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

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

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<tbody>
<tr>
<td>Major Economic Development</td>
<td>Liberation, reconstruction, and the establishment of a postwar Korea</td>
<td>Export-oriented industrialization and rapid development</td>
<td>Economic reconstruction and stable growth</td>
</tr>
<tr>
<td>Major Educational Development</td>
<td>Establishment of an education system and the universalization of primary education</td>
<td>Expansion of secondary education and vocational education and training</td>
<td>Quality improvement in secondary education and a rapid expansion of higher education</td>
</tr>
<tr>
<td>Key Education Policies</td>
<td>- Establishing the basis of an education system - Universalization of primary education - Literacy movement</td>
<td>- Expanding secondary education - Developing vocational education and training - Securing education revenue - Creating teacher training programs</td>
<td>- The July 30 Education Reforms - Expanding higher education sector - Quality improvement in primary and secondary education - Enhancing local educational autonomy</td>
</tr>
</tbody>
</table>

**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**

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

*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**

![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**

![Figure 2 Performance and Equity](image)

*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
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 decades, there remain concerns about future generations and educational challenges, so the 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

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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).

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>
<thead>
<tr>
<th></th>
<th>Humanity, Arts, and Education</th>
<th>Health and Welfare</th>
<th>Social Science, Business and Law</th>
<th>Service</th>
<th>Science and Engineering</th>
<th>Agriculture</th>
<th>Uncategorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>25%</td>
<td>14%</td>
<td>20%</td>
<td>7%</td>
<td>25%</td>
<td>7%</td>
<td>1%</td>
</tr>
<tr>
<td>OECD Average</td>
<td>20%</td>
<td>13%</td>
<td>31%</td>
<td>5%</td>
<td>15%</td>
<td>10%</td>
<td>2%</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>MH Roh Administration (2003.2-2008.2)</th>
<th>MB Lee Administration (2008.2-2013.2)</th>
<th>GH Park Administration (2013.2-current)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Specialization of Metropolitan Universities, 2003</td>
<td>- Capacity Enhancement of University Teaching</td>
<td>- University Specialization Project (CK), 2013-</td>
</tr>
<tr>
<td>- Capacity Building for Innovation in Local Universities (NURI), 2004</td>
<td>- Capacity Enhancement for Local Universities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Advancement of College Education (ACE), 2010-</td>
<td></td>
</tr>
</tbody>
</table>
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](image)

**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

<table>
<thead>
<tr>
<th>Period</th>
<th>Characteristics</th>
<th>Contents and Outcomes</th>
</tr>
</thead>
</table>
| 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**

<table>
<thead>
<tr>
<th>Projects</th>
<th>Promoting ICU-centered Universities</th>
<th>Fostering Hub Universities for IAC</th>
<th>Fostering LINC (Leaders in Industry-University Cooperation)</th>
</tr>
</thead>
</table>
| 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  
13 Universities including 5 industrial universities | Universities  
2010: 19 universities | 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

Cooperative Development of Regional Universities and Industries
- Manpower cultivation and technology development and transfer
- Employment and technology innovation
- Regional development

Establishment and Promotion of IUC Leading Model

Goal

Strategy

- Wider Supporting Range of IUC
  - To actively support IUC, e.g., startups
  - To expand IUC outside of engineering field
  - To reinforce support for industries

- Diversification and Characterization of IUC
  - To create various leading models
  - To provide modularized and multifaceted support
  - To specialize regional industry base

- Enhancement of IUC Sustainability
  - To restructure systems to IUC-friendly ones
  - To strengthen the roles of the Board of Industry-Academic Cooperation
  - To manage projects by step

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

<University>

University Program

Specialized Areas (Linked to Regional industries & Existing Industry-tailored Program

Community-Based Program

Technology Transfer & Industrialization

Employment & Employee Education

Consortium for ICU

Prospect of Industrial Manpower Demand and Supply

Enterprise Connection

<Regional industries>

- Leading (strategic) Industries of Economic Region
- Regional Specialized Industry
- Region-based Industry

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

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)

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

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)

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

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

<table>
<thead>
<tr>
<th>Classification</th>
<th>2-year University</th>
<th>4-year University</th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of students taking field training</td>
<td>42,414</td>
<td>47,720</td>
</tr>
<tr>
<td>The number of enterprises participating in field training</td>
<td>25,309</td>
<td>28,151</td>
</tr>
<tr>
<td>The number of universities participating in Capstone Design</td>
<td>97</td>
<td>108</td>
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<tr>
<td>The number of students taking Capstone Design courses</td>
<td>56,676</td>
<td>75,509</td>
</tr>
<tr>
<td>The number of Department of Contracts</td>
<td>708</td>
<td>458</td>
</tr>
<tr>
<td>The number of students in Department of Contracts</td>
<td>11,274</td>
<td>10,531</td>
</tr>
</tbody>
</table>

Source: National Research Foundation of Korea, 2014.

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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.
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