

Current Problems of Mathematics Education in Korea and How to Solve Them¹

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One of the most fundamental problems in education in Korea up to yet is that teaching-learning activities in the classroom are carried out without considering each student's interest, ability, aptitude and other attributes.

In 1995, National Committee on Educational Reform of Korea recommended big changes on various aspects of the education system of the nation.

In 1997, just before so-called the "International Monetary Fund (IMF) crisis" in Korea, Ministry of Education announced the seventh amendment of national curriculum. The foundation of new national curriculum is the implementation of a "differentiated" curriculum.

Also, the new curriculum strongly suggests "performance assessment", which was introduced to the nation in mid 1990's.

However, most mathematics teachers have reluctant to both new curriculum and performance assessment

1. EDUCATION REFORM

The desire of Koreans for best quality education was major driving force for nation's development. Education in the Republic of Korea (South Korea) made remarkable advances in quantity as well as quality over the last five decades.

However, the improvement of teaching-learning of mathematics is far below than expected. Educational environment is not good as other field of the society. Hence the government declared "Educational Revolution" in 1995, and announced new curriculum, which is called "differentiated curriculum", in 1997.

As core of educational reform, South Korea has started new curriculum of

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mathematics last year according to the implementation schedule (see Table 1) of seventh curriculum² of the nation's school system (grades 1–12: see Table 2).

Table 1. Implementation Schedule for New Curriculum

Schools	Academic Year				
	2000	2001	2002	2003	2004
Primary School	Grades 1 and 2	Grades 3 and 4	Grades 5 and 6		
Middle School		Grade 7	Grade 8	Grade 9	
High School			Grade 10	Grade 11	Grade 12

Table 2. The Layout of Mathematics Courses in New Curriculum

Schools	Grades	Mathematics Courses	
High School	12	Completely Elective Courses	
	11		
	10		
Middle School	9	10 × 2 Steps of Requisite Courses	Extra Curricula (both for gifted and remedy)
	8		
	7		
Primary School	6		
	5		
	4		
	3		
	2		
	1		

Early this year (2001), Ministry of Education & Human Resources of the Korean announced the “Plan for Improvement of Educational Environment”, which the Korean government will spend 9 trillion 920 billion won (approximately 8 billion U. S. dollars) until year 2004 to improve educational environment (such as to build 14,494 new classrooms and to hire 23,600 new teachers (7 % increase)). The core part of the plan is to reduce the numbers of students in a class (see Table 3).

However, there are much concern and worry on carrying out the seventh curriculum from the year 2000 because the curriculum is based on the complicated “differentiated

² So-called “the seventh curriculum” is not properly named because it is actually the seventh amendment of the national curriculum of school in the system of education.

education” concept (Lee 2001; Han Shick Park 2001).

Table 3. Numbers of Students per Class

School	Korea		Japan	Germany	France
	Year 2000	Expected (Year)			
Primary School	35.7	Under 35 (2003)	27.5	Under 30	25–30
Middle School	38.0	Under 35 (2003)	33.0	Under 30	No data
High School	42.7	Under 35 (2002)	36.9	Under 25	35

Resource: Ministry of Education & Human Resources

Even though South Korea has changed the mathematics contents of school curriculum more than seven times, the teachers in the primary, middle and high schools never fully understand the necessity or reason (Han Shick Park 2001).

Since “performance assessment” was introduced in Korea in the mid 1990’ s, much difficulty has also raised in teaching-learning of mathematics in schools.

J. Park & H. Park (2000) studied teachers’ response on “performance assessment”, which is strongly suggested by the new curriculum, as of 300 primary school teachers. 167 teachers (58.3%) responded negatively.

Another recent survey³ shows that more than three quotes of secondary school teachers are not happy about new curriculum (See Figure 1). They like to postpone or abandon the curriculum (See Figure 2).

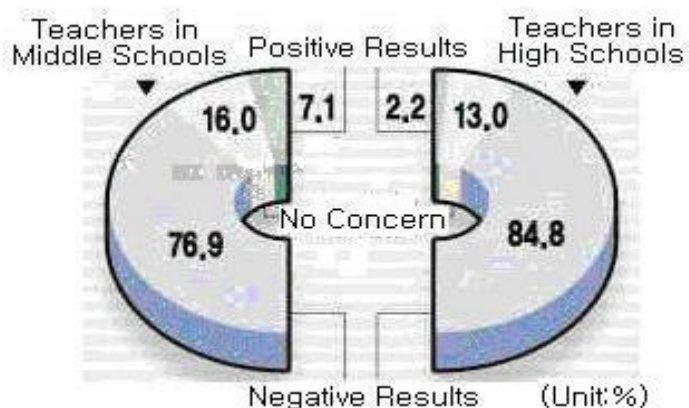


Figure 1. Teachers’ Expectation about Success of New Curriculum

³ Korean Federation of Teachers’ Associations and a daily newspaper “Dong-a Ilbo” conducted a survey as of 1903 curriculum coordinators out of nation’s 4450 secondary schools.

We need to find out the reason of this phenomenon and to look for remedy.

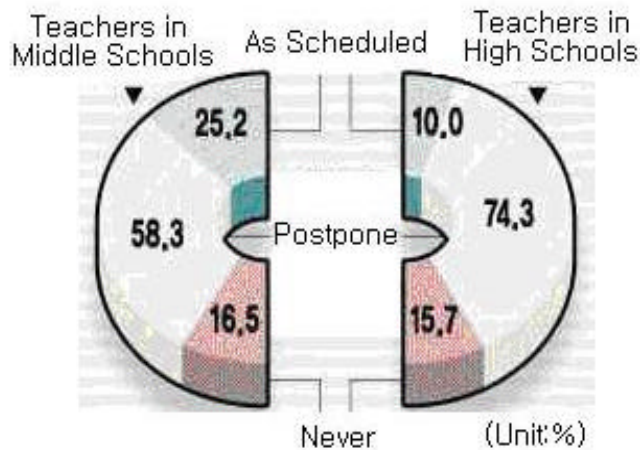


Figure 2. Teachers' Opinion on Starting Time for New Curriculum

2. BRIEF HISTORY OF MATHEMATICS EDUCATION IN SOUTH KOREA

Without understanding the historical background and the social constraints, which act in Korean mathematics education, it is very difficult to understand how such phenomenon has occurred (Han Shick Park 1993).

Post-Liberation Period. 1945-1956

The liberation of Korean Peninsular from Japan was a turning point for education in Korea, even though after the liberation, the nation has been divided into two parts (the Republic of Korea in the south and the Democratic People's Republic of Korea in the north).

During the Japanese occupation, the schools in Korean Peninsular were merely for elites. After liberation, the forerunners of education were concerned with the extension of school education to everybody and begun a new movement, which included the student-oriented teaching-learning.

However, the mathematics contents were not greatly changed because those persons who made the mathematics curriculum did not know much about worldwide movement of mathematics education. The contents of new mathematics textbooks were very similar to that of old Japanese one (Han Shick Park 1993).

There was a severe shortage of mathematics teachers, too. Just before the end of World War II, about 40% of elementary school teachers in Korea were Japanese and they

went back to their home country, and the situation in secondary schools was severer.

On the converse, in the three years of 1945–48, the number of schools and the enrollment of students were doubled.

In 1950, South Korea started new school system. However, the new school system didn't work well because the Korean War erupted soon after.

Pragmatism Period. 1955–1964

In 1951, Japan had changed mathematics curriculum under the influence of American pragmatism. In 1952, American Mission of Education came to Korea to open the “Teacher Training Center” and introduced the “living math”.

Ministry of Education shaped the first Korean mathematics curriculum. Since the Japanese curriculum was influenced by American pragmatism, so was the Korean curriculum. The first Korean curriculum was enacted in 1955 and remained in practice until 1964. The first curriculum had many problems from the beginning because most textbooks (especially high school textbooks) were not made according to philosophy of “living math”.

In 1961, education in Korea entered into a new epoch after military coup. The new totalitarian government emphasized modernization just to escape from starving.

Systematic Curriculum (“New Math”) Period. 1965–1999

In 1963, the second curriculum change was announced and the new systematic education was started in 1965 and remained effective until 1973.

During the development of the second curriculum change in Korea, the “new math” movement in America was introduced. But curriculum developers did not know what the movement was, and hence they could not put the “new math” into the second curriculum.

Even though the “new math” had not been reflected in curriculum change, the Ministry of Education encouraged textbook writers to reflect the movement in textbooks. Therefore, some textbooks reflected the “new math” trends extensively while others were not. In 1972, the unit “Computer and Numerical Analysis” was added to all of high school textbooks in response to public opinion that the use of the computer should be included in the textbooks. However, not many teachers cared about the unit.

Finally, the “new math” curriculum (the third curriculum change) became effective in 1974. The “new math” textbooks based on the third curriculum change were in many respects patterned after the American experimental textbooks like S. M. S. G. and U. I. C. S. M., but the new movement was not properly implemented well in Korea because the contents of the textbook were too diverse and aimed too high. Another reason for the unsuccessful implementation was that many qualified mathematics teachers were

transferring to industry because of relatively higher salaries, and supply of qualified teachers was somewhat limited.

In 1981, the fourth curriculum change (the first revision of the “new math” curriculum) was made. Some contents of the “new math” were deleted and basic skills were emphasized, which resulted in a considerable retreat from the “new math”. The fourth curriculum change also emphasized the ability and the integrative approach to problem solving.

In 1987, the fifth curriculum change (the second revision of “new math” curriculum) was made with a further emphasis on basic knowledge and skills, problem solving, mathematical activity and attitude of students.

Another serious problem arisen in 1974 and again in 1981 was that the textbook publishers monopolized the mathematics textbook market. They published only one kind of textbook for junior high school and only five for senior high school. This lowered the quality of the textbooks and eventually the quality of mathematics education.

Furthermore, the Ministry of Education of the totalitarian government administered a national exam to decide which students were qualified to enter universities. The national exam was consisted of multiple-choice problems, so it could not evaluate performance of students properly. The national exam had a great influence on the teaching of mathematics of high schools and finally on mathematics education of the whole nation. Creativity of mathematics was completely ignored.

The sixth mathematics curriculum change was enacted in 1992. The new curriculum has placed more emphasis on problem solving and use of computers in mathematics. However, mathematics teachers did not want to diversify the contents of school mathematics. Hence, critical changes in mathematics education didn't come.

3. PROBLEMS OF MATHEMATICS EDUCATION IN SOUTH KOREA

Mathematics teachers of high schools are very popular since mathematics is one of very important fields of university entrance examination. However, teachers are just looking for strategy to increase the number of students who get high scores in the entrance examination. One strategy is to abandon to teach very difficult problems and repeating very simple problems.

Hence new curriculum reduced about 30% of contents of mathematics. The uniformity of school education is another problem. Educational programs, which are presently offered by most schools neglected individual differences of students in ability, interest, aptitude and other personal attributes.

Best quality education requires qualified teachers. However, supply of qualified

teachers was somewhat limited because the best students in mathematics did not want to be future mathematics teachers.



Figure 3. An American mathematics classroom

Teachers stubbornly adhering to conventional teaching methods have further complicated the problem. One-third of the students are abandoned to accumulate deficiencies beyond the remedy.

One market in Korea, which is very popular, is publishing home delivery worksheet of mathematics. Most of home delivery work sheets exactly follow the schedule specified by the national curriculum of school education. About 30% of secondary students learn mathematics from private tutors or teachers of non-school institutions.

Best quality education needs also best educational environment such as well-designed mathematics classroom

Figure 4 shows an example of American mathematics classrooms well equipped with teaching-learning materials. Korean mathematics teachers also need such mathematics classrooms.

Jeong (2001) has given a model of mathematics class, which she says, a model class of the “differentiated” education.

Jeong claims that the “differentiated” curriculum of South Korea is very similar to curriculum of Britain. She introduced Chestnut Grove School in England as an example.

However there is big difference between situation in Korea and that in Britain. In Britain each school has many mathematics classrooms, but in Korea no middle school teacher has his/her own classroom. Just before mathematics class begins, in Britain students has to move, but in Korea the teacher has to move because students do not need to change their home-base rooms.

Jeong (2001) says the seventh graders in Chestnut Grove School are divided six different classes according students ability in mathematics. Two top classes have only 2–8 students each and next three classes have 18–23 students each. The class of lowest level has mathematics IT room with CAI programs. She has not mentioned the size of this class.

Even at end of year 2003, schools in South Korea will still have class size of 35 students. We do not know that Korea will have mathematics classrooms equipped with teaching-learning materials.

In conclusion, the quantity in mathematics education in Korea has been expanded tremendously, but the quality is much lower than expected. We need international cooperation to improve the quality of mathematics education.

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