

EDUCATIONAL TECHNOLOGIES IN SOUTH KOREA

Maciej Grzybowski

Hanpo Sp. z o.o.

ul. Piekary 12a

61-823 Poznań

e-mail: mg@hanpo.pl

Abstract: The aim of this paper is to define educational technologies used in South Korea and the importance of the role of the Korean government in their implementation. It is to show and prove how the electrical devices, which are being used by an average person on a daily basis, can be used to change the schooling system and increase the effectiveness of learning and teaching, giving students and teachers multiple options to choose from. The purpose of Information and Communications Technologies (ICT) usage in schools is to change the traditional, passive way of learning into a more engaging and interactive type. ICT make education less time-consuming, more diverse, eco-friendly in some aspects and simply easier, but ICT are not perfect either and they definitely brings few risks along too.

Key words: Korea, Information and Communications Technologies (ICT) education, e-learning, game controllers, robots, cloud computing.

Introduction

Among the five highest national IQ scores worldwide, at least top three of them are taken by Asian countries after every research. For a number of years, South Korea has been ranked on the second place several times, following Hong-Kong or Singapore. Korean civil engineer Kim Ung-Yong, former prodigy child can be found in the Guinness Book of World Records under “Highest IQ” section with a score of 210¹. This has been at least partially determined by Korean schooling system. The aim of this paper is to define educational technologies used in South Korea and the importance of the government role in their implementation. The aim of ICT usage in schools is to change the traditional, passive way of learning, uniformed and standardised education into more engaging and interactive type, diversified and creativity-based learning, producing qualified workforce of the 21st century.

ICT – Information and Communications Technology

2005 was the year when Korea started distributing and utilizing Information and Communications Technology, called further “ICT”. The Korean education system is in the main part run by the Ministry of Education, Science and Technology, directed by governmental rules and regulations and organized according to nationwide standards and curriculum. Many educational policies and strategies are implemented with the top-down approach. ICT use in learning process is no exception in Korea. A new movement for the adjustment of technology in education was initiated in 1980s. The effort to utilize ICT in the Korean educational system was implemented with the initiative called the ‘Plan for the renovation of education 5.31’ proposed by the Education Renovation Committee in 1995. The Korean Ministry of Education has developed a five-year master plan for ICT use in education. It began in 2010 and is now in the fourth stage. The aims and visions of the ICT use in education are to strengthen the future competitiveness of education, science and technology, and to cope with rapid changes in

¹ Kim Ung-Yong, Wikipedia, http://en.wikipedia.org/wiki/Kim_Ung-yong, (accessed March 20, 2013),

the economy and society, and in science, technology and education worldwide².

SMART Education

Recently, the ministry has announced an advanced plan for 'SMART Education.' The use of the word "smart" was not accidental in this occasion as it consists of five necessary elements-letters which ensure the successful and efficient learning process. "S" stands for "self-directed", meaning learning being initiated by students of any age by themselves, having the willingness to *x* knowledge. "M" means keeping the children and youth "motivated", mostly by including fun in the learning and teaching methods e.g. educational games. In order to be most efficient, the teaching process should be hold according to the specifications of the individuals and so "A" for having a capacity of "adaptation" shall not be forgotten. Rich assets of the information are the next step to be taken aiming for the highest knowledge scores and "resources" are the smart "R". Last but definitely not least, the use of ICT appears to be a key to Korea's development success and so the Korean education system cannot be imagined without the "T" – technology being embedded. The main goal of implementing the SMART program was to digitalize the entire school curriculum by 2015 and reflect modern changes of the 21st century. Korean government wants to focus on not only more efficient but mostly more creative education through the use of technology and at the same time bridging the educational divide, in other words - gap in the teaching standards, by making SMART Education available to everyone³. The main focus is reasonably put on tech-savvy students who are the great part of all Korean students. Statistics shows that 98% of Korean households use the Internet on a daily basis, 2/3 of them use smartphones. 5% of this 50-million-citizens nation is declared to be addicted of using smartphones and they do so at least 8 hours per day every day. According to Korea Communications Commission's

² Paul Bacsich, Daniela Proli, *Researching Virtual Initiatives in Education: South Korea*, Virtual Campuses, http://virtualcampuses.eu/index.php/South_Korea#ICT_in_education_initiatives, (accessed March 20, 2013),

³ Ju-Ho Lee, *Korea's Choice: Smart Education*, OECD Education Today, <https://community.oecd.org/community/educationtoday/blog/2011/07/26/korea-s-choice-smart-education>, (accessed July 26, 2011),

research, in June of 2012 67% of young Koreans between the age of 5-19 were using smartphones and the numbers are growing. This however, should not be a surprise as South Korea has the fastest Internet and the widest access to it in the world⁴. The SMART Education program includes the development and dissemination of digital textbooks and online evaluation systems, building an open environment for the public and facilitating the safe use of educational materials. Professional development will be enhanced by Smart education and an educational infrastructure will be created with Cloud Computing, meaning the (educating) resources being delivered as a service over the network like the Internet⁵.

Educational hub of southeast Asia

South Korea is successfully aspiring to be named the educational hub of Southeast Asia. Its schooling system is no longer just a strategy but has become a formal policy after being embraced and adapted by the government and the nation, reaching the international level but still putting the main focus on national development. South Korea however is not the only competitor in the race towards the intellectual leadership and global prestige. Singapore, Hong Kong, Malaysia and Sri Lanka are not slowing down the tempo either⁶. The Country of Morning Calm aims to promote itself by strengthening its global competitiveness in the educational sector with providing world-class educational services to attract prestigious schools and students from other countries. Many, if not the most of the educational initiatives are hold by Korean Ministry of Education, Science and Technology. The list is long: "STEAM Initiative" (STEAM stands for Science, Technology, Engineering, Arts and Mathematics), Admissions Officer System,

⁴Youk-Yung Lee, *As smartphones proliferate, South Korea moves to stem digital addiction from age 3*, Canada, <http://www.canada.com/technology/all/smartphones+proliferate+South+Korea+moves+stem+digital+addiction/7619920/story.html>, (accessed November 28, 2012),

⁵ Gary Eason, *Digital textbooks open a new chapter*, BBC News: Business, <http://www.bbc.co.uk/news/business-15175962>, (accessed on October 18, 2011),

⁶ Alya Mishra, *Debate on potential to host several higher education hubs*, University World News, <http://www.universityworldnews.com/article.php?story=20121207163806248>, (accessed December 9, 2012),

“NAEA” National Assessment of Educational Achievement, National Basic Livelihood Security, “ACE” Advancement of College Education, the World class University, Cyber Home Learning System etc. The governments of other, not only Asian countries are keeping their eyes wide open and are closely watching Korea and its achievements not only to compete but also to learn from⁷.

Educational technologies

IT industry has remodelled and redefined the education system. The Korean educational system’s development and its advanced (and growing higher) level, would not be successful if the proper technologies were not used. The distinction must be made between the devices and solutions provided with the use and help of these devices.

Common and dedicated devices

South Korean Education Ministry is going to spend over 2,4 billion \$ on providing students with tablets, smartphones and computers to study on. The South Korean government plans to replace the primary level of education with digitalized materials by 2014 and deliver computer notebooks to all its middle and high level schools by 2015⁸. Students who cannot afford it will be provided with free tablets. Once the education digitalization is complete in 2015, all the schools will be given wireless internet. Tablets and PC tablets with keyboard and touch-screen are not only making it easier for students as reference book, exercise book and other resources are combined into one device but also they make the classes more attention-engaging and even entertaining. Students’ curiosity can be appeased from the spot thanks to permanent internet access. Another device, smartphones are required as being able to be used in education and being able to improve education. Smartphones and laptops are considered as pedagogical tools not only for home-use only. Despite reporting a

lower-than-average degree of self-confidence in using computers, Korean students performed top in the number of relevant pages that they visited while working on tasks aimed at assessing their digital reading skills in the PISA 2009 digital reading test. Compared with paper-based reading tests, in which girls performed significantly better than boys, the gap between girls and boys was narrower in digital reading. Last but not least, the educational games and game controllers cannot be forgotten, especially when it comes to the youngest students. Courses and lessons are often provided in a form of a video game. They teach children to distinguish colours and shapes, they help Elementary School students memorize mathematical tasks but they also help older students, graduates and adults learning languages, providing a full package of knowledge, training and fun at once. The example of an entertaining and educating concept is DICE+. This electronic device matches the commonly-used in Korea tablets with external game controller, making it 2in1 regarding the game structure and achieving the main goal of games use in educational system – teaching and providing fun along. Korea has also developed an unique branch of devices dedicated to educating only - robots. In 2010 the government ran a pilot program equipping classrooms with telepresence robots so that English teachers located in the Philippines could teach students in Korean elementary schools the English language⁹. Among the robots is EngKey, developed by the Korea Institute of Science and Technology (KIST). The robot is controlled by teachers abroad who can communicate using embedded microphones and speakers. The EngKey ‘robot’ features a small display with a woman’s face which mimics the facial expression of the teacher, who has cameras in his/her room¹⁰. Another version of the EngKey does not connect students to a teacher but uses voice recognition

⁷ Alan Dessoff, *Asia’s Burgeoning Higher Education Hubs*, NAFSA Association of International Educators, http://www.nafsa.org/_/file/_/ie_julaug12_asia.pdf, (accessed July-August 2012),

⁸ Karol Jaskuła, *Korea Południowa wprowadza tablety do szkół*, PC World, <http://www.pcworld.pl/news/372784/Korea.Poludniowa.wprowadza.tablety.do.szkol.html>, (accessed July 5, 2011),

⁹ Susannah Palk, *Robot teachers invade South Korean classrooms*, CNN: Global Connections, <http://edition.cnn.com/2010/TECH/innovation/10/22/south.korea.robot.teachers/>, (accessed October 22, 2010),

¹⁰ Aaron Saenz, *South Korea’s Robot Teachers To Test Telepresence Tools In The New Year*, SingularityHUB, http://singularityhub.com/2011/01/03/south-korea%E2%80%99s-robot-teachers-to-test-telepresence-tools-in-the-new-year/?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+SingularityHub+%28Singularity+Hub%29, (accessed January 3, 2011),

technology to help students practice their English pronunciation and dialogue¹¹.

Common solutions

Once the devices are provided, further steps can be taken towards both common and dedicated solutions. The main and essential resolution to achieve the goals of ICT-based education system is the permanent Internet access. In order to make it easier, faster and simply more convenient for schools to share the data with their employees and students, Cloud Computing is being used. It means that all the information, data and materials are moved to an online server and made available to anyone, anywhere at any time with no risk regarding potential errors or damages of individual users' devices. As the Korean Education Ministry makes emphasis on cooperative learning, the increase of social networking can be observed. Social networking forms are used not only to exchange students' knowledge, to ask questions and answer them. They also help developing students' interactive social skills. Another common solution applied in ICT education system among its technologies is Internet Protocol Television. IPTV is the television service delivered using the Internet. It enables the broadcast of lectures and lessons via online channels to the students who chose or are forced to learn at home. IPTV eliminates the hazard of negative consequences of absence at school caused e.g. by illness.

Dedicated solutions

There may be only few common solutions the advantage of which can be taken for educational purposes, however there are plenty of the dedicated solutions that are commonly used in Korea. Since 2007, 130 Korean schools have been testing digital textbooks as a replacement of paper books, aiming to apply digitalization in all schools by 2015. The main advantage of digital textbooks is possibility to update their content whenever it becomes outdated. Important feature of digital textbooks is their multitasking. Apart from providing educating matter, they do provide all types of

multimedia and may be used as dictionaries, encyclopaedias and browser for all kinds of knowledge sources.

Once the digital textbooks are provided, digital libraries are needed. As long as newest publications are offered in both, paper and digital form, the difficulty appears regarding older writings and works. This will be rather a time-consuming task for publishers but definitely the one worth doing, especially considering ambitious plans of Korean government.

When the learning tools are digitalized, attending classes at school seems to be no longer necessary and so the idea of providing content through videos appeared. This however, is probably a greater advantage for the schools than for the students themselves. While the direct interaction between the student and the teacher may be contributing more to their self-development, renunciation of hiring the teachers and renting the classrooms is definitely a great saving for school budgets.

A decade ago games, video games and game controllers were considered mostly as time-wasting and distracting. Today, they are commonly used in educational purposes, providing the content along with the numbers, shapes, colours, pictures, videos, music and spoken word. Being attention-engaging, focus- and interaction-demanding educational games and controllers influence students' learning process in a more efficient and permanent way. The list of games examples is long, the most common in Korea and worldwide are the ones helping in learning Korean language¹². According to Apple App Store, the most popular educational games recently are: Toca Train, Cocomong's Lab Free and Make-up Salon¹³.

E-learning and Cyber Home Learning System

Whereas Korean education system is one of the top systems worldwide, there is one controversial aspect which cannot be skipped: e-learning and its separated targeting. While SMART Education is set to be available to all

¹¹ Amy Jung, *Get to know Engkey and Kibot! South Korea's Most Famous Education Robots*, Advanced Technology Korea, <http://www.advancedtechnologykorea.com/6372>, (accessed July 22, 2011),

¹² Greg Ferenstein, *How Social Gaming is Improving Education*, Mashable: Social Media, <http://mashable.com/2010/02/07/social-gaming-education/>, (accessed February 7, 2010),

¹³ App Annie, *South Korea Educational Games*, <http://www.appannie.com/top/ipad/south-korea/games/educational/#>, (accessed on March 20, 2013),

young students, giving them all equal chances, e-learning has a double approach and makes a distinction between employed and unemployed graduates and adults, offering them different learning platforms. This creates the barrier to Korean e-learning systems of spreading worldwide as regarding international standards, the educating offers are meant to be available to anyone at any age and any social status. The restrictions may appear as discriminating to some nations and discourage them permanently from using Korean online services. Let the “Dream Wings” be the example. The domain dream.go.kr was set up specially for women who wish to come back into the workforce after taking maternity leave. Its mission is to help them find a new job, provide consulting and necessary education. This phenomenon is based on its expansion on offline grounds.

Another side of e-learning in South Korea is represented by Cyber Home Learning System enabling students to access all files from the classes at home, supporting them for self-study through the internet. It not only makes it easier for pupils to learn, revise and study for the exams but it also encourages parents to quit or at least spend less on Hakwons, which are extra classes carried after-hours and highly charged but still widely common¹⁴.

There seems to be an issue regarding so called “cloud based testing” which means that the online tests and exams taken by students are never signed with their names but with their personalized numbers. The figures however are all the same for professors and students become an anonymous crowd with no character, specific features and any individuality. On the one hand it may be classified as equal and objective treating the students, but when looking at it from the point of view of an unlucky but talented pupil, it is ruining creativity and uniqueness.

Standardized platforms based on Facebook idea are gaining popularity around the world and so does “Cyworld” in Korea. It is not based only on uploading self photos, creating alter-ego profiles or chatting but also sharing the content, spreading the news and keeping being up-to-date. Cyworld is a great tool for students who miss their classes because of hospital stay or

any other extraordinary circumstance that forces them to be absent at school.

Implementations

Once all of the devices are used and solutions are implemented, an entity must be declared in order to take advantage of ICT education most efficiently. There are two kinds of entities: Virtual Schools and Cyber Universities. Virtual schools are run by educational organizations teaching courses entirely or partially through online methods whereby individuals can earn credits in the particular area of interest which can be counted toward graduation or advancement to the next grade. The exemplary virtual school is the Air and Correspondence High School based in Seoul and Pusan. The cyber universities work on the same basis and examples can be found mostly in Seoul (Ewha Womans University, Hanyang Cyber University and International Cyber University).

Role of the government

As most of the educational initiatives are government-backed, its role in creating and maintaining ICT system is important and sufficient. There is a need for an appropriate ecosystem for the digital content which is best managed by governmental bodies, such as Ministry of Education, Science and Technology that is an initiator and implementer of the policy. Some of the main Ministry objectives was to create learning environment with its permanent quality control and evaluation, nationwide and international distribution, qualified teachers and content developers, all run accordingly to its laws, regulations and policies. The principal intent is to digitalize all elementary textbooks by 2014 and middle and high schools by 2015, provide wireless internet in every school and tablets for every student. The government expects to offer free tablets for students with difficult financial situation who could not afford them to ensure equal learning chances. Over 2 trillion KRW (1,8 billion USD) are planned to be spent and invested in the necessary infrastructure, from devices purchase to staff trainings. Whilst all the plans and taken actions appear to be very ambitious and as for now successful, two worrying issues shall be noticed. First of all, the authors of textbooks which are supposed to be digitalized are concerned about the possible copyrights

¹⁴ *Researching virtual initiatives in education: Cyber Home Learning System, Virtual Campuses*, http://virtualcampuses.eu/index.php/Cyber_Home_Learning_System, (accessed MArch 20, 2013),

infringements and an improbability of fighting them. Secondly, the Ministry anticipates that teachers who cannot meet the new demands of students, or rather of the government, will have a lot of difficulties in their teaching positions at schools. In other words, once the robots and digital teachers will take over the educating tasks, the amount of vacancies among the schools will be shortened¹⁵.

Conclusion: advantages and disadvantages

Liberation from the physicality of the education concerns mostly the elimination of carrying plenty of heavy books in students' backpacks for whole days which could cause health problems in the future. Centralized sources of knowledge and practice accessible from any device are indisputably a priceless help in learning processes, which may become more efficient not only for pupils to study but also for lecturers to teach. The great advantage of online learning systems is the opportunity for ill children absent at classes to benefit from the same materials as students present at school and for all of them to continue learning while natural disasters or diseases. Two-year-long field studies hold in 110 Korean schools concluded that students who used digital textbooks increased their learning efficiency and resulted in better scores. Digital tools have an influence on cutting off the expenses on education that parents occur. This is most of all based on decreasing the need for Hakwons but also the costs of purchasing e-textbooks on tablets are 50-60% lower than the costs of printed books. Tablets also lower the amount of paper copies of books and working materials printed by the teachers for handouts and assignments which not only saves money but also environment. According to Del Williams, a school with 100 teachers uses on average 250,000 pieces of paper annually. A school of 1,000 students on average spends between \$3,000 - 4,000 a month on paper, ink, and toner, not counting printer wear and tear or technical support costs¹⁶. Nevertheless it has to

be mentioned that the price of the devices themselves is much higher than the cost of a paper book. New York Times points out that "adverse health impacts from making one e-reader are estimated to be 70 times greater than those from making a single book. One tablet requires the extraction of 33 pounds of minerals, 79 gallons of water, and 100 kilowatt hours of fossil fuels resulting in 66 pounds of carbon dioxide. Print books produce 100 times fewer greenhouse gases. Two gallons of water are required to make the pulp slurry that is pressed and heat-dried to make paper, and only two kilowatt hours are required to form and dry the sheets of paper." Although it may seem harmless, ICT education creates also some disadvantages towards students themselves. Increased use of online technologies decreases the need of memorization which results in pupils not gaining the knowledge but instead developing the ability of searching for information and making a choice only. As e-learning is self-directed, it strongly disables interactions between the pupils which may be considered as a great harm to their team-working abilities in the future and professional career. Last but not least, occasional technical errors are strongly abruptly slowing or even disabling the lessons¹⁷.

The question

The question that the Education Ministry shall ask themselves is on the return of this investment. It shall be thought twice whether the funds put in the purchases and trainings will give the expected results and in fact, will be beneficial for Koreans' intellectual development and lead Korea towards worldwide educational supremacy¹⁸.

¹⁵ Sang Yoon Shin, *Smart Education in Korea: South Korea's Making the Switch to Digital Textbooks*, Advances Technology Korea, <http://www.advancedtechnologykorea.com/8000>, (accessed October 10, 2011),

¹⁶ Del Williams, *How Much Is Out-of-Control Printing Costing Your School?*, Softwareshef,

http://www.softwareshef.com/products/materials/pmp_academic/pmp_academic_review.pdf, (accessed Aug. 1, 2012),

¹⁷ *Should tablets replace textbooks in K-12 schools?*, ProCon, <http://tablets-textbooks.procon.org/#background>, (accessed on March 4, 2013),

¹⁸ Robert Stefanicki, *E-podreczniki nie zdetrinizowały papieru w Korei Południowej*, Gazeta Wyborcza, http://wyborcza.pl/1,76842,11424258,E_podreczniki_nie_zdetrinizowały_papieru_w_Korei_Południowej.html, (accessed March 27, 2012).

References

1. App A., *South Korea Educational Games*, App Annie, <http://www.appannie.com/top/ipad/south-korea/games/educational/#>, (accessed on March 20, 2013).
2. Bacsich P., Proli D., *Researching Virtual Initiatives in Education: South Korea*, Virtual Campuses, http://virtualcampuses.eu/index.php/South_Korea#ICT_in_education_initiatives, (accessed March 20, 2013).
3. Dessoff A., *Asia's Burgeoning Higher Education Hubs*, NAFSA Association of International Educators, http://www.nafsa.org/_/file/_/ie_julaug12_asia.pdf, (accessed July-August 2012).
4. Eason G., *Digital textbooks open a new chapter*, BBC News: Business, <http://www.bbc.co.uk/news/business-15175962>, (accessed on October 18, 2011).
5. Ferenstein G., *How Social Gaming is Improving Education*, Mashable: Social Media, <http://mashable.com/2010/02/07/social-gaming-education/>, (accessed February 7, 2010).
6. Jaskuła K., *Korea Południowa wprowadza tablety do szkół*, PC World, <http://www.pcworld.pl/news/372784/Korea.Poludniowa.wprowadza.tablety.do.szkol.html>, (accessed July 5, 2011).
7. Jung A., *Get to know Engkey and Kibot! South Korea's Most Famous Education Robots*, Advanced Technology Korea, <http://www.advancedtechnologykorea.com/6372>, (accessed July 22, 2011).
8. Lee Ju-Ho, *Korea's Choice: Smart Education*, OECD Education Today, <https://community.oecd.org/community/educationtoday/blog/2011/07/26/korea-s-choice-smart-education>, (accessed July 26, 2011).
9. Lee Youk-Yung, *As smartphones proliferate, South Korea moves to stem digital addiction from age 3*, Canada, <http://www.canada.com/technology/all/smartphones+proliferate+South+Korea+moves+stem+digital+addiction/7619920/story.html>, (accessed November 28, 2012).
10. Mishra A., *Debate on potential to host several higher education hubs*, University World News, <http://www.universityworldnews.com/article.php?story=20121207163806248>, (accessed December 9, 2012).
11. Palk S., *Robot teachers invade South Korean classrooms*, CNN: Global Connections, <http://edition.cnn.com/2010/TECH/innovation/10/22/south.korea.robot.teachers/>, (accessed October 22, 2010).
12. ProCon, *Should tablets replace textbooks in K-12 schools?*, ProCon, "<http://tablets-textbooks.procon.org/#background>, (accessed on March 4, 2013).
13. Saenz A., *South Korea's Robot Teachers To Test Telepresence Tools In The New Year*, SingularityHUB, http://singularityhub.com/2011/01/03/south-korea%E2%80%99s-robot-teachers-to-test-telepresence-tools-in-the-new-year/?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+SingularityHub+%28Singularity+Hub%29, (accessed January 3, 2011).
14. Shin Sang-Yoon, *Smart Education in Korea: South Korea's Making the Switch to Digital Textbooks*, Advances Technology Korea, <http://www.advancedtechnologykorea.com/8000>, (accessed October 10, 2011).
15. Stefanicki R., *E-podręczniki nie zdetrinizowały papieru w Korei Południowej*, Gazeta Wyborcza, http://wyborcza.pl/1,76842,11424258,E_podreczniki_nie_zdetrinizowały_papieru_w_Korei_Poludniowej.html, (accessed March 27, 2012).
16. Virtual Campuses, *Researching virtual initiatives in education: Cyber Home Learning System*, Virtual Campuses, http://virtualcampuses.eu/index.php/Cyber_Home_Learning_System, (accessed March 20, 2013).
17. Wikipedia, *Kim Ung-Yong*, http://en.wikipedia.org/wiki/Kim_Ung-yong, (accessed March 20, 2013).
18. Del W., *How Much Is Out-of-Control Printing Costing Your School?*, Softwareshef, http://www.softwareshef.com/products/materials/pmp_academic/pmp_academic_review.pdf, (accessed Aug. 1, 2012).