

# IT-Based Education in Korean Schools and Chonbuk National University: Current Status

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## ABSTRACT

Korea has been putting strong emphasis on the development and application of information and communication technology (ICT) for decades and, as of 2005, it is considered to have the best infrastructure for accessibility of high speed internet in the world. Korea is now pushing forward the utilization of such ICT infrastructure for productive improvement of education in general and with particular emphasis for schools. Schools and universities are encouraged to actively apply ICT for improving education in practice, and noticeable change is observed. This talk introduces various examples of IT application to education, currently ongoing in some schools and in Chonbuk National University.

## 1. Introduction

Information and communication technology (ICT) has induced drastic societal change in recent decades and it is expected to continue. Educational sector is no exception from such change and a consensus is formed that ICT can fruitfully be exploited for improving teaching and learning. As such many developed countries are seriously trying to develop ICT-based educational systems and materials.

Korea has scarce natural resources and very high population density. To overcome such handicap and maintain high growth, it chose ICT as one of the strategic key technologies for future and had maintained substantial investment to its development and application. As a result of such continued investment, the current Korean ICT infrastructure can easily be summarized as the most connected and wireless country.

Education is a long-term enterprise for stable national and societal development. Koreans have a long tradition of keeping faith in the value of education and readily sacrifice themselves for better education of their children. In line with this tradition, the government has been playing an active role for comprehensive educational improvement utilizing the ICT infrastructure.

Encouraged by the government initiative and almost unanimous popular support, schools at every level have been actively engaged in ICT use for classroom education in various ways. This talk attempts to overview current status of ICT-based education practice with several examples.

## 2. ICT-based Education: Potential Benefits and Prerequisite

It is generally accepted that ICT-based education can bring the following potential benefits:

### •Teacher's side▶

- time saving through resource sharing
- time saving through automated evaluation of tests
- real-time diagnosis of students' progress on knowledge and understanding
- efficient knowledge transfer and understanding using multimedia instruction materials

### •Student's side▶

- accessibility to learning materials at any time and place
- time saving through downloading of instruction notes
- real-time self diagnosis of learning progress

To fully exploit these potential benefits, however, the following environment is prerequisite:

- installation of internet connected computers (the hardware aspect)
- distribution of high quality instruction materials (the software aspect)

### 3. Current Status of IT-based Education: Schools and Public Sector

#### 3.1 Preparation of Infrastructure

##### ICT Infrastructure at Schools

Adapting ICT into Education Master Plan I (1997-2001) & Master Plan II (2001-2005) by the government gave the hardware infrastructure as follows:

- every school with an informationalization station
- every classroom with an internet-connected & projection-capable PC
- every teacher is given a PC & a notebook
- every school with multimedia classroom(s), where everyone sits with a PC

With such hardware infrastructure, the development of ICT-based education materials and their distribution to schools are actively encouraged.

##### ICT Infrastructure at Home

To help installing PC at every home with low cost, the "People's PC" program was initiated in 1998. The result of such government initiative lead to the current statistics as follows:

Item	Rate(%)	Date	Data Source
Homes with PC	77.8	2004.12	Kor Natl Internet Devlp Agency
Homes with internet-connected PC	72.2 (1 <sup>st</sup> worldwide)	2004.12	Kor Natl Internet Devlp Agency
Homes with high-speed internet	24.9(1 <sup>st</sup> worldwide)	2004.12	OECD Report

As of 2005, the teachers can lead class lessons with real-time multimedia instruction materials projected on a large screen driven by an internet-connected PC in the classroom. Since 90%+ of high-speed internet connections are by young couples, almost all the children are able to use instruction materials through internet at home for their self study.

##### Development of Instruction Materials

To date the burden of developing instruction materials is mainly taken by the teachers. Developing high quality material requires not only the knowledge on specific subject but also the skill and experience using word processing, presentation and other multimedia tools. Although each provincial Office of Education provides to the teachers with the IT-skill training courses during vacation months, it is difficult for them to reach the level of professional IT experts. Since such capability is beyond the average teacher's experience, most of the instruction materials are limited to simple summary of instruction notes prepared with word processor and/or presentation tools. Depending on skill of the teacher, photographs, graphics, and more complicated multimedia elements are added to attract students' interest. The government is supporting the contests to find instruction materials of exceptional quality and to make them open in public domain for sharing.

Unusually keen interest of Koreans on educating their children implies that development and distribution of IT-based education materials of high quality is regarded as a good business opportunity. Two business sectors interested in such development seem to be the textbook publishers and the online education service providers.

The publishers, in view of the market, have to develop IT-based instruction materials together with the textbooks. To date investment in this direction has not been much. Upon completion of the on-going revision of national curriculum, however, the publishers are certain to develop IT-based education materials well matched with the new textbooks. Since quality of these materials is a key factor determining the textbook market share, one can expect the quality to be high enough. The online education service providers are already doing quite well in the big private education market of Korea. They employ topnotch instructors and excellent IT professionals to produce high quality IT-based education materials for the paid subscribers only. Since access to these materials is restricted to rather small circle of subscribers, it cannot be considered making any significant contribution to the improvement of education standards for the country.

In 2004, Ministry of Education & Human Resources Development initiated a project developing a model high school textbook for Physics I. The purpose of development was (i) rectifying some serious drawbacks recognized in the current textbooks and (ii) investigating a new format for better readability and for clear understanding of key concepts. The project was carried out by a team of twelve: three from Korean Physical Society Education Committee, five professors, and four high-school teachers. The set produced consists of the main textbook, the laboratory manual, and a CR-ROM that contains the whole text together with movie clips and problem sets. The movie clips show some experiments to help students understand abstract concepts, and the problems sets are arranged for the students to self-test own level of understanding what they learned in the lesson. If a student fails to find the correct answer, a hyperlinked window automatically pops up. The pop up window contains relevant explanation so the student can review it for supplementary study. It is expected that the new textbooks based on the revised national curriculum will reflect much of the new format tried in this model textbook, Physics I.

### 3.2 Primary and Secondary Schools

Each school keeps its own homepage, uses it for displaying announcements to students and keeping instruction materials developed by the teachers and used in the classes. The development of instruction materials is not an easy work, but the convenience of use and ease of modification when necessary seem to persuade teachers for investing substantial time. Thus the style, format, and frequency of classroom use of the materials are strongly depending on personal preference of the teacher. Some teachers are sufficiently wise to adopt instruction materials already developed by their colleagues to save time as well as to avoid meaningless “reinvention of wheels.” Some noteworthy examples are given below.

- Case 1: Primary School - <http://www.jungsan.es.kr/>
- Case 2: Junior Secondary School - <http://www.ky.ms.kr/>
- Case 3: Senior Secondary School - <http://jeonju-gh.hs.kr/>

### 3.3 KERIS

Developing IT-based educational materials for a whole course is not so simple to be carried out within several hours. Hence need for resource sharing naturally arises as common sense. It is, however, not easy to locate appropriate materials developed by teachers in other schools without any prior personal acquaintance. To facilitate such information sharing, a national organization (Korea Education & Research Information Service, KERIS) and regional ones under each provincial Office of Education are established and they are networked. KERIS also has a function to research and develop a standard for e-learning at national scale.

- Case: Information Sharing - <http://www.keris.or.kr/main/index.jsp>

## 4. Current Status of IT-based Education: Business Sector

In view of the existing huge market of private education in Korea, it is easy to understand a strong demand for high quality IT-based education. This demand, however, has not been met by the instruction materials developed by teachers for classroom use. Such mismatch comes partly from limited time and skill of the teachers and partly from lack of incentive to encourage them to develop high quality materials. This gap was the hatching ground for commercial internet service providers dedicated to IT-based education. These private companies provide high quality IT-based education materials developed by topnotch programming experts and famous instructors, and the access is limited to the subscribed members only. Their business seems to be prospering.

### 4.1 Internet Service Provider for Primary School Students

Those websites are accessible to the paid subscribers only. They provide high quality instruction materials on all the subjects to the teachers at relatively small fee. However, the subscription fee for students is not so cheap. The reason behind such fee differential between teacher and student is understandable. It is reasonable to expect that children will choose websites whose contents are familiar to them through the classroom lessons.

- Case - <http://www.tnara.net/>

### 4.2 Internet Service Provider for Secondary School Students

Potential market for IT-based education service to secondary students is bigger than to primary students since the competition gets severe at higher grades, peaking at the 12<sup>th</sup> grade when all become very sensitive to relative class ranking in the school record. And hence very keen competition among the websites developed online and extended offline to the cram schools. Thus maintenance of quality is very critical for the business. As such the quality of materials and service is generally good but the subscription fee is expensive.

- Case 1 - <http://www.mbest.co.kr/>
- Case 2 - <http://www.megastudy.net/>

## 5. Universities and Colleges

Universities/colleges used own budget constructing the infrastructure for ICT-based education. Since the quality of such infrastructure is related with attracting better high school graduates, all of them have built up sufficiently good ICT infrastructure. In some of them, wireless internet access is possible. Websites are usually built and maintained at every level within the organization, down to the academic department, and some professors maintain their own personal websites. The level of sophistication for ICT-based education is not uniform among the courses and it depends strongly on skill and passion of the professors involved.

In general, members of the engineering and natural science faculties are more actively adopting ICT for their courses compared with those in social science and humanities. Such difference is expected to diminish gradually with time as

the faculty is filled with younger generation at ease with ICT. For the courses taken by a large number of students, such as Introductory Physics, some textbook publishers provide quality multimedia courseware to increase their market share. To date, however, the materials are usually for use in lecture and focused mainly to audio-visual impression and not to the level of including evaluation etc yet.

### **Chonbuk National University**

The ICT infrastructure is planned and maintained by Information and Computing Center. Currently broadband high-speed internet access is everywhere on the campus, and wireless internet access is possible. In larger lecture halls, LCD projectors are installed.

#### Department of Physics (<http://phys.chonbuk.ac.kr/>)

Department of Physics with 16 professors occupies a 4-story 5,000 m<sup>2</sup> building. It accepts up to 45 freshmen a year. Its ICT infrastructure was completely built up by 2000 and upgrades followed when any need arose. The most important course offered is Introductory Physics I and II, usually taken by about 1,500 freshmen consisting of mainly science and engineering majors. To facilitate ICT-based education, especially for Introductory Physics I and II, a multimedia hall is constructed in 2000. The hall is equipped with 17 internet connected PCs and a LC projector of high quality. The hall can accommodate up to 32 students so that at most two students can share one PC. The hall is unique in Korea and can be used for both lecture and laboratory, concurrently or separately.

A dedicated website for Introductory Physics course is built and maintained for online access to lecture materials and lab manuals. The whole lecture notes for two-semester course are available in files both in text and pdf formats so that a user can download and modify the content for own use. There are professors who want to keep own style in lecture materials and enjoy freedom to build and maintain own website.

#### School of Electronic & Information Engineering (<http://ei.chonbuk.ac.kr/>)

School of Electronic & Information Engineering with 52 professors occupies a 5-story 10,000 m<sup>2</sup> building. It accepts up to 450 freshmen a year. It has received various funding from the government including the BK21 Program for improvement of undergraduate education. The BK21 (1999-2006) budget is KWon28B. The School is much better in the ICT infrastructure and more active adopting ICT-based education compared with other schools and departments.

## **6. Conclusion**

Korean government took a bold strategy to adopt ICT as a generator of growth momentum and invested heavily for development and application of ICT. As a result of continued effort, Korea secured the front-runner status in some areas of ICT technologies and devices. It will try to keep and extend such areas of technological dominance in the future.

As a consequence of continued investment, the infrastructure for ICT-based education was built relatively early and is currently ranked as the world front-runner. All the school classrooms are internet-connected and equipped with large screen display devices, facilitating increased use of multimedia education materials in the class. Most of the homes are internet-connected and students can download their self-study materials. Korean government is actively trying to set up a sensible project to use ICT infrastructure for the quality improvement of education.

However, development of high quality materials for ICT-based education has not reached to a satisfactory level yet. Since the availability of such materials is critically important for improving educational quality, future investment should be focused to that direction. Also it is hard to find the study-aid applications in public sector, which exploits the full potential of ICT to help efficient learning by providing study materials matched with individual student's level of achievement.

In the private sector of online education market, there appears a growing number of websites that provide high quality study materials to the paid subscribers. Although they provide fairly good materials and reveal the potential of ICT-based education, their service is restricted to the students of rich families. Exclusion of the poor from high quality education is opposite to the primary ideal of internet, namely provision of equal opportunity to all through resource sharing. It is an irony that internet could contribute to the increase of disparity between the rich and the poor, and we should try harder to rectify it.

Therefore the government should take the leading position actively encouraging development of high quality materials, which exploit the full ICT potential for improving education, and support free use of such materials by everyone. Korean government is planning a comprehensive e-learning project for the realization of that ideal.

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