

# The Current Status of Information Technology and IT-based Physics Education in Korean Universities

Keum Hwi LEE

Institute of Photonics and Information Technology\*  
Chonbuk National University, Jeonju 561-756, S. KOREA  
[khl@chonbuk.ac.kr](mailto:khl@chonbuk.ac.kr)

## ABSTRACT

Education preparing for the future should have a feedback mechanism reflecting the societal change and need. The ongoing change of Korean physics education, started in 1995 with the nationwide education-reform drive, is a case in point. It aims for the customer-oriented education with program diversification and intensive use of information technology, so that the educational emphasis can be shifted from teaching to active learning. General overview and some specific examples for IT-based introductory physics will be presented with emphasis on the changes made in lecture contents, laboratory experiments, and web-based recitation (problem-bank) programs. The future plan will also be briefly discussed.

## Education for Society

The new millennium, characterized by revolutionary changes in information (& communication) technology (ICT/IT) and its impact on our knowledge-based economy, demands paradigm shift in ways of managing various sectors of our society and education is no exception. Education is an interactive process aiming at transfer of the knowledge-information contents between the educating and the educated. Since human being thinks and forms society, teaching and learning are one-sided and low-dimensional projections of education and 'interactive engagement' is its holistic and better description. An educational system or activity occupies finite space (*classroom*, school, country, ...), time (*class period*, academic year, era, ...), and more complex (*class subject*, major, educational unit, ...) domains and is only a part of bigger whole so that it is surrounded by interface dividing it from the rest. Since time-dependent and permeable characteristics of interface come into play, education of people should have a feedback mechanism reflecting the societal change and need.

Science education for everyone is a fundamental prerequisite for ensuring endogenous and sustainable development and world peace. Use of IT for it, particularly through networking, offers new and more effective means of equal access to scientific knowledge and hence will contribute greatly to educational quality improvement for all by overcoming any barrier such as space and time, disparity of available funds/experts between educational institutions as well as between industrialized and developing countries. Thus the collaborative programs on IT-based education can lead to minimizing disparity of educational infrastructure.

## Current Status: Korea and IT

Korea (ROK) has scarce natural resources and very high population density (3<sup>rd</sup>/world & 1<sup>st</sup>/OECD). Since the human resources of high caliber play crucial role for the national future, Presidential Education Reform Commission initiated the nation-wide drive (1995-) for the customer-oriented education, the program diversification, and intensive use of IT. Earlier the government chose IT as a strategic key technology for future growth and has persistently invested for its development and application. The resulting IT infrastructure can be summarized in 'the most connected and wireless country' as the statistics below indicates.

Item	Rate(%)	Date	Data Source
Homes with PC	77.8	2004.12	Korean Nat'l Internet Devlpt Agency
Homes with internet-connected PC	72.2 (1 <sup>st</sup> worldwide)	2004.12	Korean Nat'l Internet Devlpt Agency
Homes with high-speed internet	24.9(1 <sup>st</sup> worldwide)	2004.12	OECD Report

## IT-based Physics Education in Korean Universities

The government takes the leading position for comprehensive educational improvement utilizing these IT infrastructure. With such initiative and almost unanimous popular support, the educational institutions at every level have been actively engaged in IT use for better education in various ways.

#### Adapting ICT into Education Master Plan I (1997-2001) & Master Plan II (2001-2005):

- 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
- &c

Universities/colleges used own budget constructing the infrastructure for IT-based education. Since the quality of such infrastructure is related with attracting better high school graduates, all of them have built up sufficiently good IT 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. More attempts are made for introductory service courses with large enrollment (such as Introductory Physics).

However, the level of sophistication for IT-based education is not uniform and it depends strongly on skill and passion of the professors involved. There is need for training professors for IT-based education, and the following two were organized.

#### UNESCO-ASPEN Seminar-Workshop - MULTIMEDIA PHYSICS EDUCATION:

Promoting Active Learning in Introductory Physics Courses, 9-15 July 2000

- training 30 ASPEN professors (20 Koreans, 10 others) with a condensed NSF version

#### UNESCO/ASPEN-KPS Workshop on IT-based Physics Education, 12-16 July 2001

- another run of the above with different participants (Koreans, others, & TAs)

More than 35 Korean physics professors, carefully selected from all the major universities, were trained in these and they form a Korean network of professors friendly to and active for IT-based physics education.

#### IT-based Education Materials

To date the burden of developing instruction materials is mainly on the professors' shoulders, and as such their scope and quality vary widely. Except for some lecture notes on departmental homepages or dedicated websites, no much resource sharing is noticeable for the developed material and the 'reinvention of wheels' seems frequent. It is to be noted, however, that in 2002 Korean Physical Society (in collaboration with Chonbuk National University) distributed to all professors a free CD containing the lecture notes with accompanying simulations for calculus-based University Physics. Since the notes are given in both text and pdf files, the user can modify it before using.

#### **Example: Chonbuk National University**

The readers are referred to Jin Seung KIM's paper "IT-Based Education in Korean Schools and Chonbuk National University: Current Status" elsewhere in this Proceedings for further details.

#### **Concluding Remarks**

Korea chose IT as a strategic key technology for growth and has invested heavily for it, and the current IT infrastructure can be summarized in 'the most connected and wireless country.' It secured the front-runner status in some areas of IT technologies and devices and will try harder to keep and extend such areas of technological dominance.

The infrastructure (hardware part) for IT-based education was built relatively early and is currently ranked as the world front-runner. Korean government is actively trying to set up a sensible project to use IT infrastructure for the quality improvement of education.

However, development of high quality materials (software part) for IT-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. Resource sharing in this area should actively be pushed.

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