An Interview with Oh Nam Kwon

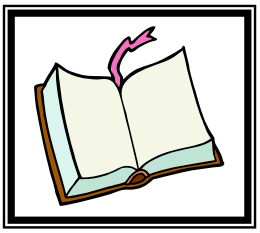
Ed Laughbaum, The Ohio State University, <elaughba@math.ohio-state.edu>

Dr. Kwon <onkwon@mm.ewha.ac.kr> or <kwon.88@osu.edu> is a Professor of the Department of Mathematics Education at Ewha Woman's University, Seoul, Korea. She received an M. A. in Mathematics from Seoul National University in 1985, a Ph. D. in Mathematics in 1992 and M. Ed in Mathematics Education in 1993 from Indiana University. Her primary research interests are the use and integration of hand-held technology and gender issues in mathematics education. She has been leading several projects funded by Korea Research Foundation and the Ministry of Education since 1993.

OCTM: Welcome, and thank you for agreeing to be interviewed.
ONK: Thank you and it is my pleasure.

OCTM: We would like to learn a little about math education in Korea. So, the first series of questions relates to mathematics education and students in Korea. Does a "typical" Korean student do daily homework? How much homework is assigned each day? Please answer this for each of the three grade levels - elementary, middle, and high school.

ONK: A typical elementary student has homework to do on the days (four to five days per week) that one has a mathematics class at school. Usually problems from the textbooks are assigned as homework. It covers about one to two pages each day. Homework can be done within thirty minutes. A middle school student has homework to do three to four times per week that can be done between thirty to forty minutes at each time. A high school student spends about ten to twenty minutes more time than a middle school student does. However, a typical senior in high school spends more time studying mathematics in order to prepare for the National College Entrance Examination.



OCTM: How long is the Korean school year, and how many minutes per day are students in math class?

ONK: The Korean Education Law established the minimum number of school days for the completion of one academic year; primary, middle and high schools should have no less than 220 school days. For tertiary education, 32 weeks are the minimum requirement of school attendance. The academic year consists of two semesters. The first semester begins on March 2nd and ends in the middle of July. The second semester spans from September 1st to the middle of February. There are four to five mathematics classes per week depending on grades at the elementary school. One class period is 40 minutes at the elementary school. Students have four mathematics classes per week at the secondary level. But one class period of middle school and high school is 45 minutes and 50 minutes respectively.

OCTM: Do Korean students typically have private math tutoring sessions after school hours?

ONK: Many students, even elementary students, have private mathematics tutoring or after school institutes to supplement regular school. One of problems that Korean education faces is directed mainly toward the preparation for the National College Entrance Examination. As a result, parents pay high tuition fees for extra tutoring to prepare their children for the rigorous college entrance examinations. Therefore, Korean parents suffer from the heavy burden of private tutoring expenses. According to the Third International Mathematics and Science Study (TIMSS), 45.3% of Korean elementary students have private tutoring or after school institutes for mathematics in 1995. 49.1% of middle school students have private

mathematics tutoring or after school institutes in 1995. Even though high school data from TIMSS is not available, my guess is that about 80 % of high school students have private mathematics tutoring or after school institutes because of their imminent college entrance examination. Mathematics is considered as a " critical filter" to enter colleges in Korea.

OCTM: Does everyone go to high school? Or is high school for a select few?

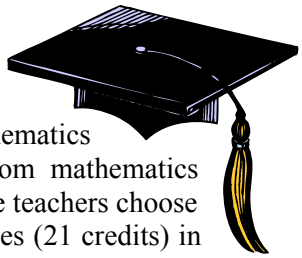
ONK: Yes, almost all the middle school students go to high schools. According to Korean Statistical Yearbook of Education, 92.4% of high-school-aged boys and 91.3% of high-school-aged girls were enrolled in 1999. Among these students attending high schools, 57.8% were enrolled in academic high schools and 42.2% were enrolled in vocational high schools.

OCTM: How many minutes (hours) per day is a teacher teaching? How many minutes (hours) do teachers use per day in preparation for class? Do they prepare while at school or at home?

ONK: Elementary school teachers teach five to six classes per day. They prepare about 20 minutes for one class unit at their schools. Middle school teachers teach four to five classes per day. High school teachers teach three to four classes per day. Middle and high school teachers spend one hour per one class unit for their preparation at their schools.

OCTM: Do teachers collaborate with one another on teaching mathematics as a normal activity?

ONK: Most elementary school teachers share their information and materials. However, middle and high school teachers are not likely to collaborate with other teachers except a few who have a common interest in teaching, such as, technology utilization in their classrooms.



OCTM: At the elementary school level, are teachers trained in mathematics? That is, how many credit hours of mathematics must they take during their pre-service education?

ONK: Most of pre-service teachers take nine to twelve credit hours of mathematics courses. Namely they take three or four courses: one or two from mathematics content and two from methodology courses. If elementary pre-service teachers choose a mathematics specialist program, they take about seven more courses (21 credits) in mathematics content and pedagogy.

OCTM: Is drill and practice a common teaching strategy in the Korean math classroom?

ONK: I am reluctant to admit this fact. But it's true for secondary school mathematics instruction. In the mathematics classroom, rote learning and memorization is prevalent. Teachers focus on drill and practice, which is one of major portion of the college entrance examination. Secondary school teachers often confess that they spend 70% of their teaching in computational skills. As a result, even though Korean students achieved excellent results in a series of recent international comparison studies of primary and middle school student achievements in mathematics such as TIMSS, they do not like mathematics. American students did not do well in TIMSS compared to Korean students, but they seemed to like mathematics more.

OCTM: Does Korea have a set of national mathematics standards? If yes, do teachers follow them? If no, do you have regional standards? Any standards?

ONK: We have a national curriculum for every subject. Our national curriculum is somewhat equivalent to the NCTM Standards. But the Korean curriculum focuses on lists of specific concepts and skills at each grade level. We don't have any regional or local curriculum. Every textbook is dependent on the national curriculum. Korean textbooks are concise and highly focused. Teachers at all levels strictly follow their textbooks. Textbooks are

considered as a "bible" to mathematics teachers. In this sense I can say that teachers follow the national curriculum.

OCTM: You have mentioned TIMSS a couple times, and as you well know Korean students scored much better than did the US students. Do you think the US public educational system is in trouble? If so, do you think we should model your system and teaching methods?

ONK: I think that the public conception to mathematics has to change. As John Glenn mentioned in the opening address of T^3 Conference in Columbus on March, nobody says, "I can't read" in public. But people in this country are quick to say, "I can't do math." I heard that parents in this country are not likely to worry about their children's mathematics achievement since parents themselves did not do well mathematics for their schooling. I think that mathematics literacy is as important as language literacy. About your second question, importing textbooks from my country or Singapore definitely will not solve your problem. Every country has its own culture. Even though a certain system works well in Korea, there is no guarantee that it will work in this country. Janice Grow-Maienza points out in her research on Mathematics Instruction in Korean Primary Schools (in press, Journal of Educational Psychology) that one of main factor of high achievement of Korean students on international comparison studies is parental involvement in education. She claims that the very high value placed on education by Korean families relative to other national populations is probably very important. She further claims that the amount of money spent for private tutoring and after school institutes is 8% of Korea's Gross National Product. This makes a difference in the number of hours children are exposed to mathematics instruction and probably in their achievement in Korea. I agree with her.

People in this country are quick to say, "I can't do math."

OCTM: Lets change direction a little. You have been on sabbatical at The Ohio State University for about seven months now, how would you compare math education in the US with math education in Korea?

ONK: It is not easy to directly compare mathematics education in the US with mathematics education in Korea. There are huge differences in culture between the two countries. I believe that cultural difference are related to educational differences in general. Thus, without a deep understanding of cultural differences, the comparison of cross-national differences in mathematics education might be superficial. The simplified version of the comparison may be summarized as follows:

1. Uniformity vs. Diversity: The Korean education system has been organized and operated with rigid restrictions and uniform control by the government. The national curriculum might be just one example of such rigidity of the Korean educational system. As far as I understand, the American education system gears to diversity and allows for local needs. For the case of mathematics curriculum, I have learned that every district can have its own mathematics curriculum.
2. Considering Individual Differences: The Korean education program is so uniform that it is not responsive to individual differences in ability, aptitude, and interest. Until recently, ability grouping was not permitted. Almost all the mathematics courses are compulsory for Korean students. According to the Korean Educational Development Institute survey of secondary school students in 1994, 45% of students responded that they could understand less than half of what was taught in mathematics. On the other hand, the American educational programs can accommodate diverse teaching-learning activities to be responsive to individual needs.
3. Textbooks: Mathematics textbooks in terms of format, content covered, and exercises are different between the two countries. Textbooks in the US are larger (in size) and thicker

(in the number of pages) than textbooks in Korea. The content of the textbooks in the US tend to be more visual with many colors and illustrations while Korean textbooks depend more on the written text with illustrations used as examples or to clarify an idea. In short, the American textbooks are more "entertaining" to students than the Korean textbooks.

OCTM: Based on your research at Ewha University in Seoul and your experience in math education, do you think graphing calculators will become a common teaching tool in Korea? Why, or why not?

ONK: Graphing calculators are not common teaching tools in Korean classrooms yet. But I predict that if the following barriers can be overcome, Korean students will and should enjoy the power of visualization through graphing calculators in their mathematical learning.

1. Cost: The cost of a graphing calculator is more than twice the cost in the US. For example, the cost of a super calculator such as TI-92 is about $500. Considering the fact that the cost of a laptop computer is as cheap as $1,000, this is quite expensive. This is one of the obstacles to utilizing hand-held technology in the Korean classrooms. Whenever I gave workshops for in-service mathematics teachers, they understood the messages I tried to convey. My message is that there is considerable educational potential of technology use in mathematics teaching. At the same time we realize that the cost is an obstacle for such utilization.
2. College entrance examination: While the use of calculators on national and states tests such as SAT and AP tests is permitted in the US, the Korean college entrance examination and other national tests explicitly forbid the use of calculators and computers. There is a widespread belief among mathematics teachers, parents, school boards, and legislators that using a calculator in testing makes the test easier for students rather than it permitting the assessment of higher order thinking that cannot be tapped in traditional pencil and paper tests.

Recently, Korea has been actively working on implementing and facilitating information-technology-based education systems. I hope this will soon link with implementing hand-held technology in mathematics education.

OCTM: The testing you describe seems to be assessing the "doing" of mathematics. Yet hand-held technology is a teaching and learning tool. Are you saying that educators in Korea only see hand-held technology as a method for doing mathematics?

ONK: As a matter of fact, there is a tendency for Korean educators to see hand-held technology as a tool for doing mathematics. There are relatively small populations of Korean educators to understand the educational potential of hand-held technology. Even among those who understand it, the most common reason for not using it is that it can't be used on any standardized tests. One of the factors about the negative attitudes toward mathematics is that teachers put too much emphasis on doing mathematics rather than understanding it. Through authentic understanding, mathematics students can put a value on why they have to study it.

Through authentic understanding, mathematics students can put a value on why they have to study it.

OCTM: Your position on the use of hand-held technology seems to be favorable. Do you think it should be used from elementary school on - assuming it is used appropriately?

ONK: I believe that the use of calculators in the early grades is necessary for familiarization, for checking work, and for problem solving. Recently I have had a chance to visit a kindergarten classroom using CBR. I was amazed at the kindergarten pupil's understanding of graphs. That is a good example of appropriate use of hand-held technology at the early ages. During

my observation, I noticed that through an active experience with the CBR, kindergarten pupils were acquiring conceptualization and understanding of graphs.

I noticed that through an active experience with the CBR, kindergarten pupils were acquiring conceptualization and understanding of graphs.

OCTM: One last question, for handheld technology to be used effectively and appropriately, must it be integrated into the textbook or can we use a more traditional text and then have technology supplements?

ONK: In order to optimize and maximize the power of hand-held technology in mathematics education, it is essential to be integrated into the textbook. I think that there might be a possibility to use it superficially rather than meaningfully when treated as a technology supplement.

OCTM: Thank you for this opportunity to hear your opinions. It is good to get observations from educators in other countries.

ONK: It is my great pleasure.

QUOTE:
"If the professors of English will complain to me that the students who come to the university, after all those years of study, still cannot spell "friend," I say to them that something's the matter with the way you spell friend." Richard P. Feynman, The Meaning of it All - Thoughts of a Citizen-Scientist. 1998. Perseus Books. Reading, MA.