Inter-American Development Bank

Skills for Work: The Development and Expansion of the Higher Education Sector in the Republic of Korea

Knowledge Sharing Forum on Development Experiences: Comparative Experiences of Korea and Latin America and the Caribbean

Heejin Park
Jeung Yun Choi
Jong Hyeok Yun
Jae-Eun Chae

Knowledge and Learning Sector

DISCUSSION PAPER Nº IDB-DP-398

August 2015

Skills for Work:
The Development and Expansion of the Higher Education Sector in the Republic of Korea

Knowledge Sharing Forum on Development Experiences: Comparative Experiences of Korea and Latin America and the Caribbean

Heejin Park
Jeung Yun Choi
Jong Hyeok Yun
Jae-Eun Chae

Korean Educational Development Institute

August 2015

IDB
Inter-American Development Bank

List of Acronyms

ACE	Advancement of College Education
BK21	Brain Korea 21
CK	University for Creative Korea
CTL	Center for teaching and learning development
DAC	Development Assistance Committee
DeSeCo	Definition and Selection of Key Competencies Project
ECEP	Educational Capacity Enhancement Project of Universities
GNI	
HEI	Higher Education Institute
HDI	Human Development Index
IAC	Industry Academic Cooperation
IAU	Industry Academic University
IDB	Inter-American Development Bank
KAIST	Korea Advanced Institute of Science and Technology
KEDI	Korean Educational Development Institute
KERIS	Korea Education and Research Information Service
KICE	Korea Institute for Curriculum and Evaluation
KLAS	Kyung Hee Learning Archive System
KRIVET	Korea Research Institute for Vocational Education & Training
LAC	Latin American and Caribbean
LINC	Leaders in Industry-university Cooperation
MOE	Ministry of Education
MOSF	Ministry of Strategy and Finance
MSIP	Ministry of Science, ICT and Future Planning
NEETs	Neither Employee nor in education or training
NILE	National Institute for Lifelong Education
NURI	New University for Regional Innovation
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
PISA	Programme for International Student Assessment
R&D	Research and Development
SCI	Science Citation Index
TIMSS	The Trends in International Mathematics and Science Study
WTO	World Trade Organization

Contents

Tables

Figures

Executive Summary

Korea has invested heavily in education and the development of an education system aligned with its national development plans by adopting a sequential approach, both in terms of school levels and the quantity and quality of education. Working on one educational level at a time, Korea has focused on developing its educational system, beginning with primary education in the 1950s, secondary education in the 1970s and 1980s, and higher education in the 1990s and 2000s. The first goals pertained to meeting demand for the quantity of education provided. The universalization of primary, secondary and higher education was achieved in 1957, 1999 and 2000, respectively. Now, Korea has started to invest in factors that aim to improve the quality of education, using metrics such as pupil-teacher ratios, class size, student satisfaction with school, and research and development outcomes of higher education institutions (HEIs).

This sequential development strategy of Korea is distinguished from those of countries in LAC and Africa, which were at a similar stage of development as Korea in the 1960s, but invested at every level of education simultaneously. As a result of the unique approach, Korea has accomplished education development in quantity as well as in quality in a relatively short time. Korean students have consistently achieved high scores on international academic assessments for more than a decade. In addition to high academic achievement, the Korean educational system tries to nurture the development of non-cognitive skills of students, such as compassion, communication, responsibility, creativity, passion, etc., to enable them to work collaboratively and effectively in the increasingly global, technological and knowledge-based economy.

At the higher education level, attention is directed to the global competitiveness of universities internationally and governments continue to increase their investments in higher education in an attempt to raise the research and development capacity of their country. Korea also makes enormous efforts to improve its education system to better meet the demands of the ever-evolving society. Due to the government’s sequential approach to educational development, investment in higher education really only began in the 1990s. In the last two decades, tax money has been poured into this sector in an effort to improve the quality and competitiveness of universities and colleges. The number of institutions increased dramatically in this time period. In 2014 there were 433 higher education institutions in Korea. In 2013, the higher education budget increased to almost 15% of the total education budget from 9.2% in 2005.

With the sector expansion having thus been achieved, efforts are now focusing on quality improvement. Two particular policies are the specialization of higher education, and industry-academy cooperation. Specialization of higher education is a strategy that allows the higher education sector to respond to challenges that the country is currently facing, such as the oversupply of graduates in a specific area, or skills mismatches. The three pillars of specialization are research, teaching, and technical education. The Korean government has implemented diverse funding projects, tailored to the needs of each university and their specific areas such as the Brain Korea 21 project (BK21), the Advancement of College Education project (ACE), and the Leaders in Industry-University Cooperation project (LINC). An example of the major accomplishments of those funding projects is the drastic increase in research papers published in international journals after implementing the Brain Korea 21 project. The Industry-Academy Cooperation policy is also an important policy initiative for the innovation of higher education in Korea. Such cooperation in Korea matches the educational and research activities of universities to the demands of industry. It does this through the development and transfer of technology; special programs for industry-academy cooperation; curricular reforms; the provision of facilities for laboratory education and experiments; and institutional reforms to facilitate the cooperation. One representative government-funded project to promote cooperation between industry and academia in Korea is the Leaders in Industry-University Cooperation project, which aims to establish a growth system for regional universities and industries; and expand and reorganize universities' Industry-Academy Cooperation system. The governmental R&D expenditure for the higher education sector and the intellectual property rights and technology commercialization by higher education institutions has also rapidly increased. Given those accomplishments, Industry-Academy Cooperation is judged a successful policy that stimulates the development and open innovation of the higher education sector in Korea.

In sum, the analysis of Korea's experiences and continuous endeavors to help its students lead happy and productive lives, and contribute to building a better nation can provide insights and meaningful lessons to the countries in Latin America and the Caribbean, too. LAC countries are also invited to share their educational experiences with Korea, given their own strengths in education, including the high satisfaction with school that students in LAC countries report. This type of knowledge sharing between Korea and the LAC countries would contribute to improve the education systems of both sides, which ultimately supports them to raise their students to be happier and more capable adults.

Introduction

Heejin Park (Korean Educational Development Institute)

The important role of education for a country's well-being and sustainable development has been well recognized around the world. When the workforce is trained properly through a country's education system, its people can successfully enter the labor market and the country can establish a solid foundation for social and economic development. For example, countries with high educational attainment levels generally have high Gross National Income (GNI) per capita and high scores in the Human Development Index (HDI) (UNDP, 2014, 34). Therefore, the international community has made enormous efforts to use education to improve national development. A prime example is the growing interest and concerns internationally about the reform of primary and secondary education, in which components of "core competencies," such as independence, communication and collaboration skills, are being integrated into the national curricula (Namgung et al., 2014, 54). The Definition and Selection of Key Competencies Project (DeSeCo) of the OECD is one of the major forces that triggered the debate on competency-based curricular reforms (Kim et al., 2010, 29-30). OECD has also tried to develop and improve internationally comparable indicators based on this conceptual frame (OECD, 2005), and countries adopting this approach, including the Republic of Korea, have strived to improve their children's skillset according to those indicators.

At the higher education level, attention is directed to the global competitiveness of universities. Governments continue to increase their investments in higher education in an attempt to raise the research and development capacity of their country. Korea also makes enormous efforts to improve its education system to better meet the demands of the ever-evolving society. In particular, it is an important policy agenda in East Asian countries, including Korea, to assure the quality of higher education, due to the rapid expansion of the sector in the last couple of decades (Mok, 2003, 202-205). On the other hand, there are countries where the expansion of the higher education sector is an important policy goal, such as the United States. The Obama Administration has initiated a campaign called, "2020 College Completion Goal" aimed at increasing the college-going population to 10 million by 2020 and supporting every American citizen in having the opportunity to attend higher education at least once in their lifetime, in an attempt to raise the "best educated, most competitive workforce in the world" (Kanter, 2011).

Countries in Latin America and the Caribbean have faced various educational

challenges, including low levels of educational attainment and academic achievement on international assessments such as the Programme for International Student Assessment (PISA; Yun et al., 2013, pp.i-viii). Given the generally low levels of basic skills of the people in some countries, it is presumable difficult to own an effective education system that properly addresses the demands of labor markets and workforce training. Moreover, the components of the so-called "core skills" in education have increased in importance because of the rapid changes of the ever-evolving knowledge-based society. Therefore, a high quality education system is critical for training a competent labor force that is ready to enter the job market. Raising the overall levels of education thus needs to be the top priority of national development plans for those countries in Latin America and the Caribbean.

According to OECD data, LAC countries that participated in PISA 2012, namely Brazil, Argentina, Peru, Chile, Uruguay, Colombia, and Costa Rica, showed low levels of academic achievement and in indicators of educational equity (OECD, 2014, 13). In Brazil, tertiary education attainment reaches only 12% among adults between 25 and 34 years old, which is very low compared to the average of OECD (32%) or G20 countries (26%). The percentage of 15 to 29 year olds who are "NEETs," which means neither employed nor in education or training has also been very high (19% in 2008 and 16% in 2011). Based on those data, it seems that LAC countries, including Brazil, face various educational challenges, such as low quality in basic education and failure of higher education to meet the demands of the society.

Korea has been well known for its notable nation-building process and economic development, which has been closely related to its development in education (Korea Educational Development Institute et al., 2014, p110). Korea's educational accomplishments are distinguished particularly in light of its limited resources in the postwar and colonization period. Education has also played an important role in Korea for the cultivation and training of its people, who have ultimately led the nation's development and innovation advances (Chae, 2013, 169). Korea's success in education attracts world-wide attention from both developing and developed countries. Educational policies of different countries cannot be identical since the socio-economic and cultural contexts of each country vary, and must be taken into account when considering a national educational system. In this sense, we adopt an historic viewpoint to understand better the development of education in Korea and its contributions to the national development, and to draw examples that may be applicable to countries in LAC. At the same time, this approach enables us to explore the challenges in education that Korea currently faces in the ever-changing world, which also help to identify implications for other countries.

This study consists of three parts. First, it provides an overview of the history of Korea's

educational development aligned with its national development. Second, it reviews the expansion and development of the higher education sector in Korea and discusses major challenges that the country has encountered recently at the higher education level. Third, it presents two representative policies of Korea in the higher education sector, namely the specialization of higher education and industry-academy cooperation policies are introduced, with the emphasis on government-funded projects, best practices and short-term accomplishments. Those policy efforts are mainly geared to raise the quality of higher education in Korea to better meet the socio-economic demands of the country. This is particularly relevant in the knowledge-based society where the global competitiveness of colleges and universities is regarded as a key to the country's wellbeing.

Chapter 1

Korea's Educational Development, Achievements, and Challenges

Heejin Park (Korean Educational Development Institute)

1.1 National Development through Educational Development

The Republic of Korea successfully rebuilt itself in only a half century after the Korean War, from 1950 to 1953, and the Japanese occupation until 1945. Once an aid recipient, Korea surprised the international community by joining OECD in 1996 and the OECD's Development Assistance Committee (OECD/DAC) in 2009 (Choi, 2010). In other words, having rebuilt itself with the help of international aid, Korea transformed into a donor country. In doing so, Korea has drawn attention from many in the international community as an exceptional case. In addition to the drastic economic development, Korea has been also known for its educational development in a short time period in terms of the rapid expansion of educational opportunities at all school levels as well as high academic achievement. In an international symposium jointly held by the Korean government and World Bank Group in October 2014, Yong Kim, the president of the World Bank Group, mentioned that Korea is a country that is striving to "improve its already impressive success in developing human resources." Emphasizing the important role of education in the nation's development and wellbeing, he introduced a virtuous cycle of education and national development. That is, a country's economic development, expansion of educational opportunities, and quality improvement in education are very closely interrelated (Kim, 2014). Thus, the educational development of a country is properly understood only in the historic, socio-economic and cultural contexts of the country. Except for the few countries that possess exceptionally plentiful natural resources, it is unlikely that a county will achieve sustainable economic development without a developed education system that provides a trained labor force, or that it will have a well-established education system without achieving a certain level of economic stability. In particular, in a knowledge-based society, the close relationship between a nation's economy and educational development become more salient than ever (Ibid.).

In this context, this study reviews the development of education in Korea in relation to the country's development from an historic perspective, assuming that the relationship must be an interactively connected one. Scholars have agreed that the development of education in Korea has been an important driving force behind the country's development (Adams, 2010). In

other words, with the rapid expansion and development, Korea's education system has provided a qualified labor force that meets the demands of the nation's economic development. At the same time, one can argue that the Korean government has purposefully invested in education to use it as a strategic tool to develop the country and thus, education policy implementation has been closely aligned with national development plans. In general, scholars divide the development of education in Korea into four phases (Lee. et al., 2006, 4; Kim and Lee, 2009, 41): establishing a foundation for education (1940s-1960), quantitative growth in education (1961-1980), qualitative transformation (1981-2000), and structural reforms (2001-present). Building upon those analytical efforts, we adopt Chae's (2013) model that matches educational development phases of the country to its economic development. Table 1 provides an historic overview of the close relationship between education and economic development in Korea since 1945, when the country was liberated from Japanese colonialism.

Table 1 Educational Development and Economic Development in Korea (1945-Present)

	Phase I (1945-1960s)	**Phase II (1960s-1970s)**	**Phase III (1980s-early 1990s)**	**Phase IV (mid 1990s-Present)**
Major Economic Development	Liberation, reconstruction, and the establishment of a postwar Korea	Export-oriented industrialization and rapid development	Economic reconstruction and stable growth	Reconstruction of industries to satisfy a knowledge-based society
Major Educational Development	Establishment of an education system and the universalization of primary education	Expansion of secondary education and vocational education and training	Quality improvement in secondary education and a rapid expansion of higher education	Education reforms and the improvement of competitiveness in education
Key Education Policies	-Establishing the basis of an education system - Universalization of primary education - Literacy movement	-Expanding secondary education -Developing vocational education and training -Securing education revenue -Creating teacher training programs	-The July 30 Education Reforms -Expanding higher education sector -Quality improvement in primary and secondary education -Enhancing local educational autonomy	-The May 31 Education Reforms -The 7th national curriculum -Investing in R&D activities and academy-industry cooperation programs -Enhancing ICT education -The National Human Resource Development Plan

Source: Lee, 2008 revised by Chae, 2013.

.

In the first phase of educational development in Korea (1945-1960), the structure of the education system was established. Without sufficient resources to invest in all school levels, the

government prioritized the improvement of literacy. In an attempt to achieve this goal, the government implemented “the 6-Year Compulsory Education Completion Plan (1954-1959)” and quadrupled the education budget during this period from 4.2% in 1954 to 14.9% in 1959 (Chae, 2013, 171). With the successful implementation of the 6-Year Compulsory Education Completion Plan (1954-1959), Korea achieved universalization of primary education in 1957 and then a rapid expansion of education at upper levels consecutively (Lee et al., 2006). By achieving the expansion of basic education early, Korea could establish a foundation to provide education to mass low-wage workers in the early stage of industrialization (Ibid., 4).

The second phase saw the expansion of lower secondary education (1960s to 1970s). Although the country was going through a political stagnation due to a military regime, it was a period of economic growth along with the worldwide economic boom. After establishing the “5-Year Plan for Economic Development (1962-1980s), the government adopted educational policies based on the assessment of industrial demands to support the development goals properly; during the second phase the national development goal was export-oriented industrialization (Chae, 2013, 172). The educational opportunities for lower secondary education were drastically expanded during this period with the increasing demand for a semi-skilled workforce for light and labor-intensive industry. At the same time, the Korean government strictly controlled the quota for higher education institutions, matching supply and demand (Choi, 2010, 12). In particular, the Korean government emphasized technical education and announced the “Promotion of Industrial Education Act (1963).” Also, the government initiated a university policy supporting engineering education to meet the demand of the heavy chemical industry in 1970s (Ibid.). “The Financial Grants for Local Education Act (1971)” was enacted to secure a source of education revenue as well as to promote regional development without marginalization. The official development assistance (ODA) in the educational sector from 1969 to 1999 also contributed substantially to the development and improvement of education in Korea (Ibid., 13-15).

The third phase was characterized by quality improvement in secondary education and the growth of higher education. In detail, the country achieved three major accomplishments: 1) the expansion of opportunities for higher education, 2) the reform of the vocational training system at the secondary and higher education levels, and 3) a partial adaptation of local education autonomy (Ibid. 19). Moreover, the government, which seized power through a military coup, announced “the 7.30 Educational Reforms” in 1980 to win popularity. The main ideas of the 7.30 Reforms included; 1) the increase of university enrollment quotas, 2) the initiation of Korea National Open University, 3) the approval to transform 2-year technical

colleges into 4-year universities, 4) the introduction of specialized high schools, such as foreign language high schools and science high schools, and 5) the introduction of an education tax (Chae, 2013, 173). Economically, this period was characterized by the advancement to the information industry and technology development from heavy and chemical industry, driven by the private sector (Ibid.).

In the fourth phase of education development in Korea, higher education has been almost universalized and the opportunities for lifelong learning have also become widespread. This period has also been characterized by the enhancement of civil society, growing demands for political participation, and the ever-increasing influence of neo-liberalism and globalization, signaled by the establishment of the World Trade Organization (WTO) system (Choi, 2010, 19-20). This period saw sharp changes to the international economic geography and the economic troubles, so called "IMF" because of the International Monetary Fund (IMF)-led structural adjustment program, which began in Korea in 1997 with the Asian financial crisis. During this time, Korea has gone through rapid economic transition into a technology-intensive industry, emphasizing semiconductors or information technology, while the traditional manufacturing industry has been decreased (Chae, 2013, 173).

Table 2 Changes in Education Brought by the May 31 Education Reforms

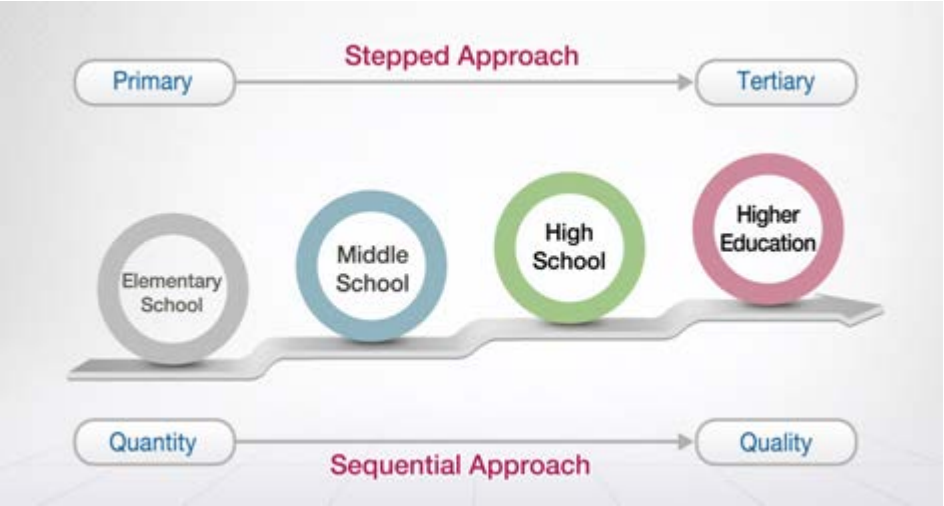
Classification	Before the Reforms	After the Reforms
Characteristics of the education system	Government-led, focused on supply	Emphasis on the role of market, focused on demand
The relationship with the economy	Providing manpower in direct response to the national economic development plans	Relying on the function of market
Educational administration system	Centralized system	Decentralized system enhancing autonomy in education
Core values in education	Socialization, the moral and social norms	Diversification, autonomy and accountability
Goals of education policy	Expansion of opportunities in education	Quality improvement in education and raising global competitiveness

Source: Choi, 2010.

In response to the changing circumstances, the Kim Young-Sam administration, also known as a civilian government (non-military regime), enacted 'The Reforms for the Establishment of the New Education System' ("The May 31 Education Reforms") to restructure its education system, taking the "supply and demand" approach (Choi, 2010, 21). In particular, the Kim administration intended to transform the nature of the education system in Korea, moving from an education system of a developing country whose major focus was on

creating human resources, to a system that includes quality improvement and diversification of education that leads the future of the country in the knowledge-based global economy (Table 1-2).

Figure 1 Korea's Educational Development Model



Source: Korean Educational Development Institute, 2014.

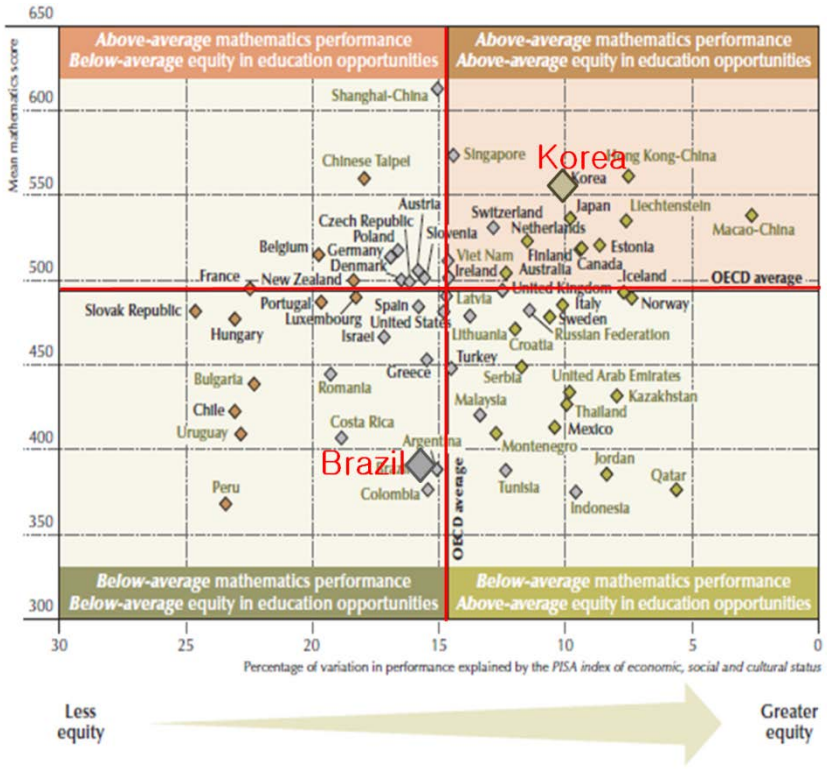
In sum, Korea has put education at the top of its national development priorities, investing heavily in education, developing and aligning the education system with its national development plans. Recognizing the need for a trained labor force to drive economic growth, yet lacking the resources to invest in all school levels simultaneously, Korea had to adopt a stepped and sequential approach. Working systematically by adopting the stepped approach, it concentrated on each level of education as the nation's demand for social and economic development grew. It first developed primary education, and then moved to secondary, and finally higher education. Korea also took the quantity and then quality sequential approach. Focusing first on quantity, it worked to expand the number of students, teachers, and schools, starting in the 1950s. Once it had met its expansion goals, the government altered its efforts to improve educational quality.

1.2 Korea's Achievements and Challenges in Education

Korea has been complimented by many in the international community for its educational accomplishments. The academic achievement of Korean students has ranked at the top for more than a decade on international academic assessments such as the PISA (Figure 3). Moreover, data shows that Korean students achieve high scores in academic achievement and

educational opportunity and equity (Figure 1-2). It is also notable that Korea belongs to the group of countries whose students' scores in academic assessments as well as levels of equity in education have improved during the last decade (Figure 3).

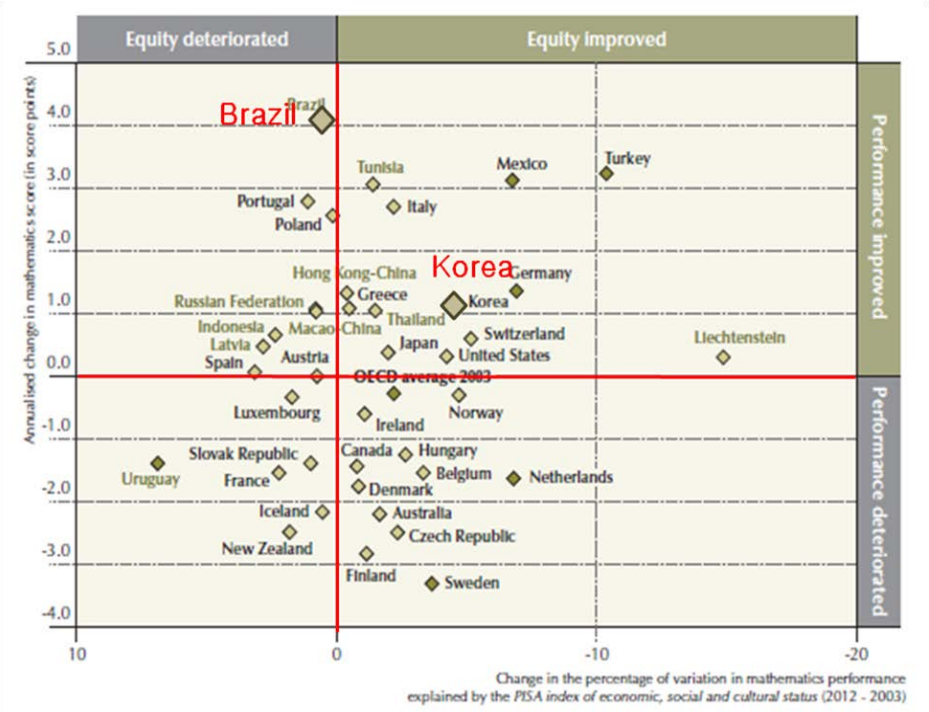
,Figure 2 Performance and Equity



Source: OECD, PISA Database, 2012; OECD, 2014.

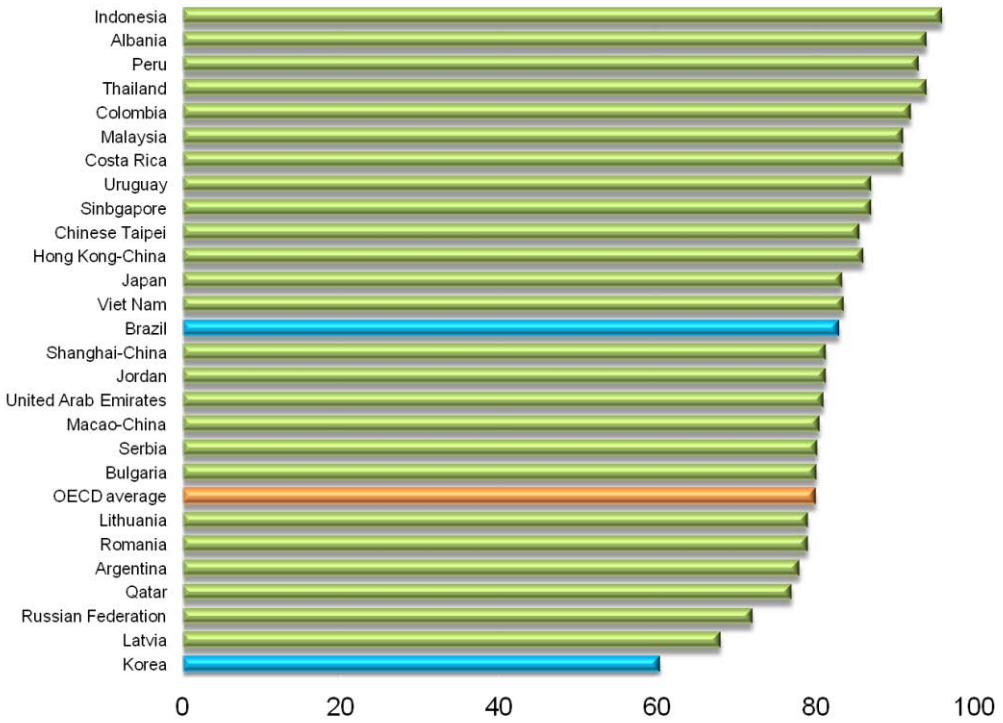
Although Korea has attracted attention from many in the international community for its high educational accomplishment, Korea has also faced countless educational challenges. For example, it is infamous for the low level of happiness of students at school, where it ranks at the bottom of the PISA-participant countries (Figure 4). Experts agree that some reasons behind those challenges are the excessive competitiveness of university entrance exams and heavy burden of private tutoring both in terms of family expense and pressure on students. Students therefore lack confidence and interest in the curriculum (KEDI et al., 2014, 114)

Figure 3 Change between 2003 and 2012 in the Strength of the Impact of Socio-economic Status on Performance and Annualized Mathematics Performance



Source: OECD, 2014.

Figure 4 Percentage of Students Who Reported Being Happy at School



Source: OECD, 2014.

Moreover**,** there is a growing consensus in Korean society regarding the need for children's holistic development and concerns about the unbalanced development of students' cognitive and non-cognitive development. Experts increasingly appreciate that Korean children need more than just intellectual development; they also need to develop emotionally and socially (Ibid., 125). In other words, Korea wants its children to be more communicative, compassionate, responsible, creative, and passionate, believing that children will thus grow into more happy and capable adults (Ibid., 110-112). They will thus be better able to contribute to the development of the country in the high-tech knowledge-based society, where individuals must work both independently and collaboratively (Kim, 2014). Some of the efforts of the Korean government in primary and secondary education include curricular reforms in 2007 to integrate the core competencies suggested by the OECD's DeSeCo project (Kim et al., 2010, 25, 29-30), the recent emphasis on the development of students' creativity and character, and the promotion of so call "Happy Education." The Happy Education initiative is one of the major policy goals of the current administration, which aims to improve students' experiences and perceptions of school, making students' school lives more satisfactory and rewarding. A representative program of Happy Education is "Free Semester," which allows 7th grade students to explore various field-oriented experiences and career options by participating in activities and programs outside of traditional classroom settings for one semester, free from paper-pencil examinations (KEDI et al., 2014, 122).

In sum, it is apparent that, while Korea has made substantial educational accomplishments during the last several there remain concerns about future generations and educational challenges, so the decades, country continues to strive to improve its education system. The education challenges Korea is facing can be classified into two groups: those that emerged as by-products of excessive drive for, and competitiveness in, education, both at the individual and governmental levels; and emerging challenges caused by the change in the socio-economic environment, namely globalization, development of technology, and transformation into the information and knowledge-based society. While no country can be free from the influence of global changes, the drive for education is predictable to a certain degree. The competition-driven Korean educational system has created a social atmosphere in which students are less happy, less satisfied, less confident and less interested in school compared with their intellectual achievements. Conversely, the Korean development model in education has its undeniable strengths, particularly in terms of its accomplishments with limited resources in a

short time. Therefore, the knowledge sharing among Korea and the countries in LAC may be even more meaningful when we thoughtfully consider and acknowledge the fact that all education systems have weaknesses as well as strengths.

Chapter 2

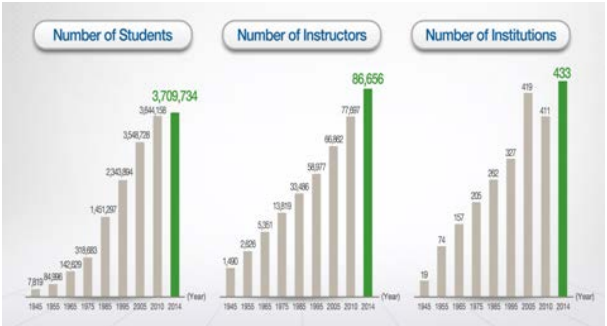
Development Strategies for Improvement of the Higher Education Sector

Jeung Yun Choi (Korean Educational Development Institute)
Jae-Eun Chae (Gachon University)
Heejin Park (Korean Educational Development Institute)

2.1 Development of Higher Education in Korea

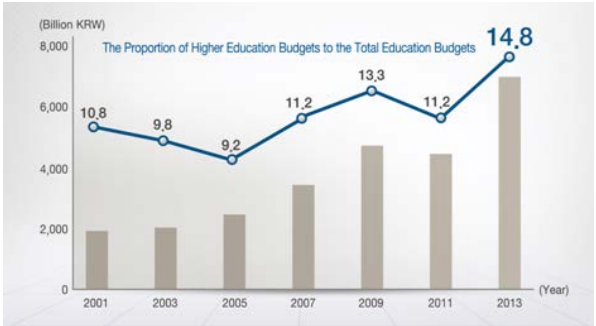
Korea has made enormous efforts at the higher education level to improve its educational system and better meet the evolving demands of society. Due to the government's stepped and sequential approach to educational development, investment in higher education really only began in the 1990s. In the last two decades, government funding has been poured into this sector in an effort to improve the quality and competitiveness of higher education institutions (HEIs, hereafter), and the number of HEIs increased dramatically in this time period. In 2014 there were 433 HEIs in Korea and in 2013 (Figure 5), the higher education budget increased to almost 15% of the total education budget from 9.2% in 2005 (Figure 6).

Figure 5 The Expansion of Higher Education in Korea (1945-2014)



Source: KEDI, 2014.

Figure 6 Budgets for Higher Education in Korea (2001-2013)



Source: KEDI, 2014.

With the expansion of higher education having thus been achieved, efforts are now focusing on quality improvement and quality assurance to better meet the socio-economic demands of the country. Two particular policies are "the Specialization of Higher Education" and "Industry-Academy Cooperation (IAC)."

2.2 Specialization of Higher Education Policy

2.2.1 Overview

The Korean government faces various challenges in its higher education sector, such as the rapid decrease of the college-going population, limited resources for higher education, and lack of specialization of HEIs. Especially, many colleges and universities in Korea have been criticized for their similarities in institutional values or missions, targeted students, academic programs, teaching and learning strategies etc. In addition, there is a call to restructure the system of HEIs to align it with industrial changes. For the specialization of higher education, stakeholders within and outside of HEIs selectively reshape the flow of resources to allocate them to wherever they have comparative advantages: “Selection and Concentration” here guides the directions and strategies of the specialization of higher education. An historic review of the direction and the main contents of the policies for specialization of universities are as follow.

Specialization Focused on Science and Engineering Fields (1970- early 1990s)

The university specialization policy was first initiated in Korea in the 1970s, when the country experienced a rapid expansion of the higher education sector. However, there was criticism about the mismatch between the increasing number of people with higher education and the actual economic demands of the country (Kim et al., 1989). In response to those criticisms against the rapid expansion of higher education, the government initiated policies to ensure and improve the quality of higher education by introducing strict regulations against low performing HEIs. One of the exemplary policy programs was the “Specialization of Local Universities Project” that aimed to foster skilled workforce in science and engineering fields required for the successful implementation of the five-year national economic development plan. The main direction of the “Specialization of Local Universities Project” was to promote specialized engineering programs in local HEIs by providing governmental funding until the early 1990s (Ibid.).

In addition, numbers of engineering students and programs had continued to increase during that period. Although there was strict regulation on student for universities in the Seoul metropolitan area, science and engineering fields were exceptional. As a result, the quota of science and technology departments particularly those related to high-tech industries was notably increased in HEIs in the Seoul metropolitan area between 1992 and 1995. With those particular student quota and funding policies, the overall ratio of students enrolled in science

and engineering departments in Korea had been traditionally high. Table 3 shows that the proportion of science and engineering students in Korea is 32% (25% for manufacturing and civil engineering, and 7% for science), which is considerably higher than the OECD average (25%), while the proportion of students in the social science, business, and law in Korea is much lower (20%) than the OECD average (15%).

Table 3 Percentage of Entering Students by Field of Study in Higher Education, Korea and OECD (2012)

	Humanity, Arts, and Education	Health and Welfare	Social Science, Business and Law	Service	Science and Engineering		Agriculture	Uncategorized
					Manufacturing and Civil Engineering	Science		
Korea	25%	14%	20%	7%	25%	7%	1%	none
OECD Average	20%	13%	31%	5%	15%	10%	2%	4%

Source: OECD (2014)

With the effective policies implemented in the higher education sector and having thereby secured the necessary workforce, the government successfully actualized the Seventh Five-Year National Economic and Social Development Plan (1992-1996) and Five-Year Economic Development Plan (1993-1997) (Lee et al., 1999). In other words, Korea had met the excessive demand for a skilled workforce, especially in the science and engineering fields, for the country that had gone through drastic industrial development from the mid-20th to the early 21st century.

Diversification and Specialization of University Models (Mid 1990s - 2000)

The direction of governmental education policy has experienced a dramatic change in this period with the introduction of a non-military civilian government in 1993. The government announced “The Education Reforms for the Establishment of New Education System to Raise Talents Who Lead the Era of Globalization and Information” (i.e. The 5.31 Education Reforms) in 1994. The main idea of the reforms was to recognize the importance of educational opportunities for everyone, wherever and whenever, and to actualize lifelong society (Education Reform Commission, 1995). The government introduced a catchphrase of “diversification and specialization of universities” at the higher education level for the 5.31

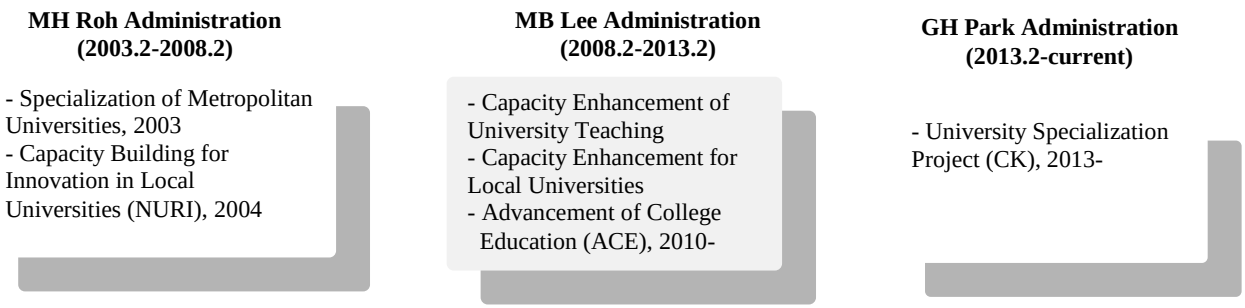
Reforms (Choi et al., 2008). The four major policies introduced under the umbrella of "diversification and specialization of universities" are as follows (Jang, 2004; Lim, 2005).

- The adoption of "The Deregulation of the Establishment of Universities (1996)," which reduced the regulation of the establishment of universities. As a result, the number of universities dramatically increased afterwards;
- The introduction of a Professional Graduate School System to foster professionals in medicine, law and etc.;
- The implementation of "The International Talents Project" (1996–2000) to foster professionals at the international levels; and
- The promotion of "The Specialization of Local Universities Project (1997)": The five main areas of which are international relations (6 schools), engineering (8 schools), basic science (5 schools), humanities (4 schools), and other areas of specialty (5 schools).

Specializing the Overarching System of Higher Education (2000-2013)

In the early 2000s, given the decrease in the college-going population because of the low birthrate, the Korean government decided to restructure the entire higher education system as a whole through "specialization" instead of fostering changes at the university level. According to the Plan on the Specialization of Universities, they were categorized into three groups, such as universities for teaching, research, or technical education, depending on each institution's strengths and circumstances (Chang and Choi, 2010). Figure 7 shows some of the major policies and projects for the restructuring of higher education system through "specialization" and their changes during the last decade in Korea (Choi et al., 2008; Yun et al., 2014).

Figure 7 Higher Education Policies in Korea

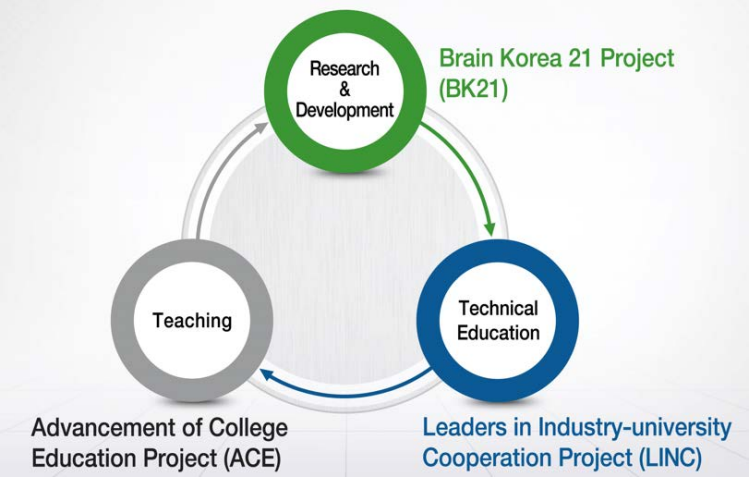


In addition to the policies and projects listed in Figure 7, the government has initiated projects for enhancing the research and development capacity of HEIs in the end of the 20th century. The representative funding project, which has resulted in considerable changes and outcomes, is the “Brain Korea 21 (BK21 Project)” and “BK21 Plus Project”. Since 1999 government funding has been poured into the higher education sector to improve programs for research and development through the BK21 and BK21 Plus Projects. The government allocated KRW3,400 billion into universities during two seven-year periods (1999-2007), starting in 1999 and 2007. The BK 21 Plus project is also a project funded on a massive scale (2014-2019) (Ministry of Education, 2014; Ministry of Education, the National Research Foundation of Korea, 2013)

2.2.2 Three Pillars of the Specialization of Higher Education in Korea

The three pillars of the specialization are research, teaching, and technical education. The Korean government has implemented diverse funding projects, tailored to the need of each university and their specific areas. These include the BK21 Project to improve research and development capacity, the ACE Project (Advancement of College Education project) to raise the quality of undergraduate education, and the LINC Project (Leaders in Industry-university Cooperation project) to match the educational and research activities of universities to the demands of industry. In addition, the LINC Project is also an important policy for promoting industry-academic cooperation and thereby is discussed in the latter part of this paper.

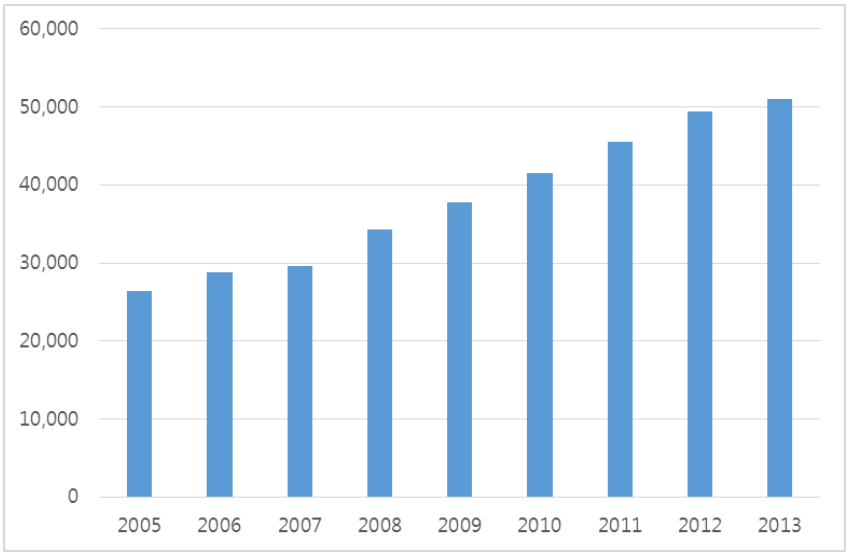
Figure 8 Three Pillars of the Specialization of Higher Education in Korea



Research and Development: Brain Korea 21 Project

Brain Korea 21 (BK21) Project is a representative project in Korea to improve the global competitiveness of its higher education system. This project was introduced in 1997 right after the "IMF financial crisis" hit the country, in a belief that it was crucial for the development of the research capacity of HEIs to secure the nation's wellbeing and development. Having poured such a great amount of funding into graduate schools of HEIs and provided financial aid to graduate students and novice researchers, the government stimulated the creation of research-oriented universities in Korea (MOE, 2014). Another major accomplishment of the BK21 Project is the drastic increase of research papers published in the science and technology fields in top-tier international journals: it has almost doubled in just under a decade (Figure 9).

Figure 9 Academic Papers Published in SCI Registered Journals (2005-2013)



Source: Ministry of Science, ICT and Future Planning & KAIST, 2014.

Teaching: The Advancement of College Education Project (ACE)

The Korean government has also tried to improve the quality of undergraduate education, and adopted policies accordingly. Two representative governmental funding projects for undergraduate education included "The Educational Capacity Enhancement (ECEP) Project" (2008-2013) and "The Advancement of College Education (ACE) Project". The ECEP project was aimed at improving the quality of undergraduate education by exploring various exemplary programs at the undergraduate level, including both extra-curricular activities and

programs and official curricula of each institution (MOE, 2013). The government allocated KRW200 billion per year for this project.

In addition, the ACE project has also brought about various changes in the higher education sector in Korea, particularly in terms of raising awareness of the importance of teaching at the undergraduate level. Since 2010 the government has selected several universities every year and provided funding for four consecutive years to identify and spread best practices across the country through the ACE project. As of 2013, a total of 25 universities have introduced new systems and implemented various programs to improve the quality of teaching and about KRW270 billion has been allocated to selected institutions (MOE, 2014).

<Box 1: Best Practices of the ACE Project>

The "ARETE" Program of Kyunghee University

An exemplary case of the ACE project that brought in curricular reforms is the ARETE program at Kyunghee University. ARETE, a Greek word meaning excellence, started as a student initiated discussion group, but has been expanded into a core part of humanities education at the university, with the help of the ACE project. With the funding, the university has provided books and spaces on and around campus for group meetings and activities where students have the chance to explore fundamental philosophical questions, such as the meaning of life, justice, truth, and visions of the future. Kyunghee University has integrated ARETE into its formal curricula believing that humanities education is the universal foundation of undergraduate education transcending time.

Source: MOE , 2014. Presentation on ACE Project Plan, p.9.

2.3 Industry-Academic Cooperation Policy

As a knowledge-based economy has been intensified in Korea after the industrialization era, the importance of science and technological innovation is emphasized ever more. This change requires extensive industry-academy cooperation (hereafter referred to as "IAC"). In addition, as the importance of developing and using innovative technology has been recognized in Korea, the IAC has drawn attention as a means to accomplish this innovation. This section examines the changes in policies and institutions that led the development of IAC in Korea and reviews the on-going government projects for the IAC to understand the cooperation better. It also looks briefly at the current trends in IAC in Korea, and discusses major issues and challenges.

2.3.1 Background of Industry Academy Collaboration Policy

The “Promotion of Industrial Education and Industry-Academy Cooperation Act (2003)” defines the concept of Industry-Academy Cooperation in three categories: 1) Enhancement of manpower to meet the demands of industry and future industrial development, 2) Research and development for the creation and expansion of new knowledge and technology, and 3) Technology transfer and consultation to industry. This definition is meaningful in that it provides direction for Korean IAC, such as science and technology innovation, and enhancement of national competitiveness through the activation of IAC. The types of IAC are classified by various standards such as the lead agent, purposes, or activities of the cooperation. For example, partnerships vary by lead agent; they may be university-led, enterprise-led, and government or local government-led. Purposes or activities include: 1) Joint (commissioned) research and development, 2) Education and training, 3) Knowledge and technology transfer, 4) Technical consultation, 5) Creating business, 6) Human resource and information education, 7) Sharing infrastructure, such as equipment and materials.

2.3.2 The Development of Industry-Academy Cooperation in Korea

The institutional approach is one of the representative strategies of Korea’s economic development (Cha, 2014). The Korean government has set up legal and administrative infrastructure to institute policies to accomplish national tasks, and established think tanks to plan, implement, and evaluate policies based on empirical data and scientific analysis. Institutional approach can also be seen in the process of IAC development in Korea. The Korean government developed IAC by reflecting characteristics of each stage of economic growth and by enacting relevant laws, establishing policies and designating central operating bodies.

Scholars hold several different views about aspects of the initiation of Korean IAC. However, it is generally agreed that IAC was started in the 1960s. The Korean economy had experienced a structural reform, turning from light industry to heavy chemical engineering and then to capital-intensive industries in a few decades, starting in the 1960s. In the 1960s and 1970s, industrial training and the related Act was introduced as a ground for IAC. The cooperation in this early stage was focused on supplying the skilled workforce needed for industries (Park et al., 2000).

The economy in Korea in the 1980s and 1990s had advanced to the point of technology-intensive industries, developing heavy chemical engineering industries using specialized technology and adopting cutting-edge industries. In this period, the structure of the Korean

economy was transformed from the capital and equipment investment industry to the R&D investment industry. Before this period, Korean companies only mimicked the technologies of advanced countries, but from this time, Korea developed new technologies and advanced to become a country that contributes to the improvement and development of new technologies. Therefore, the demand for scientists and technicians drastically increased. In other words, the industrial technology policy became essential for the country, as the technical skills emerged to be a core industrial competitive factor. In the 1980s and 1990s, IAC became a significant political subject as one of the technology development strategies. The efforts to establish systems for IAC were initiated in earnest (Park et al., 2000).

Since the 2000s, Korea adopted a strategy to reshape its industrial structure, focusing on cutting-edge technology. Therefore, the main activities of the IAC project were to foster high skilled human resources required in the new technology industries. In this period, the investment of R&D was regarded as important, but major challenges remained in making the outcomes of R&D into intellectual property and maximizing economic benefits. In addition, IAC stressed the importance of intellectual property rights, including patents, technology, and the R&D budget. The establishment of a balanced national development and national innovation system was a major government project in the transitional period. IAC was highlighted as a strategy to achieve such a national agenda (Jyung et al, 2007). In the 2000s, the law and administrative system on IAC was introduced to create an environment to implement IAC effectively. For instance, the previous “Industry Promotion Act” was restructured into “Promotion of Industrial Education and Industry-Academy Cooperation Act”, and since 2004 each university has established a Board of IAC. This policy implementation brought in a revolutionary change in that individual universities were able to own the management system for their R&D activities. Doing so allowed them to; 1) manage R&D budget flows comprehensively and systemically, 2) authorize research results of intellectual properties including patent, and 3) transfer the achievement of R&D activities into corporate goods. Because of the drastic changes brought by the “Promotion of Industrial Education and Industry-Academy Cooperation Act”, experts even argue that IAC in Korea really started in 2014, with the establishment of the Board of IAC in individual universities (National Research Foundation of Korea, 2012).

The government’s funding of programs to promote IAC was drastically increased in 2000s. For instance, “New University for Regional Innovation (2004-2008)” helped establish the foundation of IAC. In addition, both the “Capacity Building for Leaders in IAC Project (2004-2011)” and the “Human Resource Development Center for Economic Region Leading

Industry Project (2009-2011)" emphasized the importance of IAC in higher education and even regarded it as one of the universities' major missions, along with education and research. Table 4 introduces the historic trends of IAC policies from the 1960s until recently.

Table 4 Characteristics and Main Changes of IAC Policy

Period	Characteristics	Contents and Outcomes
1960s	Human resource training & IA joint research	-Securing human resources in science and technology fields -Improving labor competencies -Establishing a relevant legal system
1970s	Establishing the foundation for individual IAC agent	-Establishing major government-funded research institute -Establishing Daedok Science Town -Modifying relevant legal institution
1980s	Invigorating IAC Research	-Providing governmental supports by national R&D projects -Establishing important infrastructure for strengthening IAC -Modifying relevant legal institution
1990s	Expanding government-led R&D projects	-Promoting department-led R&D projects -Promoting projects for establishing local infrastructure -Modifying relevant legal institution
2000s	Promoting university-centered IAC	-Establishing or strengthening IAC center -Promoting consumer-oriented education -Providing prior supports for ready-to-be-commercialized projects -Promoting universities' participating in venture firms -Modifying relevant legal institution

Source: Lim & Kim, 2011.

2.3.3 Best Practices of the IAC Policy

As described earlier, the Korean government's funding projects for universities along with the enactment of laws are two major policy means to promote IAC. The IAC policy was promoted by several governmental institutions, including the Ministry of Education, ministries related to the economy, the Small and Medium Business Administration, and others (Park, 2013). The main focus of the IAC was diverse, depending on each institution's missions and characteristics. For instance, the Small and Medium Business Administration has focused on using universities' technologies to meet the demands of small or medium sized industries in the development of technologies and skilled labor force. On the other hand, ministries related to the economy have emphasized developing breakthrough technologies through the cooperation between universities and industries above a certain size, while the Ministry of Education stressed the structural reforms of universities as well as recruitment and cultivation of high-skill talents through the IAC (Park, 2013: 136).

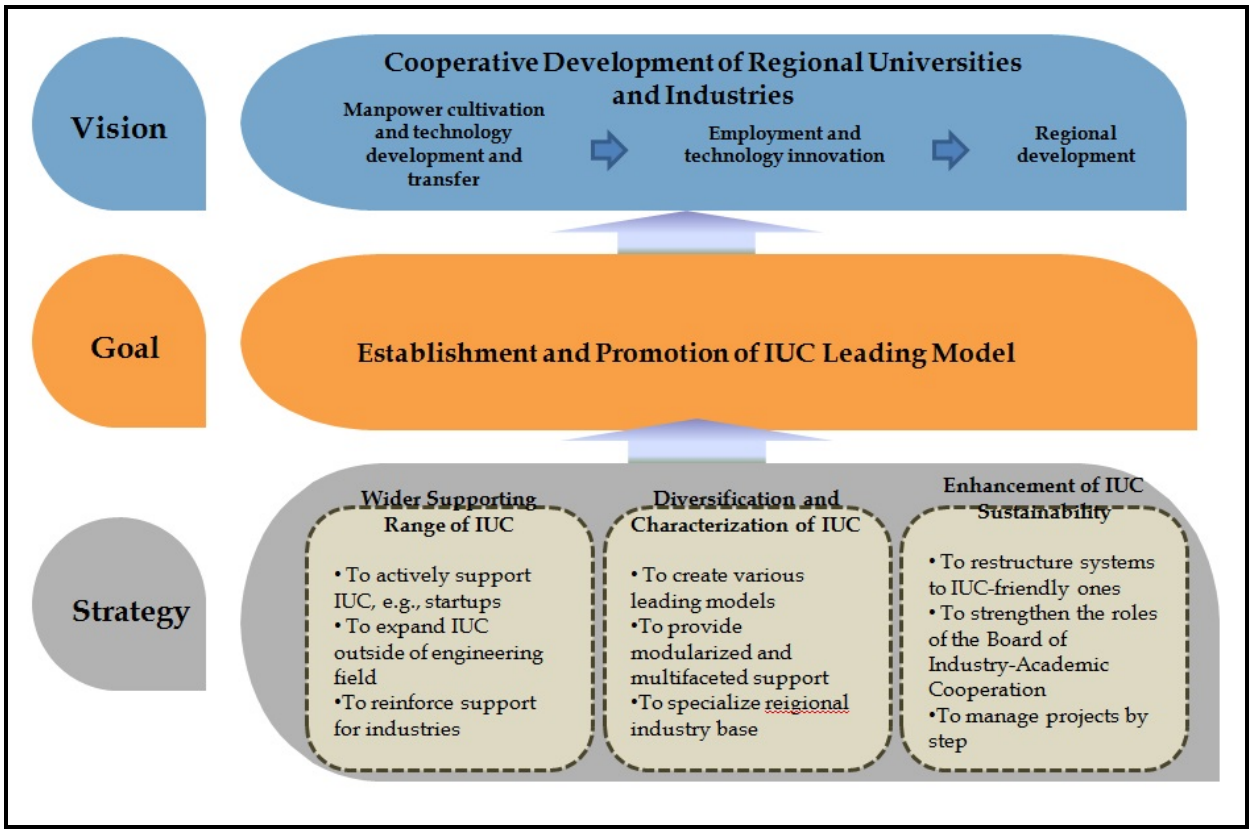
Among the IAC projects, the Government-funding Projects for IAC supervised by the

Ministry of Education can be used as a reference for the sub theme of the Korea-Latin America knowledge share forum entitled ‘Skills for work’; thus the project by the Ministry of Education is introduced. It includes the “Project to Promote ICU-centered Universities” (2004-2011), the “Project to Foster Hub Universities for IAC” (2009-2011), the “Project to Foster Leaders in Industry-University Cooperation (2012-2016)”. The details of each project are shown in Table 5.

Table 5 Major Governmental Funding Projects for IAC

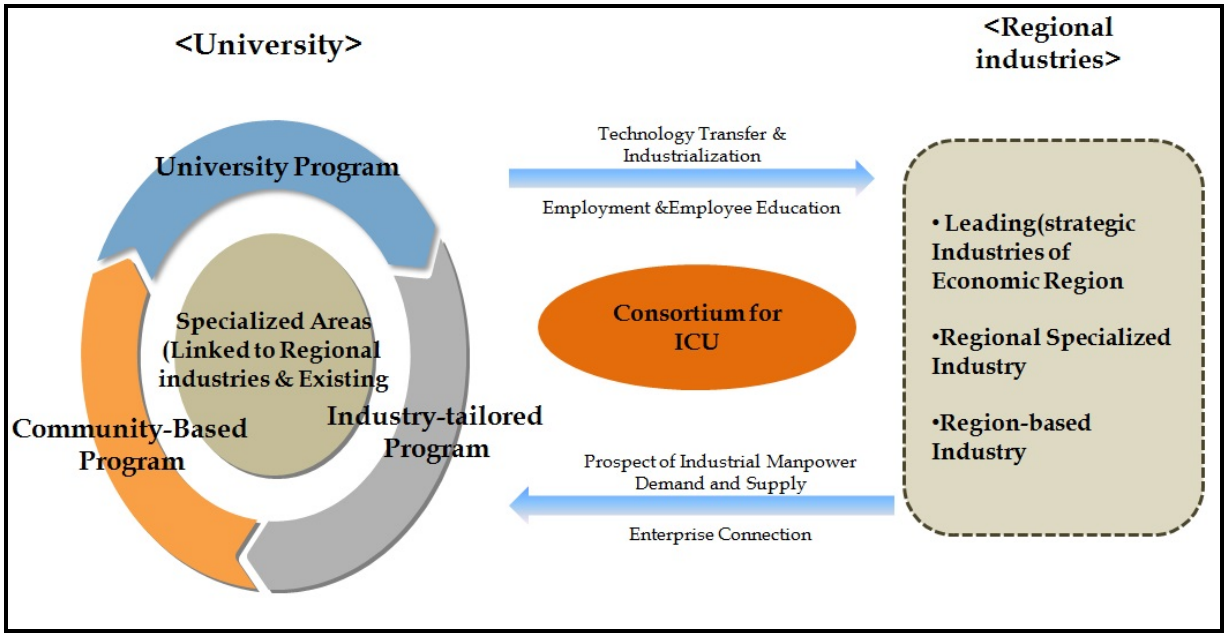
Projects	Promoting ICU-centered Universities	Fostering Hub Universities for IAC	Fostering LINC (Leaders in Industry-University Cooperation)
Goals	- To change industry clusters into innovation clusters through IAC - To reform the university as a hub of technology development and manpower cultivation	- To cultivate and provide the excellent manpower required for the development of leading industries in line with the government’s development plan of new growth industries in the economic region	- To establish a growth system for regional universities and industries - To expand and reorganize the university’s IAC system
Targets	Universities and industrial Universities	Universities	Universities
	13 Universities including 5 industrial universities	2010: 19 universities	2014: 56 universities
Fund	$44 Million/Year	$100 Million/Year in 2009	$240 Million/Year in 2014
Period	2004-2011	2009-2013	2012-2016

Figure 10 LINC Project



Source: National Research Foundation of Korea website: http://www.nrf.re.kr (accessed on Feb. 6. 2014)

Figure 11 Measures to Strengthen Links between Universities and Regional industries in LINC Project



Source: National Research Foundation of Korea (http://www.nrf.re.kr, accessed on Feb. 6. 2014)

2.3.4 Achievements of Industry-Academy Cooperation Policy

IAC in Korea has been developed in response to the conditions and requirements of each era, and thus the purposes and directions of IAC has changed accordingly. Major activities of the IAC also differed in each time period, and indicators used in the current status of IAC in Korea also showed differences for each era. The National Research Foundation of Korea presents annually the status of IAC in Korea based on investigation reports. Since 2006, it has also conducted an annual survey, targeting universities, using an index of IAC. Such attempts for systematic statistical investigations on the IAC are relatively recent in Korea. Therefore, there have been substantial changes regarding survey targets and survey items during the last decade. The data on the IAC conducted by universities in Korea are presented below.

Industry-Academy Cooperation Research Performance and Operating Income

The amount of university research funding has increased in the last 5 years (Table 6), increasing in all disciplines and reaching KRW5.1 trillion ($4.6 billion) in 2012. Funds for science and technology have increased every year, while those for humanities and social fields have fluctuate, suggesting that the increase of research funding in Korea in recent years has been driven by the growth of research in science and technology.

Table 6 University Research Costs, by Discipline and Year

(Unit: Million KRW)

Year	Humanities and Social Sciences	Science and Technology	Rate A/B	Total
2012	637,639	4,507,153	12.4/87.6	5,144,792
2011	569,336	4,352,479	11.6/88.4	4,921,815
2010	668,217	3,646,306	15.5/84.5	4,314,524
2009	518,468	3,494,403	12.9/87.1	4,012,871
2008	524,011	2,974,548	15.0/85.0	3,498,559
2007	410,019	2,820,549	12.7/87.3	3,230,568
2006	291,777	2,171,805	11.8/88.2	2,463,582
2005	305,288	2,030,059	13.1/86.9	2,335,347

Source: National Research Foundation of Korea, 2010 and 2014
Note: Systematic data collection at the national level, and publication of it in the Industry-Academy Cooperation white paper began in 2006.

Research and development funding that a university receives needs to go first to the Board of IAC, which is an umbrella organization of each institution for IAC. Therefore, it is possible to estimate the extent of IAC conducted at each university by examining the amount of operating income of the Board of IAC, particularly the income from cooperation with industry,

governmental funds, donations etc. The five universities with the most revenue from IAC in Korea are Seoul National University (KRW648.1 billion), Yonsei University (KRW 338,9 billion), Korea University (KRW 231.8 billion), Hanyang University (KRW221.3 billion), and Pohang University of Technology (KRW 200 billion).

Table 7 Operating Revenues of Industry-Academy Cooperation Group: 2011-2012

(Unit: Million KRW)

Classification	Universities		Junior Colleges	
	2011	2012	2011	2012
Total	5,147,597	5,455,591	428,429	455,852
Industry-academia collaboration with corporate earnings	875,074	882,739	52,197	77,622
Government subsidies revenue	4,072,342	4,381,189	362,058	357,448
Transfer and donation revenue	58,133	45,773	7,370	7,516
Other revenues	142,048	145,889	6,804	13,266

Source: National Research Foundation of Korea, 2014.

The Current Status of Intellectual Property Rights and Technology Commercialization of Universities

As society advances rapidly to become knowledge-based, the expectation of the role of Korean universities in the creation and dissemination of knowledge increases. The emphasis placed on intellectual property of universities among IAC activities is growing accordingly. As a result, there is increased governmental funding to support university intellectual property and technology commercialization, and intellectual property rights and technology commercialization indicators have been adopted as a performance indicator.

The intellectual property rights earned by universities in Korea have increased dramatically in the past five years. For example, the retention numbers of intellectual property rights have more than doubled, from 21,265 cases in 2008 to 50,890 in 2012. Until 2010, data were only gathered for four-year universities, but since 2011, two-year colleges have also been tracked. This change in data collection affected the increase of overall intellectual property rights because the number of surveyed institutions increased. However, the four-year growth rate of all intellectual property rights was 139.3 %, while the growth rate of the surveyed universities is 85.9%. It shows that the number of intellectual property rights held by universities has rapidly increased, even after controlling for the number of participating institutions.

Table 8 presents the current status of technology transfer and commercialization, which serves as an indicator of the scope of practical knowledge created by universities. Commercialization has steadily increased over the past five years. Universities' technology transfer contracts increased from 1,221 cases in 2008 to 2,012 in 2012. Universities' earnings from technology transfer also increased from KRW27.8 billion in 2008 to KRW54.1 billion in 2012. The income from the technical fee per technology transfer contract, which shows the efficiency of technology transfer and commercialization, has increased gradually from KRW22.8 million in 2008 to KRW26.9 million in 2012.

Table 8 Technology Transfer and Commercialization of University (2009-2012)

(Unit: Million KRW, each case)

Classification	2008	2009	2010	2011	2012
Technology Fee	27,807	27,872	37,571	47,978	54,119
Contract per case	1,221	1,365	1,615	1,990	2,012
Income of technical fee per technology transfer contract	22.8	24.4	25.1	24.1	26.9

Source: National Research Foundation of Korea, 2014.

Field-oriented Training

Raising a skilled labor force to meet the demands of industry through the IAC is particularly important for higher education institutions whose major mission includes education. In that context, the Ministry of Education includes field-oriented training as the main component of its IAC policies. To understand the current status of field-oriented training better, it is helpful to review the data on field-oriented trainings (Table 9).

Table 9 Field-oriented Education: University and Industry-Related Training: 2008-2012

Classification	2-year University		4-year University	
	2011	2012	2011	2012
The number of students taking field training	42,414	47,720	39,408	63,231
The number of enterprises participating in field training	25,309	28,151	18,133	35,415
The number of universities participating in Capstone Design	97	108	24	39
The number of students taking Capstone Design courses	56,676	75,509	8,539	10,509
The number of Department of Contracts	708	458	151	50
The number of students in Department of Contracts	11,274	10,531	1,831	1,250

Source: National Research Foundation of Korea, 2014.

Policy Implications and Suggestions for Knowledge Sharing

Korea has made enormous efforts to improve its education system to better meet the demands of the ever-evolving society. At the higher education level, attention is directed to the global competitiveness of universities internationally and governments continue to increase their investments in higher education in an attempt to raise the research and development capacity of their country. Due to the government's sequential approach to educational development, investment in higher education in Korea really only began in the 1990s. In the last two decades, tax money has been poured into this sector in an effort to improve the quality and competitiveness of universities and colleges. The number of institutions increased dramatically in this time period In 2013, the higher education budget increased to almost 15% of the total education budget, from 9.2% in 2005. With the sector expansion having thus been achieved, efforts are now focusing on quality improvement. Two particular policies are the specialization of higher education, and industry-academy cooperation. Specialization of higher education is a strategy that allows the higher education sector to respond to the country's current challenges, such as the oversupply of graduates in a specific area, or skills mismatches. The three pillars of specialization are research, teaching, and technical education.

The Korean government has implemented diverse funding projects, tailored to the needs of each university and their specific areas such as the Brain Korea 21 project (BK21), the Advancement of College Education project (ACE), and the Leaders in Industry-university Cooperation project (LINC). An example of the major accomplishments of those funding projects is the drastic increase in research papers published in international journals after implementing the Brain Korea 21 project. The IAC policy is also an important policy initiative for the innovation of higher education in Korea. Such cooperation in Korea matches the educational and research activities of universities to the demands of industry. It does this through the development and transfer of technology; special programs for industry-academy cooperation; curricular reforms; the provision of facilities for laboratory education and experiments; and institutional reforms to facilitate the cooperation. The governmental R&D expenditure for higher education and the Intellectual property rights and technology commercialization by higher education Institutions have also rapidly increased. Given those accomplishments, IAC is judged a successful policy that stimulates the development and open innovation of the higher education sector in Korea.

Specialization of Higher Education

The Korean government's policy measures on university specialization provide implications to countries in Latin America as follows. Most of all, it is important to foster highly equipped human resources through university specialization projects in alignment with the national development plans, as well as to avoid reckless expansion of numbers of institutions or programs. As indicated above, Korea strictly restricted the entrance quota of universities based on the demands of industry on human resources until the 1980s. The government sought to avoid the unbalanced expansion of humanities and social science fields and to meet the demands of industrial sectors for human resources matched with appropriate skills by implementing policy measures that put a particular focus on science and engineering. However, in 1990, with the rapid expansion of higher education, the problem spread across the country. In an attempt to resolve this issue, the government has introduced a number of policy measures including funding programs targeted at fostering flagship courses and programs. Given the implications of Korea's experience, it is important to introduce policies and funding systems that encourage individual universities in LAC to specialize according to their own strengths and missions, and not to expand the sector, neglecting economic forces, which may cause serious problems of either unemployment or a shortage of workers.

Second, it is necessary to create a competitive culture among universities by adapting a graded funding system, based on performance as well as university specialization policy. A major part of success of the BK21 project and ACE projects was the graded system that adapted a funding scale based on the performance of universities, providing a larger amount of financial support to those with outstanding results. The reason for this measure was that it was difficult to continue to impose government controls over universities as social democracy expanded. To endorse active participation of universities with a maximum level of autonomy of operation, such a measure was necessary. It has also proven to be a success in systemic reform of national/public universities. Considering these positive outcomes, a graded system may be helpful when implementing projects on university specialization.

Next, the BK 21 project provides an important implication for the LAC in terms of benchmarking research-oriented universities. As stated above, the BK 21 project took a new approach to provide a vision of "research-oriented universities," particularly during a time in which most universities had lost their direction in the newly arising era of the knowledge-based society. The BK 21 project maintained its importance as it encouraged the universities to enhance their research capacity and competitiveness rather than to achieve mediocre levels of education and research with divergent investments. Begun in 1999, the project continues in

2015, and has played a pivotal role in facilitating the engagement of Korean researchers in international research activities and publishing a number of SCI journals and papers. Also, the project promoted the establishment of graduate schools that foster world-class researchers, in addition to contributing to a remarkable increase in the level of national research capacity. Most importantly, becoming a research-oriented university or/and education-oriented university—the primary goal of the university specialization project—has become a feasible, practical goal for Korean universities.

Last but not least, it is highly advisable for LAC to benchmark the ACE project and implement a national project to enhance the quality of undergraduate education. In Korea, the demands in higher education have long been exceeding the supply, therefore, the quality of the undergraduate curriculum has not been a major interest of the universities in Korea. Rather, they were more interested in selecting students with outstanding academic excellence. Faculty evaluation, based on the number of published papers and research funds attained by an individual, also contributed to the relative negligence of the quality of the undergraduate curriculum. With an expansion of the admission officer system for student selection, such practices have become challenges, as the students are selected not solely based on their scholarly aptitude tests, but also considering their different abilities and social backgrounds. The increased diversity in student cohorts have raised the needs of individualized attention and guidance in teaching and learning. The ACE project, in overcoming these challenges, has contributed to recognize the challenges and issues of practices in undergraduate curriculum and to seek innovative measures. It is critical for LAC also to seek new measures in funding for the faculty to attend to educating young students in addition to their research activities.

Industry-Academy Cooperation

IAC policy is an effective and efficient way to bring about open innovation the boundaries of each university. IAC is also closely related to the policy agenda of innovation and university reform. Therefore, IAC can be used as crucial policy means that bring innovation not only in industry and market fields, but also into the university sector. Considering the strength of IAC policy as a pivotal strategy for innovation, the implications from Korea's experience in IAC can be drawn as below.

First, IAC played a significant role in implementing universities' tasks of cultivating manpower, keeping up with the rapidly changing economic and social environment. Universities have always been nurtured young talent. However, there has been criticism of

universities that their education system and contents failed to keep up with the changing economy in the process of moving into the knowledge-based economy from the period of industrialization in the 20th century. Universities in Korea have been blamed for the fact that their education process and teaching/learning methods did not meet the needs of industries that keep innovating.

The Korean government's funding to promote IAC has set the goal of fostering talented manpower for industry in university neighborhoods and strived to improve the education system, including curriculum reform, recruitment of professors with industry experience, expanded hands-on experience programs for students, and so forth. As a result, the adequacy of universities was enhanced as the university curriculum was significantly reformed, and as more corporations and students took part in on-site training programs and more professors with practical experience were recruited. Although not all higher educational institutions achieved the results, it is certain that the government's policy for IAC revitalization allowed universities to have more interest in and attention to IAC. After 10 years of intensive financial support, it has now come to fruition. From Korea's experience, Latin American countries might consider the strategies to improve the quality and adequacy of universities through an IAC policy.

Second, IAC policy, such as the government-funding project to invigorate IAC, can be used as a hub to build a creative industrial ecosystem through the linkage among universities, industries, government and regions. More importantly, it can serve as an important mechanism for THE balanced development of regions. The noticeable thing in Korea's IAC policy (not applied to all cases) was that regional industries' characteristics and the balanced development of regions were taken into careful consideration when the funding project for IAC was implemented. Korea, like other countries, confronts interregional inequality in the course of economic development, and it is important to note that IAC policy did not solve all problems of interregional inequality in economic and social development. And yet, continuous efforts were made to have interregional equality and to highlight regional characteristics during the selection of support targets and designing of the details of the project. The hard work and effort paid off and the policy considerably contributed to the development of universities disadvantaged by the funding project. This Korean case can serve as a reference model to Latin America, who is faced with several challenges to improve equality.

Third, the success factors for Korea to achieve IAC development in a short period of time include the enactment of proper laws, the government's funding, and the establishment

of organizations in charge of the affairs of IAC within universities. This Korean example can be a good reference to LAC that attempt to take a similar approach. As described above, the institutional approach, the key to Korea's economic growth, was applied to the IAC policy and it is considered that it was successful. The legal basis for IAC revitalization was made through the enactment and revision of related laws, and the establishment of the Board of Industry-University Cooperation within universities became a requirement by law. The measures made it possible for universities to manage budgets for IAC in a transparent and effective way.

In addition to the enactment of laws, under the overarching goal to activate IAC, the Korean government developed and implemented a variety of IAC programs, including cultivating the manpower necessary in regional industry, as well as a convergence of human resources, strengthening R&D capacity of small and medium-sized businesses, and vitalizing technology transfer for industry and universities. The government's businesses stimulated competition among universities and allowed industry to have more interest in, and attention to, IAC. Korea's institutional approach of the law system maintenance and the government's funding can be a helpful reference to LAC considering a similar approach. Fourth, despite the successful establishment and implementation of IAC policy, IAC in Korea is facing some challenges that should be considered by LAC that aim to design policies to activate IAC. The challenges include the mismatch between the needs of industry and universities, lack of diversity in IAC, and insufficient tangible results in terms of economic effects.

Korea's IAC made it possible for industries and universities to attempt innovation inside and out and get insight and ideas from each other for creative advancement. However, there is still a gap between what universities want and what industries try to do within the framework of IAC, especially between universities' manpower development areas and industrial and regional needs for manpower. Participants and cooperation areas (fields and industries) of IAC in Korea are still limited. Since the selection and concentration strategy was chosen to maximize policy effect in a short period of time, IAC is somewhat concentrated in the engineering sector, which is showed in research funding planning, by field. IAC activities in a wide range of fields and industries are crucial to stimulate creative knowledge and technology. Last but not least, IAC activities led by universities come under criticism that their economic effects are insufficient. The government's funding and the incentives in university assessment brought attention to universities; there were some achievements, but the economic gain is still not enough. Korea's IAC was started from human resources development in industry in the 1960s and 1970s, activated through

cooperation in R&D in the science and technology sectors in the 1980s and 1990s, and advanced in the 2000s. During the process, Korea has achieved excellent results and faced several challenges in IAC at the same time. The trial and error steps in the Korean case are as useful as the success factors for LAC countries to open innovation through IAC.

In sum, the analysis of Korea's experiences and continuous endeavors to help its students lead happy and productive lives, and contribute to building a better nation provide insights and meaningful lessons to LAC. These countries are invited to share their educational experiences with Korea, given their own strengths in education, including the high satisfaction with school that students in the region report. This type of knowledge-sharing between Korea and LAC would improve the education systems of both sides, which ultimately supports them to raise their students to be happier and more capable adults. We hope Korea's experiences and continuous endeavors to help our students lead happy and productive lives, and contribute to building a better nation, are instructive and meaningful to the countries in Latin America and the Caribbean, too.

References

Adams, D., 2010. “A Comparative Perspective on the Development of Korean Education,” in C. J. Lee, S. Kim, and D. Adams, editors. *Sixty Years of Korean Education*. pp.107-148. Seoul, Korea: Korea Institute for Curriculum and Evaluation, Seoul National University Press.

Baek, S. 2014. Direction of Educational Policy Research in the Global Era, Korean Educational Research Association Newsletter, 50(2), 1-9 (in Korean).

Chae, J. 2013. “The Education Development Plan for Algeria: With a Focus on Vocational Education and Training and Higher Education,” in H. T. Chun, and M. Tcha, editors. *Knowledge Sharing Program (KSP) 2012 of Korea: Establishment of Algeria’s National Vision 2030*. pp.168-214. Seoul, Korea: Ministry of Strategy and Finance & Korea Development Institute (in Korean).

Cho, Y. 2010. Social Responsibility of Universities in the 21st Century - Focus on the Discourse upon Social Engagement, *Studies of Education Administration,* 21(1) 1-30 (in Korean).

Choi, K., Lee, K., and Choi, J. 2013. “Establishment of Human Resource Development System According to the Changing Business/Corporate Environment”, Seoul, Korea: Ministry of Employment and Labor (in Korean).

Choi, S. 2010. “The Implications of Economic Development and Human Resource Development Policies in Korea,” KEDI Position Paper (OR 2010-01-8). Seoul, Korea: Korean Educational Development Institute (in Korean).

Choi, S., Kim, K., Chang, S, et al. 2008. “A Study on a Plan for University Specialization to Strengthen Higher Education Competitiveness,” Seoul: Korea; Korea Educational Development Institute (in Korean).

Chung, Y., Bae, S., Kim, W., et al. 2013. “A Study on the Rearing and Activating Plan for Local National University,” Policy Study 20130549821-00, Seoul, Korea: Ministry of Education (in Korean).

E-NARA, www.index.go.kr (accessed in May 10, 2014) , (in Korean).

Education Reform Commission. 1995. “An Education Reform Plan for Establishing a New Education System Leading Globalization and Information Age,” Seoul: Education Reform Commission (in Korean).

Jang, S., Kong, E. and Lee, H. 2004. “The Role of Education in Enhancing National and Industrial Competitiveness,” Research Report RR 2004-7, Seoul, Korea: Korea Educational Development Institute.

Jang, S. and S. Choi. 2010. 4-Year Characteristics and Graduates’ Labor Market Performance, *The Journal of Economics and Finance of Education*, 19(2), pp. 1-31 (in Korean).

Jung, S., Min, C., Hong, J., Park, J., Lee, G., & Hong, S. 2007. “Current Conditions and Future Prospects on Industry-Academy-Research Institute Cooperation in Korea.” Ministry of Education and Human Resources (in Korean).

Kanter, M. 2011. *Meeting President Obama’s 2020 College Completion Goal*. Presentation slides, Washington DC, U.S. Department of Education, July, 2011.

KEDI, KDI, KICE, KRIVET, KERIS, and NILE, 2014. “Korean Educational Innovation Plans for the Cultivating Creative Human Resources,” Korea-World Bank Educational Innovation Symposium: Achieving of HOPE–Happiness of People through Education-Innovation in Korean Education for a Creative Economy, Seoul, Intercontinental COEX, November, 2014.

Kim, C., Kang, Y., Lee, K., et al. 2014. “Statistical Yearbook for Employment of Higher Education Graduates (Linked with Health Insurance Database),” Seoul, Korea; Korean Educational Development Institute (in Korean).

Kim, J., Gu, B., Kim, B., Nam, Y., et al. (1988). “A Study on Historical Development of Korean Higher Education” [in Korean]. Seoul, Korea: Korea Council for University Education.

Kim, K. 2009. “The International Comparison of Korean Student’s Achievement Level through PISA and TIMSS,” In Lee, J. and Kim, S., editors. *60 years of Korean Education: Approaches and Achievements*, Seoul, Korea: Korea Institute for Curriculum and Evaluation (in Korean).

Kim, K., Chang, K., Cho, K., et al. 2010. “Development and Implementation Plan of Key Competencies for Adolescents (Ⅲ),” National Research Council for Economics Humanities and Social Science Collection of Joint Research 10-33-01, Seoul: National Youth Policy Institute, 2010 (in Korean).

Kim, Y. 2014. “Human Capital in the 21st Century,” Korea-World Bank Educational Innovation Symposium: Achieving of HOPE–Happiness of People through Education-Innovation in Korean Education for a Creative Economy, Seoul, Intercontinental COEX, November 2014.

Lim, H. & Kim, E. 2011. Establishment of Public-Private Partnership for Quality

Improvement of Higher Education. UNESCO Bankok-KEDI Seminar.

Lee, C., Jung, S., and Y. Kim 2006. The Development of Education in Korea: Approaches, Achievement and New Challenges, *The Journal of Educational Administration*, 24(4), 1-26 (in Korean).

Lee, C. and Kim, W. 2009. "The Expansion of Educational Opportunities and Growth." in C. J. Lee, editor, Sixty *Years of Korean Education*, pp.37-57. Seoul, Korea; Korea Institute for Curriculum and Evaluation, (in Korean).

Lee, H. et al. 1999. "Supply and Demand Estimation in accordance with the Liberalization of University Student Numbers by Higher Education Sectors," Seoul, Korea: Korea Council for University Education (in Korean).

Lee, S. J. (2008). "National Development Strategy and Educational Policy," Understanding Korean Educational Policy Series. Seoul: KEDI (in Korean).

Lee, S., Chang, S., Chon Y., et al. 2011. "Study on Improving Job Creation Policy and Capacity Development of Student Employment through Cooperation between Industry-University," Policy Study 2011, Seoul, Korea: Ministry of Education, Science, and Technology (in Korean).

Lim, C. 2005. Achievements and Problems of Implementing Higher Education Specialization Policy in Korea, *Educational Administration Research*, *23*(4), 219-241, (in Korean).

Ministry of Education. 2013a. The Educational Capacity Enhancement Project (ECEP) Selection Results confirmed, Press release, July 30, 2013 (in Korean).

Ministry of Education. 2013b. "Directions of Reforming Higher Education Financial Programme for Specialization of Universities," Seoul, Korea: Ministry of Education (in Korean).

Ministry of Education. 2014a. Budget Plan for 2014-15 Ministry of Education, Press release (in Korean).

Ministry of Education. 2014b. Selection Results of 'CK Programme' for Nurturing Local University and Specialization of University, Press release, June 30, 2014 (in Korean).

Ministry of Education. 2014c. 2014 Selection Results of Advancement of College Education (ACE), Press release, June 30, 2014 (in Korean).

Ministry of Education. 2014d. Implementation Plan for Advancement of College Education (ACE), Press release, March, 2014 (in Korean).

Ministry of Education. 2014. Department of Education Released a Leading University Program Implementation Plan, press release, March 19, (in Korean).

Ministry of Education. 2014. Selected Local Universities for Specialization Projects, Press releases, 2014 (in Korean).

Ministry of Education. 2013. BK 21 Plus Project Implementation Announcement, Press release, (in Korean).

Ministry of Education and Human Resources Development (Ministry of Education). 2007. Education White Paper (in Korean).

Ministry of Education and National Research Foundation of Korea. 2013. 1 Plus Global Human resource Project Selection Results confirmed, Press release (in Korean).

Ministry of Science, ICT and Future Planning & Korea Advanced institute of Science and Technology. 2014. Analysis on SCI Journals (in Korean). Seoul, Korea: Ministry of Science.

Mok, K. 2003. Similar Trends, Diverse Agendas: Higher education reforms in East Asia, Globalization, *Societies and Education, 1*(2), 201-221.

Nankung, J., Kim, Y., Park, K., et al. 2014. "An Analysis of School Education and its Actual Condition (Ⅳ): Middle School," Seoul, Korea; Korean Educational Development Institute (in Korean).

National Research Foundation of Korea. 2010. "A White Paper on Industry-Academy Cooperation 2009," Seoul, Korea: National Research Foundation (in Korean).

National Research Foundation of Korea. 2012. "A White Paper on Industry-Academy Cooperation 2010," Seoul, Korea: National Research Foundation (in Korean).

National Research Foundation of Korea. 2014. "A White Paper on Industry-Academy Cooperation 2012," Seoul, Korea: National Research Foundation (in Korean).

Organisation for Economic Co‐operation and Development [OECD]. 2005 "The definition and selection of key competences (Executive summary)," Paris, France: OECD.

OECD. 2013." Education at a Glance 2013: County Note (Brazil)." Paris, France: OECD.

OECD. 2014. "PISA 2012 Results in Focus: What 15-year-olds know and what they can do with what they know." Paris, France: OECD.

Oh, Y., Choi, J., Moon, M. et al. 2012. "A Study on Corporate Diverse Activation Plan for Cooperation with Industry-University Campus." Seoul, Korea. Ministry of Employment and Labor (in Korean).

Park. M. 2013. Examining the New Park Guen-Hye Administration's Policy of Industry-Academy-Cooperation. A paper presented to the Annual Spring Conference of The Korean Association for Policy Studies. 2013.4.19. Seoul, Korea (in Korean).

Park. J., Uhm, C., Lee, L. & Hwang, W. 2000. “Conditions and Prospects on Industry-Academy-Cooperation in Korea.” Daegu, Korea:. University-Industry Research Institute (in Korean).

Park. J., Oh, S., Kim, et al. 2014. “A Study on the improvement of the University Evaluation System for Strengthening Competitiveness of Universities,” Seoul, Korea: 2013 Policy Development Project, Ministry of Education (in Korean).

Seo, Y., Kim, M., Kim, B., et al. 2014. “The Improvement of Evaluation Criteria for Governmental Funding Project in Higher Education,” Seoul, Korea: Korean Educational Development Institute (in Korean).

Uhm, M., Park, K., Lee, J., et al. 2010. “Establishment of Systematic Basis for Advancement of Industry-University/Government Research,” Seoul, Korea: Ministry of Education, Science, and Technology, 2010 (in Korean).

Yoon, J., Choi, J, Lee, S., et al. 2013. “Research on Cooperation and Development of Education between Korea and Developing Countries (I): Latin America and Caribbean,” Seoul, Korea: Korean Educational Development Institute (in Korean).