Direction of Mathematics Curriculum Reform in Korea

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APEC Khon Kaen Conference

2011.11.12
Curriculum Revision in Korea

• Since 1945, Korean mathematics curriculum has been revised 9 times with a period of 5-10 years.
• Currently, we revised in 2007 and 2011. And, we revised again in 2015. The period is just 4 years.
• Many math teachers worry that this period is too short to manage curriculum steadily. More serious is that we have to develop new textbooks in period of 4 years.
Curriculum revision in Korea

• There were only three time of major revisions in 1973, 1997 and 2011.
• The other revisions had a relatively small scale of change.
• According to the chair of revising committee (Park, 2014), the 2015 revision has also small scale of change to reflect only some key points.
What is the hope?

• How to make an easier, a more interesting, a more meaningful mathematics for students?
• This point is based on the assumption that mathematics is necessary for promoting national and individual development and mathematics is important for all students.
Curriculum Revision in Korea

• If we could agree to this assumption “roughly”, how to realize the hope through curricula?

• Today, I want to introduce the main direction of the newly developed curriculum, which is to reflect the current hope of the society and the cumulative result of history of curricular reffrom.
Major Revision in Korea

- There were only three time of major revisions in 1973, 1997 and 2011.
- The 3rd curriculum of 1973 emphasized theoretical mathematics and strongly adopted the philosophy of "new math" which was designed for reflecting the pure mathematics that rapidly developed in the 20th century at the school level.
Major revision in Korea

- Since the 4th curriculum of 1980, the basic position of mathematics education had slowly been changed toward focusing on practical aspects such as problem solving, application and the use of calculators.
- Based on this slow change, the 7th curriculum of 1997 made a big change to focus on practical mathematics, which sharply contrasted with the 3rd curriculum.
The 7th curriculum

• In the 7th mathematics curriculum, students were expected:
  – to be able to mathematically organize real world phenomena, (application & modeling)
  – to understand mathematical relations of concepts and principles by the process of abstraction based on their own concrete operations, (understanding)
  – to promote mathematical reasoning abilities by way of solving various problems using mathematical knowledge and skills they have already acquired, and (reasoning & problem solving)
  – Finally, to acquire a positive attitude toward mathematics (attitude)
Inconvenient Truth

• However, traditionally, the most serious problem in Korean mathematics education is that mathematics is considered as a mere tool subject for students to prepare for the college entrance examination.
Math Culture

• Such emphasis on test preparation without internal motivation for learning has made it difficult for students to obtain a real understanding and to develop reasonable and productive thinking abilities.

• It demands students to mechanically accept undigested contents organized around topics frequently appearing in the examination.
Changing culture

• As a result, it has become almost impossible for students to nurture mathematical thinking and desirable mathematical attitude.

• This is a reason why almost of all students including high achievers dislike mathematics.

• Since 1997, Korean government has tried to change the culture toward focusing mathematical attitude and interest as well as problem solving and modeling.
Other Key competencies

• In addition, 21\textsuperscript{st} century future-oriented society requests students become not only more \textit{creative} in their work but also considerate towards other people and comply with the rules and order of the greater society: \textit{a good personality}. 
Curriculum of 2011

• The “Future-oriented” mathematics curriculum of 2011 had the aim of nurturing youth equipped with mathematical creativity and sound personality.
2012 Policy for mathematics education

• The MOE announced a policy on advanced mathematics education on January in 2012.

• This is because Korean students had a low interest, value and confidence in mathematics even though ranking the highest grades at international mathematics tests.
Key Point of 2015 curriculum

• Making students more interesting, easier, more meaningful in mathematics!!
• How?
• Weakening of Difficult Contents: Proof
• Strengthening of Operation: Technology
• Reducing complex calculation
Weakening of Difficult contents: Proof

• Although proving has always been acknowledged as a compulsory part of mathematical education, the teaching of proof within school mathematics has not been as successful as expected.

• That is owing to, not only the lack of knowledge of the concepts in geometry, but also the difficulty of systematically connecting propositions by logical rules within the axiomatic system.
Proof

- The reason why students have difficulty with proving or are not able to achieve the expected goals in geometric education is because of formal logical proof.
- Logical proving in geometry education involves describing geometric knowledge according to logical formats, but students are not thoroughly trained of logical formats.
Proof

• students’ arguments are considered to be justified if they provide proper reasons in the problem solving process regardless of the absence of logical formats.

• Customizing logical proof to the process of objective justification to match students’ levels provides students with the opportunity to actively utilize their reasoning abilities as well as to enjoy mathematics.
Delay one or two years of Proof

• Now we teach proof from 8th grade. But, in the 2015 curriculum we will delay one or two years to avoid the students’ cognitive difficulty.

• In Korea, we teach Euclidean geometry before going to
Technology

• To understand mathematics well and increase problem solving ability, students has to increase gradually the degree of abstractness and have a chance to explore problems or to find solution based on concrete operation.

• However, practically, technology use in mathematics classroom seems to be far less than expected
Technology

• Because a paper textbook is usually well organized in itself, teachers generally depends on the textbook’s order and contents.

• Because basically a paper textbook is designed to teach well without computer, teachers prefer the traditional “chalk and board” in their classrooms.
Technology

• Furthermore, students see teacher’s explanation through screen and there is no chance to enjoy operation because every classroom has only one PC, projector and screen.

• “Teachers talk and show and students see and hear”: Long tradition to mislead mathematics education in Korea!!
Technology

- This is the Trojan Mouse.
- This symbolizes “computer in classroom”
- A strategy to reform math classrooms where teachers are too conservative to change their teaching styles.

We have succeeded infiltration of the tool like a Trojan Horse. But, nobody guarantees its successive mission because in the Mouse, there is no army, dislike Trojan Horse
Technology

• All students have to do something rather than seeing. We need a dynamic textbook for all students to explore something on tablet PC rather than just seeing teacher’s explanation.

• Together with curriculum revision, we are preparing the era of the digital textbook. We have to prepare many things to do from authoring tool, budget and teacher preparation etc.
Reduction of complex calculation

- We will reduce complex calculation or move to higher grades.
- We will move fractional multiplication to 6th grade from 5th grade and mixing calculation of fraction and decimal numbers to middle school from 6th grade
Conclusion

• I have introduced curriculum revision developed in 2015.
• Challenge is to make mathematics more meaningful, more interesting, easier.
• It might be to follow rainbow!!
• But, it is urgent because very few students like mathematics.
• In 21st century mathematics is more important than the previous century.
We have a dream....
Microworld

Euclid explores something with compasses with his colleagues and students.
Conclusion

• In this school, students and teachers have curiosity in learning and look happy in communicating each other.

• Of course, it is a just hope and there is no royal road to reach at the final goal but we still have to keep going on although it is very rough and tough.

• It might be destiny of Korean math education society for their students.