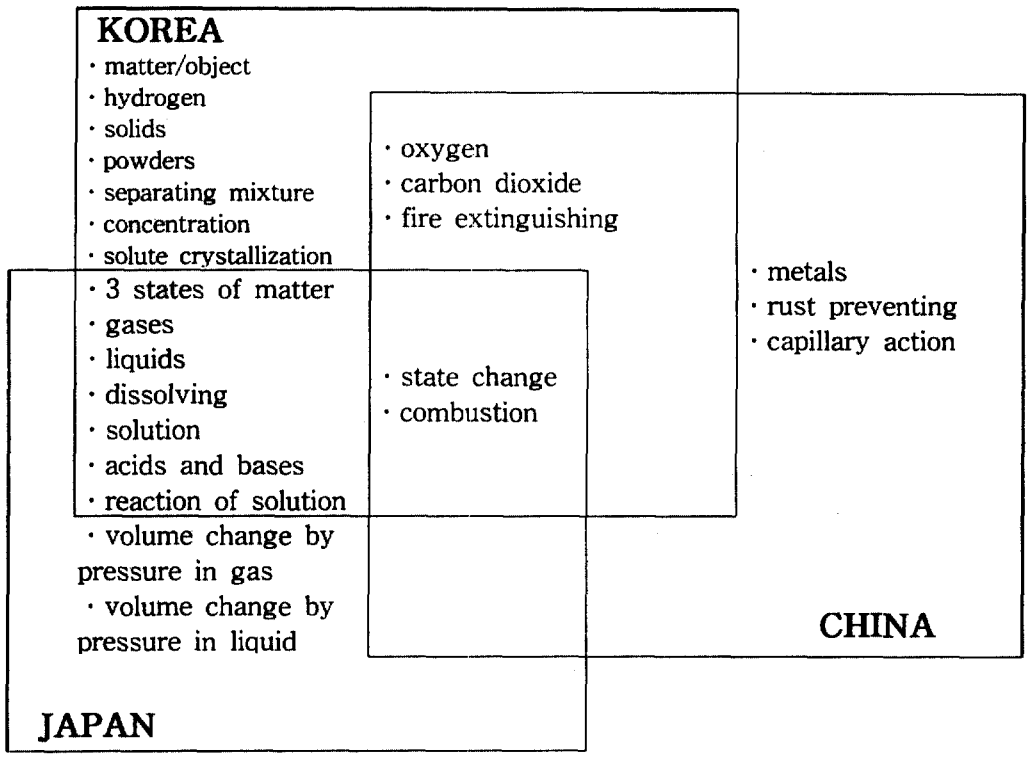

Fig. 3. The Venn diagram of chemistry topics in the national curriculum of Korea, China, and Japan

The common topics of the three countries in life science are stems and their roles, roots and their roles, flowers, seed germination, photosynthesis, life cycles (animals), insects, respiration, digestion, circulation, and environment and living things. The common topics between Korea and China are transpiration, the nervous system, nutritious substance, ecosystems, environmental problems and conservation, and air pollution. One topic, seed structures, is common between China and Japan. Korea and Japan share these topics:

leaves, life cycles (plant) and small living things (Fig 4). As a whole, the primary science curricula of Korea and China have more in common than those of Korea and Japan, or of China and Japan.

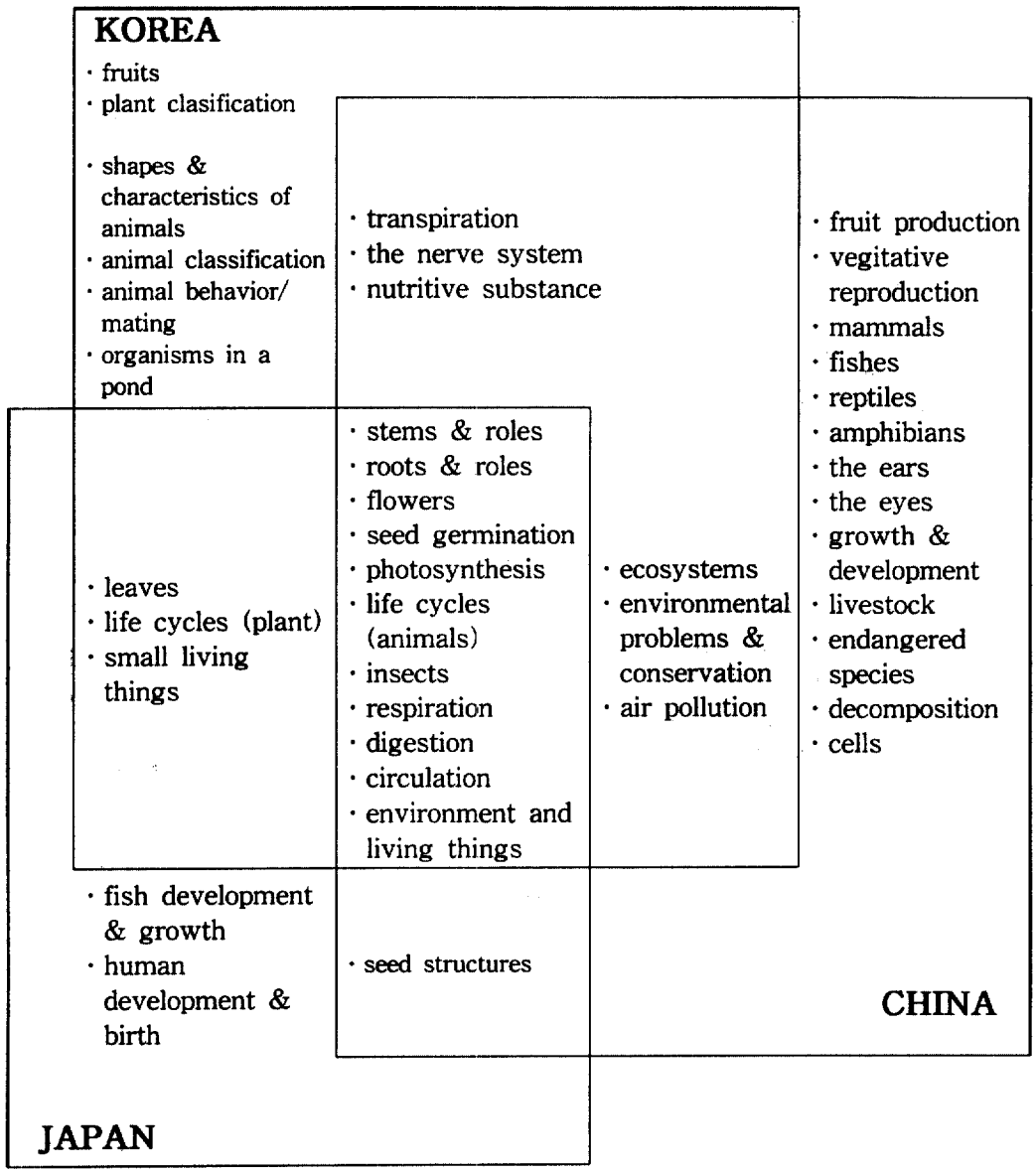

Fig. 4. The Venn diagram of life science topics in the national curriculum of Korea, China, and Japan

(3) What are the scope and sequence of science topics in the primary science curricula of Korea, China, and Japan?

To grasp the general scope and sequence of the primary science curricula in three East Asian countries, the amount of coverage in each major topic was explored at each grade level (Table 6, 7, 8, 9). In the area of earth science, the Korean primary science curriculum deals with each major topic throughout the four year grade span, and introduces one or two topics at each grade level except earth history and stars. The Chinese science curriculum introduces each major topic in one or two grades except the solar system and the universe which is introduced at every grade level. The Japanese science curriculum also introduces each major topic in one or two grades. However, the Chinese system usually deals with more than three sub-topics in each grade when the sub-topic is introduced, whereas the Japanese system deals with one or two sub-topics only (Table 6).

Table 6. The scope and sequence of earth science topics in the national curricula of Korea, China, and Japan

Core Topics	Country	Scope and Sequence			
		3rd	4th	5th	6th
Earth materials	Korea	-----	----	====	----
	China		≡≡≡≡		====
	Japan				---
Earth processes	Korea	----	====	----	====
	China				≡≡≡≡
	Japan			====	====
Earth history	Korea		====		
	China				≡≡≡≡
	Japan				====
Air & weather	Korea	----		====	====
	China			≡≡≡≡	
	Japan		----	====	
The solar system	Korea	≡≡≡≡		====	----
	China		≡≡≡≡	====	≡≡≡≡
	Japan	----	====		
Stars and galaxies	Korea		----		
	China			----	====
	Japan		----		

-: one sub-topic, =: two sub-topics, ≡: more than three sub-topics

In the area of physics, the Korean primary science curriculum deals with each major topic throughout the three or four year grade span, and introduces one or two topics at

each grade level except light and waves. Technology is not introduced in the Korean curriculum. This is because it is covered in the subject 'vocational education' in the Korean national curriculum. The Chinese science curriculum introduces each major topic in two or three grades, except technology. The Japanese science curriculum introduces each major topic in one grade, except electricity and magnetism which appears across three grades. However, the Chinese system usually deals with three sub-topics in a grade when the sub-topic is introduced, whereas the Japanese system deals with usually only two sub-topics (Table 7).

Table 7. The scope and sequence of physics topics in the national curricula of Korea, China, and Japan

Core Topics	Country	Scope and Sequence			
		3rd	4th	5th	6th
Force & Motion	Korea		====	----	====
	China		----	≡≡≡≡	
	Japan			====	
Heat & Energy	Korea	----	≡≡≡≡	----	----
	China		====	≡≡≡≡	----
	Japan		====		
Electricity & Magnetism	Korea	----	----	----	----
	China		≡≡≡≡	====	----
	Japan	≡≡≡≡	====		----
Light & Waves	Korea	≡≡≡≡		====	
	China			====	≡≡≡≡
	Japan	====			
Technology	Korea				
	China				----
	Japan				

-: one sub-topic, =: two sub-topics, ≡: more than three sub-topics

In the area of chemistry, the Korean primary science curriculum shows less consistent patterns. The topics of state, matter, and mixtures are introduced in two or three grades. However, other topics are introduced at one grade level or not introduced at all. There also is a topic focus for certain grades: matter in the 6th-grade, state and mixtures in the 3rd-grade, and solutions in the 5th-grade.

The Chinese science curriculum introduces matter and chemical reactions at two grade levels. However, other topics in chemistry, mixtures and solutions, are not covered at all.

The Japanese science curriculum introduces state and solution in two grades, and mixtures and chemical reactions in one grade (Table 8). As a whole, a smaller number of topics are introduced in the three countries' curricula in the area of chemistry. The Korean curriculum emphasizes mixtures, solutions, and matter, whereas the Japanese curriculum focuses on states and solutions, and the Chinese curriculum emphasizes matter and chemical reactions.

Table 8. The scope and sequence of chemistry topics in the national curricula of Korea, China, and Japan

Core Topics	Country	Scope and Sequence			
		3rd	4th	5th	6th
Matter	Korea	----			≡≡≡≡
	China		----	====	
	Japan				
States	Korea	≡≡≡≡	====		----
	China			----	
	Japan		≡≡≡≡		----
Mixtures	Korea	≡≡≡≡	----		
	China				
	Japan			----	
Solutions	Korea			≡≡≡≡	
	China				
	Japan			----	====
Chemical reactions	Korea				====
	China		----	====	
	Japan				----
Miscellaneous	Korea				
	China		----		
	Japan		====		

-: one sub-topic, =: two sub-topics, ≡: more than three sub-topics

In the area of life science, the three countries show similar patterns. Topics are usually dealt with in a one or two grade span. Korea intends to teach stems, roots and flowers from the 3rd- to 6th-grades. The environment and organisms are dealt with in every grade level in all three countries.

Some topics, such as respiration, digestion and circulation, and sensing and the nervous system are usually introduced at higher grades. However, fruits, seeds and reproduction is generally dealt with at the 4th- and 5th-grade level (Table 9). As a whole, many topics are introduced in the area of life science of the three curricula investigated.

Table 9. The scope and sequence of life science topics in the national curricula of Korea, China, and Japan

Core Topics	Country	Scope and Sequence			
		3rd	4th	5th	6th
Leaves	Korea	----		====	
	China			====	
	Japan				----
Stems, roots & flowers	Korea	----	----	----	----
	China		----	====	
	Japan	====		----	
Fruits, seeds & reproduction	Korea		====	----	
	China		----	≡≡≡≡	
	Japan	----		≡≡≡≡	
Animal classification	Korea	----			----
	China		≡≡≡≡		
	Japan	----			
Sensing & the nervous system	Korea				----
	China			----	====
	Japan				
Respiration, digestion & circulation	Korea				≡≡≡≡
	China			≡≡≡≡	
	Japan				≡≡≡≡
Animal miscellaneous	Korea	----	----		
	China		----		====
	Japan	----		====	
The environment & organisms	Korea	≡≡≡≡	====	----	====
	China			----	≡≡≡≡
	Japan	----	----	----	----
Miscellaneous	Korea	----		----	
	China		----		----
	Japan	----			

-: one sub-topic, =: two sub-topics, ≡: more than three sub-topics

Summary

As a whole, the Korea's primary science curriculum shows a fairly even distribution of topics across grades. Relatively small numbers of sub-topics are introduced at every grade level, especially in the area of earth science and physics. On the contrary, in the Chinese curriculum, sub-topics are concentrated in a certain grade level, therefore the major topic is dealt with in a grade or two. The Japan's science curriculum has a smaller number of topics than those of the other countries, and generally one or two sub-topics appeared in

one or two grades.

Ⅳ. Conclusion

The primary science curricula of three East Asian countries, Korea, China, and Japan, were analyzed and compared. Science is taught as a separate subject from the 3rd-grade in Korea and Japan. In China science is taught under the name of Zi ran (Nature) from the 1st grade. However, only parts of Chinese science textbooks from 4th- to 6th-grade were analyzed. From the results of the study, the following conclusions have been drawn.

First, the number of primary science topics covered is greatest in China, followed by Korea, then Japan. In addition to the wide range of topics dealt with, the Chinese curriculum also shows a more in-depth coverage of topics. On the contrary, the Japanese curriculum has the least number of topics and a shallower depth of coverage. Korea seems to be somewhere in the middle between China and Japan.

Second, the similarities of the curricula among these East Asian countries is greatest between Korea and China, and least between China and Japan. The similarities between Korea and Japan is somewhere in the middle.

Third, the Korean primary science curriculum shows a comparatively even distribution of topics across grades. A relatively small number of sub-topics are introduced at each grade level, especially in the area of earth science and physics. On the contrary, in the Chinese curriculum, sub-topics tend to be concentrated in a certain grade level, thus the major topics are dealt with in a grade or two. The Japanese science curriculum has fewer number of topics than those of the other countries, and generally one or two sub-topics appeared in a grade or two.

The conclusion requires careful interpretation because for some countries, analysis was based on both national curriculum guides and textbooks, whereas for other countries only the national curriculum guides or science textbooks were used. Only upper grade levels of Chinese science textbooks were analyzed and the study cannot show the experience of the lower grade children in China. For Japan, only the curriculum guide was used for analysis and therefore, the results represent only major aspects of experience of Japanese children.

The Japan's curriculum reflects its new national policy, in which classes are now held five days a week rather than six. Korea is also planing to implement the five day per week system in the near future. The experiences of Japan in adapting the five day per week system may provide insights to and have implications for Korea. The reduction of semester hours and content of the science curriculum are inevitable for us.

China is one of the fastest growing countries in the world. Formal schooling has been extended from 10 to 12 years recently and the proportion of children in a formal education system has dramatically increased. The science curriculum has also been in the middle of

drastic changes. The analysis of Chinese science curriculum may provide unique information on the role and interaction of science education with national economic development, confucian culture, and communist society. It also provides insights and a knowledge base in understanding the North Korean science curriculum and science education which may contribute to the mutual understanding and unification of the two Koreas.

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