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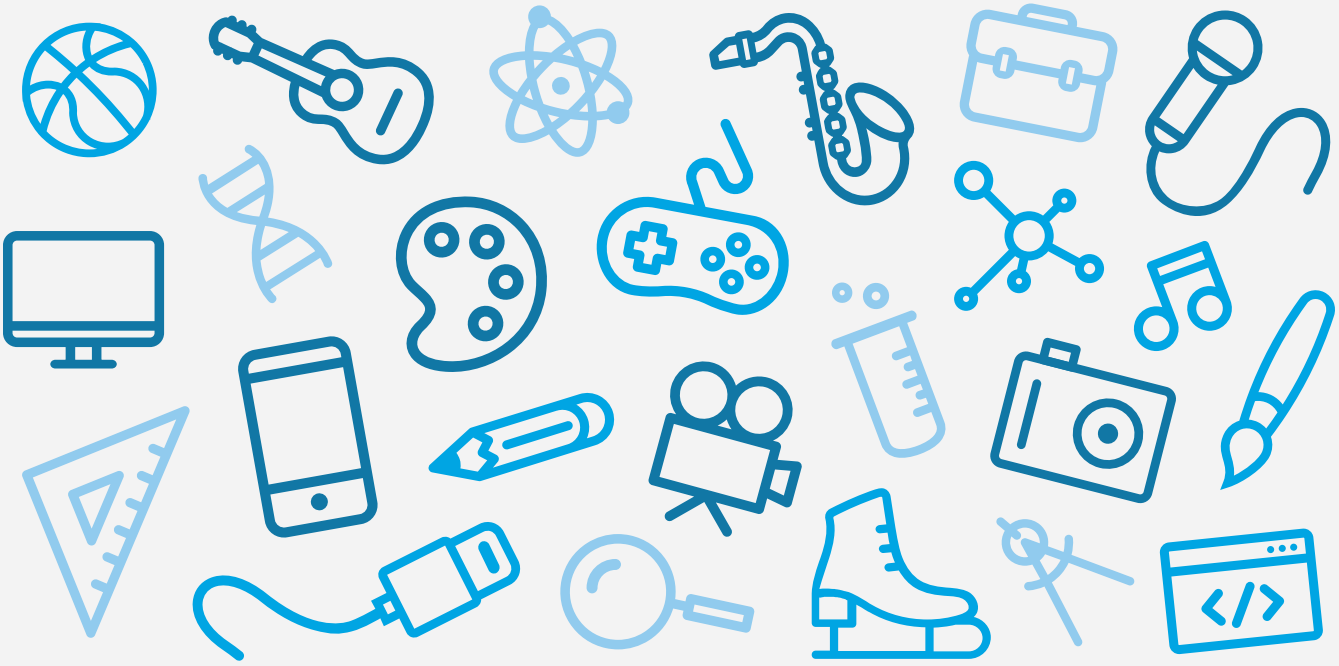

PREPARING STUDENTS FOR SOUTH KOREA'S CREATIVE ECONOMY:

THE SUCCESSES AND CHALLENGES OF EDUCATIONAL REFORM

RUFINA KYUNG EUN PARK

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ABOUT THE ASIA PACIFIC FOUNDATION OF CANADA

The Asia Pacific Foundation of Canada (APF Canada) is a not-for-profit organization focused on Canada's relations with Asia. Its mission is to be Canada's catalyst for engagement with Asia and Asia's bridge to Canada.

A leader in research and analysis on Canada-Asia relations for over 30 years, APF Canada partners with government, business leaders, academics, and opinion makers in Canada and across the Asia Pacific region to offer clear, specific, and actionable policy advice. Established by an Act of Parliament in 1984, APF Canada's thematic priorities include: promoting trade, investment, and innovation; mobilizing energy assets; building skills and competencies; and understanding Asia now.

EXECUTIVE SUMMARY

South Korea is in the process of transforming its education system to better prepare the next generation for an emerging creative economy—one that will depend on individuals who can spot opportunities for cross-sectoral innovation in areas such as biotechnology and design, and create new products that combine elements from disparate fields such as big data, sports, and music.

The two major educational reforms are the Free Semester Program (FSP) and Software Education. The FSP, which is being implemented nationwide this year, is currently being introduced for one semester in middle school Year 1 (Grade 7) in all public middle schools. It consists of more interactive curriculum and increased extracurricular programming that cater to students' interests and passions. Within one semester, the program is supposed to meet three significant goals: develop competencies for the future such as creativity, problem-solving skills, and higher-order reasoning skills; improve student happiness; and increase opportunities for students to discover their dreams and talents.

Software Education is currently in its pilot phase, and its curriculum is focused on developing computational thinking, coding skills, and creative expression through software. There are changes being introduced in all levels of elementary, middle, secondary, and university education. Elementary school teachers are facing the greatest change because they are teaching software education for the first time without extensive training in computer science, unlike teachers and professors in higher levels of education.

Within the first three years of implementing these two educational reforms, there are stories of transformative change from schools that participated in the pilot phase. Students at a FSP pilot school described the program as an "oasis with cool water in the desert" and an "airplane" that helped them to reach their distant future.[1]

Teachers were surprised that student engagement increased even though students did not have high-stakes testing during the FSP. Elementary teachers teaching coding and computations skills as part of Software Education for the first time found a very supportive network of teachers who shared useful resources and curriculum.

However, there are various challenges that impede a complete transformation of the education system. In schools, teachers are having difficulty implementing changes with limited time, constrained budgets, and unequal opportunities to receive further training. Students can be caught in between a desire to explore their passions and parental and societal expectations to focus on a prescribed college-to-career pathway. At times, parents and other societal actors, such as tech companies and private education organizations, can provide support and important partnerships to realize new educational goals—but in the process they can also exacerbate education inequality.

There are two important takeaways about education policy design to be drawn from the case of Korea. First, collaboration between the education system and society at large is often necessary and desirable, but must be pursued with caution. Secondly, related to the last point, there needs to be a greater effort to realize excellence with equity through education policy.

This report provides a comprehensive overview of the background of Korea's two major educational reforms in the context of Korea's creative economy. It also offers a current update on the process of educational innovation based on the author's field study and interviews with teachers, students, policy-makers, and representatives from the private sector that were conducted between March and May of 2016.

INTRODUCTION

South Korea's educational system is undergoing transformational changes to prepare the next generation for a creative economy—an economy that encourages new technological innovations and a convergence of different industries such as science, information technology (IT), and culture. During her National Teacher's Day address on May 15, 2016, President Park Geun Hye remarked, "our country's future depends on developing creative talents … Just as we caught up quickly with developed countries through education in the past, we now need to lead changes in this generation through the power of education."[2]

In the case of Korea, this has taken the form of two new initiatives: the Free Semester Program and Software Education. This is a significant change for an education system that is better known for rote memorization, high-stakes written exams, and lecture-style teaching. Experts suggest that these educational practices allowed Korean students to consistently outperform their peers from many other countries in international standardized testing assessments such as the Programme for International Student Assessment, which is administered by the Organisation for Economic Co-operation and Development (OECD) every three years. However, the enormous pressure to succeed in a very regimented and standardized education system also makes Korean youth some of the unhappiest young people in the world. Korean adolescents ranked last place in 2016, and 19th out of 23 countries in 2015, in the OECD Better Life Index of self-reported measures of happiness. It is hoped that educational reforms will help improve student socio-emotional well-being, allow them to better explore their passions and interests, and prepare them for the creative economy.

What will it take to produce talent for a 21st-century economy? What kind of educational reforms are needed? What role do teachers, students, and parents play in realizing these goals? How can the private sector and NGOs help? These kinds of questions are not unique to Korea, and are in

fact being asked by education policy-makers and governments around the globe. This report sheds light on the successes and challenges, to date, for Korea's two newly introduced education reforms, the Free Semester Program and Software Education. These early lessons may suggest possible implications for other education jurisdictions, including in Canada, that are seeking to incorporate curriculum that meets the demands of a creative and high-tech economy and/or are asking questions about the desirability of excessively standardized education.

Section I begins with an overview of the country's emerging creative economy to provide background on how the education reforms connect to larger economic priorities. Sections II and III discuss each of Korea's two major educational reforms, the Free Semester Program and Software Education. Each of these sections offers background on the particular policy, and stories of success and challenges based on the author's field study and interviews. Section IV closes with a summary and takeaways for formulating education policy. Lastly, the Research Notes section provides background on the author's interviews and field study.

I. AN EMERGING CREATIVE ECONOMY ECOSYSTEM

The plans to develop a creative economy were introduced at the outset of President Park Geun Hye's term in office. In her presidential inauguration address in February 2013, President Park stressed that Korea's economy should be revitalized through economic democratization and the development of a creative economy, which she defines as "the convergence of science and technology with industry, the fusion of culture with industry, and the blossoming of creativity."[3] Using cutting-edge technology to enhance everyday life, developing new technological innovations, and combining ideas from different fields to create new products are some of the hallmarks of a creative economy.

An industry growing in popularity is the Internet of Things (IoT), which is a network of physical objects—such as mobile devices, vehicles, and sportswear—that can collect and exchange data using embedded software and network connectivity. An example of an IoT device is "smart" running shoes that can collect and transmit information about distances travelled and the runner's heart rate to the runner's mobile phone. Another type of innovation encouraged in a creative economy is the development of products through reimagining the use of mundane products—for example, natural cork, which is normally used to bottle wine, being used to create an eco-friendly faux-leather fashion line of items such as bags, hats, and belts.[4]

Since the launch of the policy three years ago, 18 Centres for Creative Economy and Innovation (CCEIs)—one-stop offline hubs for startups that offer working spaces, funding, and seminars—have been established throughout the country. As of April 2016, the CCEIs have supported more than 2,000 companies, creating almost 800 new jobs. A total of KRW754B (approximately US$654M), with KRW335.6B (US$291M) from the CCEIs and KRW418.4B (US$362M) from the outside has been distributed to startups and small and medium-sized enterprises with residency in the CCEIs.[5]

ABOVE
Co-working space in the CCEI based in Pangyo Technovalley, on the outskirts of Seoul.
Photo credit: Rufina Kyung Eun Park

LEFT
3D printing space in the CCEI based in Pangyo Technovalley, on the outskirts of Seoul.
Photo credit: Rufina Kyung Eun Park

Each CCEI has different areas of focus and company partners to maximize the resources, networks, and markets already established in the surrounding region. For example, the Kyunggi Province CCEI is sponsored by KT Corporation (the largest telephone company in the country), and focuses on the IoT, games, and financial technology. The CCEI on Jeju Island focuses on culture, software, IT, and tourism, and co-operates with Kakao (the Internet company that designed Kakotalk, the most widely used instant messaging platform in the country), which has its headquarters on the island. Other companies that partner with the CCEIs to support rising startups include large conglomerates such as Samsung, Hyundai Motor Company, and Naver.

ABOVE
Attocube is an edu-tech startup with residency at the Kyunggi Province CCEI. *Photo credit: Rufina Kyung Eun Park*

Global companies and venture capitalists are also taking notice of the growing markets in Korea. Google—attracted by the country's high-speed Internet connectivity, large engineering talent base, and high mobile usage rates—chose Seoul as the city in which to launch its first Asian campus in May 2015. While the office space is only 2,000 square metres, the company has high expectations for the Seoul campus: its London counterpart generated over US$100M in venture capital and created over 18,000 new jobs within three years.[6] Internationally, Bloomberg has ranked Korea as the world's most innovative economy for three consecutive years since 2014. The country received the highest points based on various criteria, such as its spending on research and development and its concentration of high-tech public companies.[7]

ALPHAGO: AN EXAMPLE OF HOW QUICKLY SOUTH KOREA RESPONDS TO NEW TRENDS

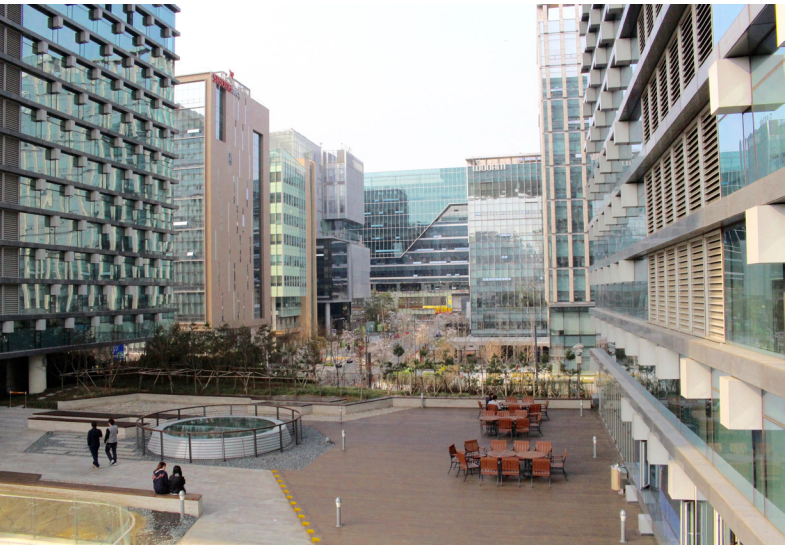
In March 2016, people in Korea were stunned when Lee Sedol, a master of the complex game Go, was defeated in a match against AlphaGo, a computer program designed by Google. (Go is a centuries-old game also known in Korean as *ba-duk*.) News sources marked it as a historical moment that signalled the start of a fourth industrial revolution in which global tech companies will compete for new markets in artificial intelligence (AI), virtual reality, and augmented reality. On TV, various technologists, policymakers, and educators debated at length on the implications of the threat of AI: How could Korea become a leader in the global AI market? What kinds of skills and capabilities do young people need to be successful in a world where they will compete with robots for jobs?

The government and industry were quick to respond to the challenge. Only two days after the AlphaGo match, the Park Geun Hye administration announced plans to spend US$840M by 2020 to boost the national local AI industry.[8] Also, six large conglomerates, including Samsung, SK Telecom, KT Corporation, Naver, and Hyundai Motor Company followed suit by committing over KRW18B (US$15M) to build an AI research institute by the end of 2016.[9] Korea's rapid response after the AlphaGo shock reveals a small window into greater economic reforms underway in the country's emerging creative economy ecosystem.

Korea's creative economy did not just emerge overnight, but has been a long time coming. In fact, the largest venture hub in the country, called Pangyo Technovalley, was launched a decade ago.[10] Dubbed the Silicon Valley of Asia, the area on the outskirts of Seoul houses more than 1,000 companies in fields ranging from information and communications technology (ICT) to computer games and biotechnology. Collectively, the firms in Pangyo Technovalley employ about 70,000 people and generated a profit of US$60B in 2015, which accounted for 20% of the GDP of Pangyo, the largest province of Korea.[11] More recently, on March 22, 2016, the largest startup complex in the country, measuring 5.3 hectares (13 acres), opened in Pangyo Technovalley. The complex includes two eight-storey buildings and one five-storey building that, presumably, can accommodate up to 200 startups. The renowned Israeli venture capital firm Yozma Group also resides in the facilities.[12]

ABOVE
NCSOFT is a multimillion-dollar game development company with subsidiaries in Seattle, Osaka, and other global locations. More than 3,000 employees work at its headquarters in Pangyo Technovalley (pictured here). *Photo credit: NCSOFT*

Korea's new high-tech industries and emerging startup scene are certainly catching global attention. Now, the question is, "What are the other essential ingredients for the creative economy?" Education is certainly an important consideration because the new economy will depend on the work of innovators and creative people. However, it is not clear what kind of curriculum and programming will allow Korea's youth to develop the competencies and skills required in the future. To address the skills and competencies dilemma, the Park Geun Hye administration has introduced two major educational reforms: the Free Semester Program and Software Education. The following sections explore each of these policies in depth, and highlight the author's field study and interviews with teachers, students, ministry officials, and private companies.



ABOVE & LEFT
The Pangyo Technovalley houses the Kyunggi Province CCEI and other companies focusing on industries such as biotechnology, ICT, and gaming. *Photo credit: Rufina Kyung Eun Park*

II. THE FREE SEMESTER PROGRAM

II.I. AN INTRODUCTION TO THE FREE SEMESTER PROGRAM

The Free Semester Program (FSP) was announced for the first time as an election pledge in November 2012 by then presidential candidate Park Geun Hye, and was adopted as a policy soon after she assumed her presidency in February 2013. The program was proposed to help develop "competencies for the future" such as creativity, problem-solving skills, higher-order thinking skills, and social-emotional skills, and to foster a "happy education that will help students grow their dreams and talents."[13] While this was not the first time that educational reforms were introduced to achieve these goals, the FSP represented the first time that an entire semester would be dedicated to the purpose. In 2009, the "Creative Experimental Activity" was introduced in middle and high schools for three to four hours a week to increase fun and engaging alternatives to lecture-based teaching. Sports offerings were increased with the addition of the "Sports Club Activity," and there were other curriculum changes to expand career and planning coursework.[14]

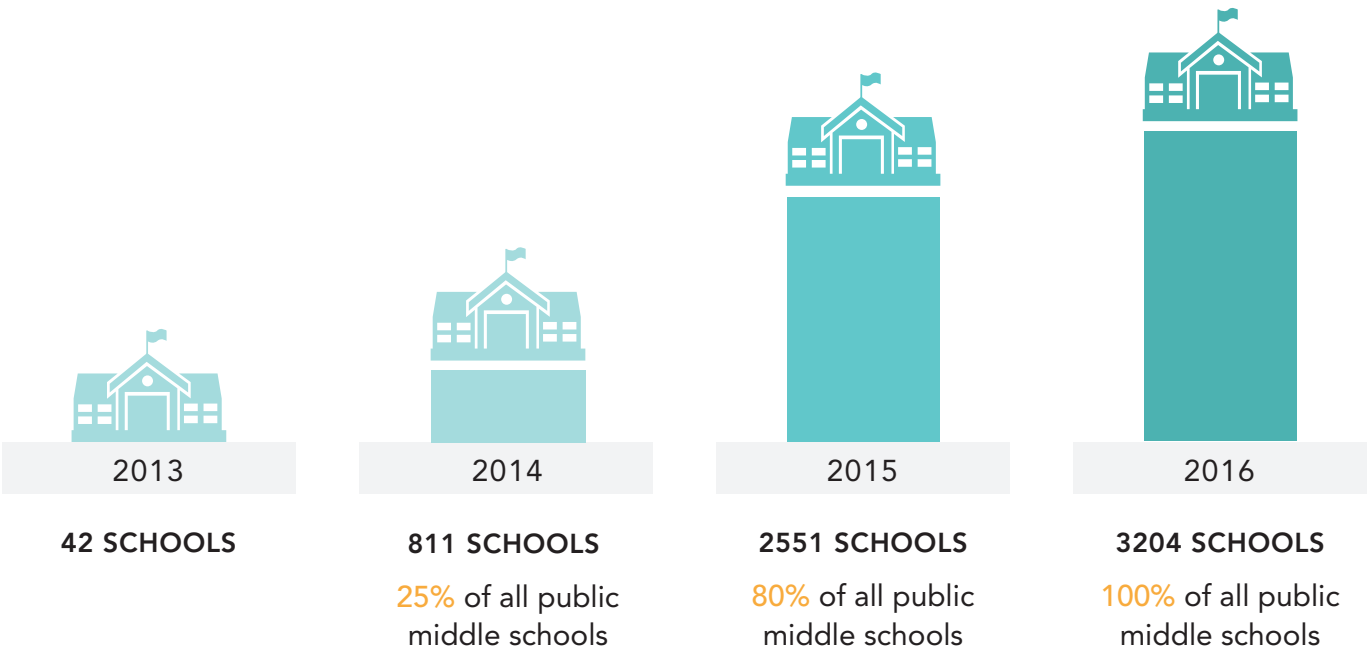
However, previous programs were unable to address two major problems associated with student socio-emotional well-being. The first is that Korean youth are very unhappy. The country's adolescents consistently rank at the bottom of the charts in the self-reported measures of happiness in the OECD Better Life Index. Korea ranked last place in 2016, and 19th out of 23 countries in 2015.[15] Secondly, students beyond elementary school did not have clear ideas about their career pathways. In 2008, the Korea Employment Information Service found that 11.2% of elementary school students, 34.4% of middle school students, and 32.3% of high school students answered "no" when asked whether or not they had future career goals. The top reasons why students had unclear future plans were not having decided what to do (32.5%), not knowing what they were good at (24.5%), and not knowing what they like doing (17.7%).[16]

Thus, the FSP was announced in hopes that a semester-long initiative could help address these two problems and allow students to develop future competencies. Each year since 2013, schools have been encouraged to apply to be part of the pilot phase as an "FSP Leading School" or "FSP Research School"; selected schools received funding to try the FSP and share success stories with other schools around the country. In 2016, all 3,204 public middle schools will offer the FSP. A small number of schools are offering the program in the spring semester and 98% of schools are planning to operate the FSP in the fall. The nationwide FSP is being introduced for middle school Year 1 (Grade 7), but some schools are also part of the FSP pilot phase for Grades 8 and 9. In the coming years, the Ministry of Education plans to expand similar programs in lower and senior grades, and revise the high school curriculum to better align with students' career interests.[17]

The curriculum of the FSP has two main components. The first is a shift to more student-centred teaching and assessment methods to develop competencies for the future. Some examples of more student-centred teaching methods include project-based learning, debate, and the flipped-classroom teaching methodology where students read materials ahead of class and come ready to engage in discussions and interactive activities. A major change for assessment methods is that, during the FSP, midterms and final written exams are replaced by more diverse types of assessments such as presentations, portfolios, and essays. To further reduce test-related

FIGURE 1

The Grade 7 FSP began with 42 designated FSP Research Schools. More schools pilot tested the program until 2016, when all public middle schools began offering it.[18]



pressures, marks received during the FSP semester are not used to calculate grade point averages reported for high school admissions.

The second component of the FSP is the expansion of classes and field trips that help students explore their passions and career interests. This is facilitated through student club activities, arts and sports activities, and career exploration classes and field trips in the afternoon. Although similar afternoon programs have been offered in the past, these non-academic activities have been allotted increased time and have become more diversified through the FSP. Also, there is a greater push to expand field trips to increase worksite visits to companies and organizations for career exploration.

The diagrams below illustrate how the FSP may be run differently from school to school. For example, Figures 1 and 2 show that each school can choose to emphasize different components of the FSP and may also dedicate slightly different numbers of hours to the main curriculum and the FSP. Table 1 provides further details about each component of the FSP. However, this will again differ according to the particular interests of students and teachers, budgetary constraints, and school location.

FIGURE 2
A school timetable for a school that focuses on "career exploration" during the FSP[19]

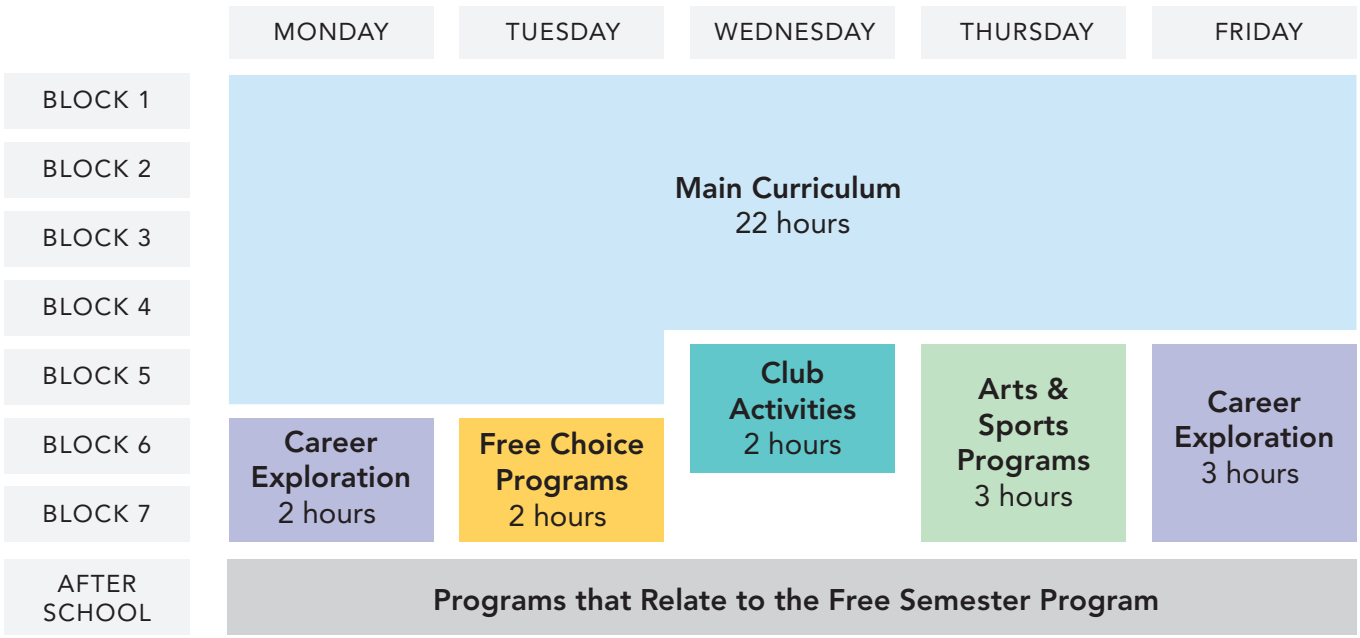


FIGURE 3
A school timetable for a school that focuses on the "free choice program" during the FSP[20]

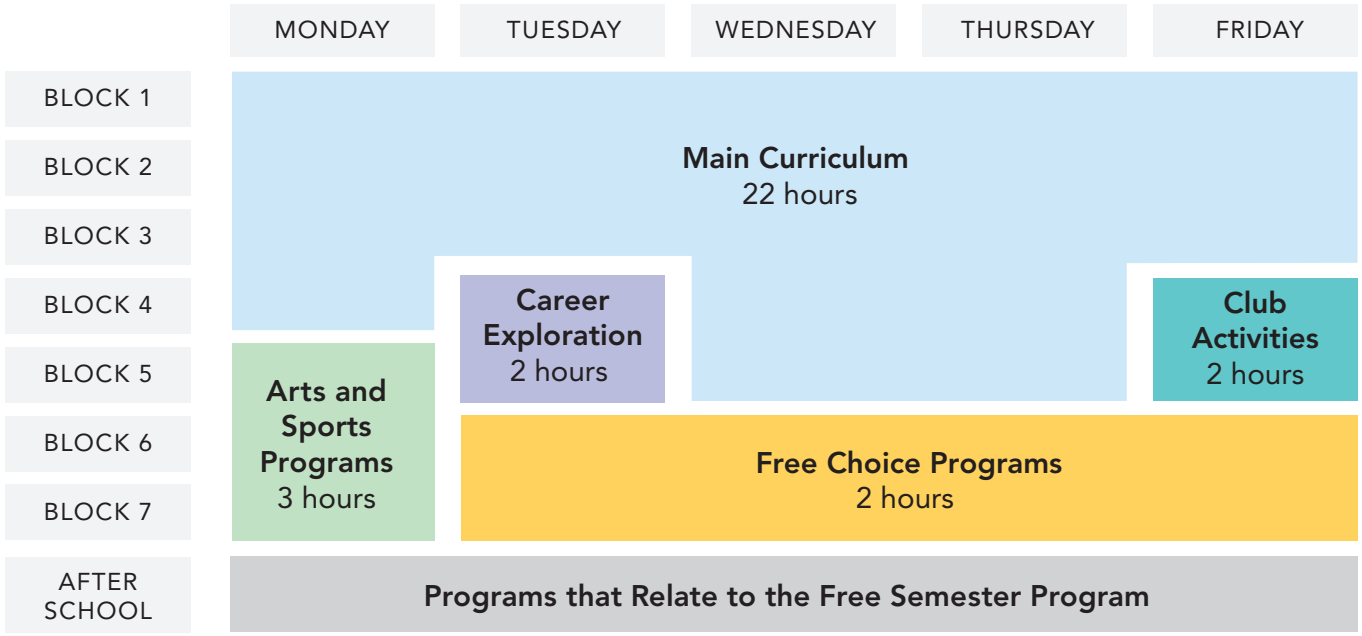


TABLE 1
Components of the FSP.[21]

CATEGORY	EXAMPLE OF POSSIBLE PROGRAMS
Career Exploration	Courses and Curriculum designed to promote self-understanding, understanding jobs and careers, Field Trips to job sites and career exploration facilities
Free Choice Programs	Special course offerings normally not offered in the main curriculum: Guitar, Mandarin, Japanese, Calligraphy, Magic, World Tour, Living Green, School Magazine, Creative Writing
Club Activities	Photo Journalist Club, Arts & Crafts Club, and other types of student clubs
Arts and Sports Programs	Gayageum (Korean traditional instrument), Swimming, Musical, Artistic Expression, Hip hop, Skating

The government supports schools to run the FSP in a number of ways. For example, teachers can acquire new knowledge and skills to teach in a more student-centred way through offline and online teacher professional development (PD) opportunities. The national Ministry of Education and the Regional Offices of Education also offer consulting on how to create and teach new curriculum and revise student assessment to reflect creativity, problem-solving skills, and higher-order thinking as opposed to rote memorization. Also, various websites have been created to facilitate more field trips. For example, on the Dream Pathway (Ggoomgil) website, governmental organizations, local businesses, and NGOs can register their organizations as career exploration sites. This serves as a resource for schools looking for places to send students for field trips, special lectures, and experiential learning. There are also official and teacher-initiated teacher research societies where teachers, policy-makers, and experts come together to discuss best practices and create teaching resources for teachers.[22] In 2015, government sponsored a total of 145 teacher research societies to run their activities.[23]

ABOVE
The Dream Pathway (Ggoomgil) website profiles different occupations, including airline pilot, chef, and construction worker.[24]

ABOVE
Over 100 teachers gathered for a seminar on Maker Education. Kakao was one of the sponsors of the event.
Photo credit: Rufina Kyung Eun Park

HOW DOES THE PRIVATE SECTOR SUPPORT SCHOOLS TO FACILITATE THE FSP?

An example of a company that helps facilitate the FSP is Kakao, the company that designed KakaoTalk, the most widely used instant messaging platform in Korea. Last year, the company, which has its headquarters on Jeju Island, offered career exploration programs related to computer programming and design to over 1,000 students in 14 schools on the island. There are plans to expand the exploration programs to other regions in Korea this year. The company also provides financial support for teacher professional development seminars, and it donates resources such as 3D printers for teachers interested in Maker Education, a curriculum that is gaining interest among teachers around the globe and promotes hands-on design and maker projects that emphasize technology and creativity.

The initial reception and results of the FSP have been very positive. In a 2014 report describing how education can foster a creative and innovative economy, the World Bank touted the FSP as a possible way for Korea to "shift to a more balanced, more creative educational experience, with less reliance on the private tutoring sector".[25] Also, recent survey data suggests that the FSP is delivering on its promised goals to create a happier education system. The Korean Educational Development Institute's 2015 survey of students who participated in the FSP found that 81.1% of students felt their capacity for self-expression increased, 74.6% said their relationship with teachers improved, 63.5% said their enjoyment of learning improved, and 50.4% said their stress related to studying decreased.[26]

The program is certainly making some positive inroads in overhauling Korea's education system, which has traditionally been more focused on lecture-based classes, rote memorization, and

high-stakes testing. However, a complete transformation toward more creative and happy classrooms will only be possible through a concerted effort—among policy-makers, teachers, parents, and Korean society at large—to provide excellent education for all children.

II.II. INDIVIDUAL TEACHERS SHOW WHAT'S POSSIBLE

Many students and teachers interviewed spoke of the potential of the FSP to deliver on its promises to allow students to become happier, develop clearer ideas about their future goals, and practise competencies in problem-solving, design, and teamwork. Students who participated in the FSP at Songrye Middle School (which was selected as an FSP Research School in 2014 and was recognized as a Free Semester Program School of Excellence in 2015) wrote mainly positive comments in a reflection activity conducted at the conclusion of the FSP last year. One student said that the FSP was "like an oasis with cool water in the desert." Similarly, another student commented that the FSP was "like an airplane because through it I was able to get closer to my future pathway, which I knew existed, but was unreachable, like a cloud far away."[27] Many teachers also highlighted the positive changes in their classrooms. During guitar class, teachers saw for the first time students self-organizing in circle formation. In social studies class, students conducted a mock class-president election and discussed how a candidate's image and charisma can mask the details of the platform policy. Within 16 weeks, students learned how to do computer-aided design and used 3D printers to make racing cars.

"I was surprised that students studied more when I changed my teaching style to a more student-centred one," remarked Sanghee Choi, a social studies teacher at Jamsil Middle School.[28] Her

ABOVE
Student projects from the arts expression class at Songrye Middle School. *Photo credit: Songrye Middle School*

school was selected as an FSP Leading School in 2013, and she taught Grade 7 for two years in a row when the programs were just underway. She is teaching Grade 9 this year and she observed that students who participated in the FSP seemed to rely less on parents' advice and had clearer ideas about future plans than students she taught in the past. "Previously, when I asked students at the start of the school year in March how many of them were going to be applying to foreign-language high schools or specialized high schools, about 20 out of 30 students would put up their hands. However, this year, just a couple of students who seemed earnestly interested said they were. So I thought to myself, 'Students in previous years must have been heavily influenced by their parents.' It seemed like, in previous years, students just went to after-school hagwons [cram schools/academic prep centres] or made decisions because their moms told them to."[29]

The changes Sanghee noticed among her students may signal that students are thinking about alternatives to the traditional college-to-career pathway, because foreign-language and specialized high schools are seen as a fast track to admission to top colleges. There is a perception that students in these specialty schools tend to graduate with higher grades and/or more impressive extracurricular experiences compared with students from normal public schools. This is due to a combination of in-school and out-of-school factors. Specialty schools usually have more intensive language immersion classes or a greater variety of courses and clubs in specialized knowledge areas such as science or international trade. Also, these schools tend to be attended by high-achieving students from higher socioeconomic backgrounds who have better access to financial resources and networks that can support their own learning and, when these resources are shared and exchanged, can help improve the educational experience for other classmates.[30]

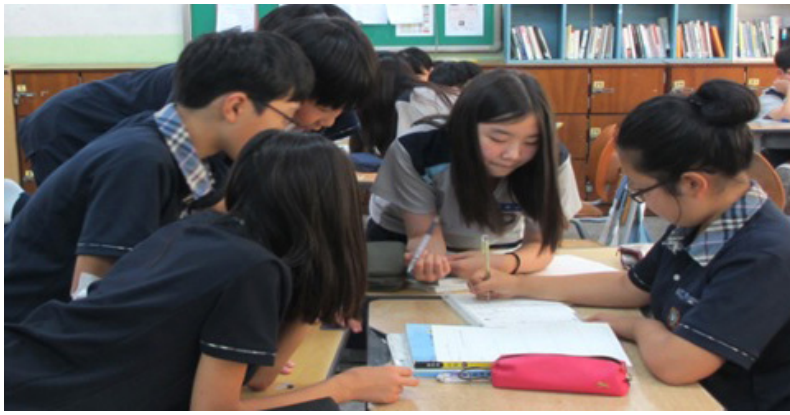
Sanghee and many other teachers at her school were initially skeptical, but the FSP turned out to be a free semester for teachers that gave them the courage to try out new ways of teaching social studies. In the first year of the FSP, most of the teachers at Jamsil Middle School did not want to take on the responsibilities of the Grade 7 FSP—it would require extra time spent on PD and planning, plus teachers were unconvinced of the benefits. Would students focus in class? Would they study if they no longer felt pressure to perform on high-stakes exams? Sanghee did not believe that the flipped-classroom pedagogical model would work in her class.

However, over time, Sanghee noticed that her students improved their teamwork skills and were more enthusiastic in her classes. Her eyes lit up when she shared about an activity she tried during the FSP: Sanghee's class held a mock class-president election in which students created political parties and candidates and then voted two separate times. The first time, students cast their votes based on the candidates' policy platforms alone. The next time, students voted based on the candidates' speech and looks. The results were significantly different each time and, through the activity, the students learned that if they were not careful, voters could be blinded by political candidates' appearances and speeches instead of thinking critically about their policy platforms.[31] Even though Sanghee is not teaching Grade 7 this year, many of her former students are asking teachers to use more student-centred teaching practices and this is giving her the confidence to continue to try the flipped-classroom model in some of her classes. Sanghee is well-supported by a growing group of self-organized social studies teachers who have similar interests in the flipped-classroom methodology, and they often gather together to share information and take PD courses together.[32]

Kyungchul Choi, a science teacher at Yebong Middle School, is another teacher who expressed excitement about the potential of the FSP. Kyungchul was a strong proponent of creative education well before the FSP. He first offered a Maker Education class (a program that centres on giving students the opportunity to design and make things, with a particular emphasis on science, technology, engineering, arts, and mathematics) in 2009 when an educational reform mandated that three to four hours a week in middle and high schools be dedicated to the Creative Experimental Activity to help create "an enjoyable school where students can study what they want."[33]

His school was selected as an FSP Leading School in 2015, which has allowed Kyungchul to continue to offer classes that allow students to learn computer design and make things using 3D printers. In one of his classes, students designed their own cars using advanced 3D designing software, tested how the design affects the velocity of the car, and printed them with 3D printers. The students then raced their cars against each other to test their product design.[34]

Even though I only visited a handful of schools that offered the FSP, it was clear that Sanghee and Kyunggchul were exceptional teachers surrounded by like-minded individuals in and outside of their schools. Sanghee was part of the FSP Task Force Team at her school and oversaw the planning efforts for the FSP. She is co-authoring an upcoming book about student-centred social studies teaching methods. Kyungchul is on sabbatical from Yebong Middle School and currently serves as a field advisor for the Education Policy Network, which facilitates co-operation and research among the Ministry of Education, provincial and city-level education ministries, and related educational organizations. He is also an active seminar speaker, trains teachers in



TOP
Students edit videos of class president candidates in Sanghee Choi's social studies class during FSP 2015.
Photo credit: Sanghee Choi

BOTTOM
Students formulate platform policies to prepare for the mock class-president election in Sanghee Choi's social studies class during FSP 2015.
Photo credit: Sanghee Choi

LEFT & ABOVE
Students in Kyungchul Choi's class get ready to race the cars they designed and built using 3D printers.
Photo credit: Kyungchul Choi

Maker Education, and organizes Maker Education events for students and families.

Their impressive backgrounds suggest that, while teachers and Leading Schools show the potential of the FSP, they should not be generalized to represent how the program is going in all 3,204 middle schools in Korea. Other schools may face more difficulty in implementing the FSP because their teachers may have less interest, awareness, and enthusiasm for changes toward more student-centred learning and creative exploration. Other teachers may not have as vibrant of a community or network to support them. Also, the Leading Schools were not perfect models, despite the positive stories highlighted in this section.

II.III. CHALLENGES FACED BY FSP LEADING SCHOOLS

Even though these FSP Leading and Research Schools had remarkable stories of positive change, they were also facing significant challenges in fully realizing the goals of the FSP. One problem was that there was often a mismatch between student interests and teacher expertise. For instance, students might want to create an extra soccer class, but the only teacher available to oversee the program may be a writing teacher who would prefer to teach a class that better matched her area of expertise.[35] A physical education teacher at Songrye Middle School explained that she offered swimming classes and horseback riding lessons in the last two years that her school offered the FSP. However, because she did not have enough experience to coach these athletic programs and the school did not have the facilities for these activities, she had to hire outside staff and organizations that could offer these programs.[36]

This year, all schools are supposed to be allotted approximately US$17,000 (KRW20M) to cover costs associated with the FSP such as field trips for career exploration, class materials, or hiring

specialty teachers.[37] Any additional costs would have to be borne by families, but this type of situation would be unlikely and problematic in a public school. Teachers pointed to financial constraints as a major obstacle to meeting student interests.[38] Even if there was an increase in funding, teachers explained that it is very competitive to secure a spot at local athletic facilities because many other middle schools want to use the facilities at the same time.[39]

While there are efforts to create teaching resources to reduce teacher dependency on hiring co-teachers and paying to use facilities outside of their schools, there was not enough time for teachers to practise using new teaching guidelines. Some teachers see the FSP as a short break from regular school that does not have long-term implications. Once the FSP is over, teachers revert back to teaching through rote memorization because student assessments count toward the final middle school report card, which many students use to gain admission to specialty or private high schools.[40] The process of change is also slowed by the fact that teachers do not always teach the same grade every year.

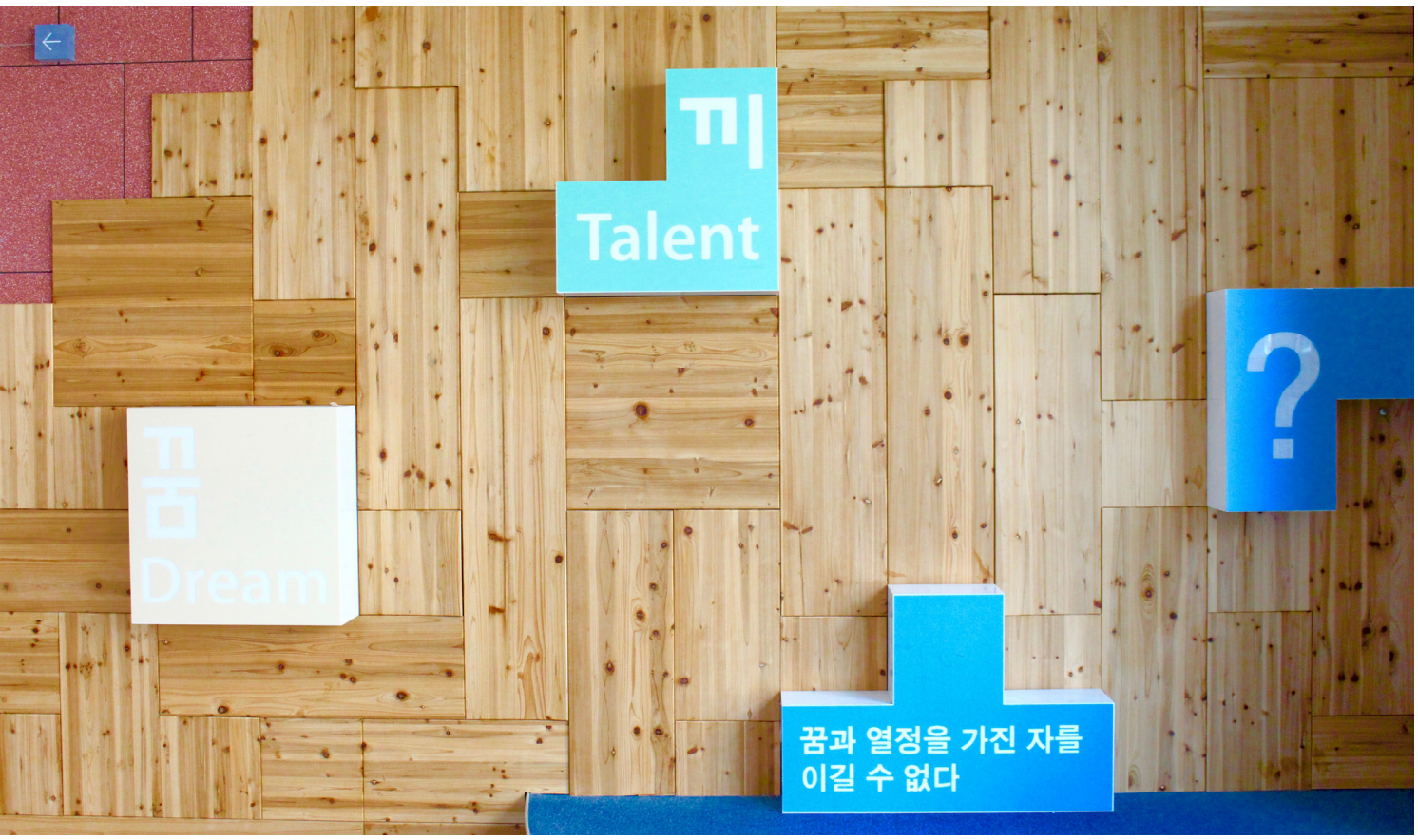
Another problem was that the program was nationalized too quickly. Yebong Middle School teacher Kyungchul Choi explained that the FSP is going nationwide in Korea only three years after it was first launched. On the other hand, it took Ireland some 30 years to implement a similar program. Three years have not been enough time to convince skeptical parents of the benefits of the FSP. Many of them believe that it is disruptive and distracting in that it pulls their children's attention away from the core academic subjects such as mathematics, English, and language arts, which are vital for college applications. Without parents completely on board with the vision of the FSP, teachers are under enormous pressure to perform and prove the benefits of the FSP within one semester. It is unreasonable to expect that teachers alone can create a "happy education that will help students grow their dreams and talents" and much less inculcate "competencies for the future" in students in such a short time.[41] Students are also unable to fully explore their interests and passions freely because of parental expectations to stick to academic studies.

II.IV. CAN WE BLAME TIGER-MOM PARENTING FOR IMPAIRING FSP LEARNING GOALS?

Interviews with a group of 11 Grade 8 students at Songrye Middle School who had participated in the FSP in the previous school year, showed that parental expectations may be impairing FSP learning goals. A couple of students explained that, even though they had an interest in the arts or sports, they usually quit because they did not think they were talented enough. Student Lim Ji Hye explained, "I really like the fine arts, but I am not that good at it even though I try really hard. My mom told me that if I don't have a talent in that area, it's better for me to focus on my studies so I stopped going to a fine arts hagwon [after-school program]."[42] It seemed as if parents were prematurely judging the merit of all school or after-school education based on whether or not it could improve their children's standing against the crowd.

Even though the afternoon blocks during the school day in the FSP semester are reserved to allow students to explore their interests, their minds were still restricted by prescribed academic pathways. Student Kim Sun Ae said, "In order to write a high school entrance essay, you need a narrative based on what your dream is. [Writing the essay] becomes easier if you can quickly decide on what your dream is, so I feel pressure to identify my dream soon … and that's why we need a lot of FSP."[43]

The students aged 13 to 15 seemed too young to be making calculated decisions. However, the pressure to achieve high grades and develop a compelling personal narrative for successful educational outcomes seemed to limit students' level of openness to fully benefit from the new opportunities in the FSP. Students around the room nodded in agreement that, to realize their academic goals, perhaps it would have been better to take one or two more written exams during that semester. Students explained that even though the semester, free of high-stakes written exams based on rote memorization, was a welcome break from the regularities of school life, they were concerned that they may have fallen behind other schools that were not part of the FSP pilot phase. Also, even if all public middle schools were implementing the program in 2016, students re-emphasized that it would be beneficial to practise test-taking skills even in the FSP in order to prepare for the midterms and final exams they will face in Grade 8 and upper grades.[44]



ABOVE
The lobby of Songrye Middle School in Seoul: The phrase on the bottom right reads, "One cannot win someone who has a dream and passion."
Photo credit: Rufina Kyung Eun Park

Teachers from various schools were not surprised about these students' comments, and instead agreed that parents are often the main factor that causes student anxieties about not following the prescribed academic pathway.[45] Sanghee Lim, an English teacher at Songrye Middle School, explained that even though the students want to go to arts and sports after-school programs, parents want them to focus on classes that will strengthen their performance in English and mathematics, which are two of the main subjects for college entrance exams. There is a wide spectrum of parenting types: on one end are "tiger moms" who are very strict about high performance in the core curriculum that will determine college outcomes; on the other end are relaxed parents who take their kids to alternative schools in rural towns to grow up near nature, removed from the competitive atmosphere in Seoul. Most parents are somewhere in the middle, still convinced that a degree at one of the nation's top colleges is important to ensuring a successful future, but wondering if there's a way to achieve that while maintaining a happy childhood.[46]

Teachers had different ideas about what it would take to change the mindsets of parents. Sanghee Choi of Jamsil Middle School said that parents need to become more open-minded because middle school records are not taken into account for college entrance, and the grades are only relevant for very high-achieving students who want to gain admission to private or public specialized high schools.[47] Kyungchul Choi of Yebong Middle School suggested that Korea needs to change its college admissions criteria so as to foster a more creative education system.[48]

While it is easy to blame parents set in old ways for blocking their children from realizing their full potential, there are two main reasons why many parents continue to vouch for the status quo. First, the majority of parents are convinced that rote memorization and standardized education are the best ways to prepare for college. Up until the late 2000s, the majority of students were admitted to college during the regular decision process, which was heavily or sometimes entirely based on the college entrance exam called "seu-neung" or the College Scholastic Ability Test (CSAT, the equivalent of the SAT or ACT in the United States). To perform well on this standardized test, it was important to develop knowledge through rote memorization and to practise taking tests. However, colleges have been increasing the percentage of students admitted through rolling admissions. Students admitted through this process often do not have to take the CSAT and are instead evaluated on their high school grades, participation in student clubs, volunteering activities, and in-school awards. In 2009, 56.7% of colleges admitted students based on rolling admissions and 43.3% on regular admission. In 2016, the number of students admitted through rolling admissions increased to 66.7% and, by 2018, it is expected that rolling admissions will account for 73.7% of college admissions.[49]

However, the decreasing importance of the CSAT and the increasing weight of extracurricular activities is not helping to ease Korea's "education fever." It's rather the reverse. High-achieving parents tend to want their children to study even harder during elementary and middle school so that they can get into a specialty high school.[50] As mentioned earlier in this report, these schools tend to have more coursework and clubs that can develop students' proficiency in foreign languages and technical skills, which may in turn give these students an advantage in rolling admissions. Even if students do not go to specialty high schools, students and parents know that school marks are still very important. These marks are, for the most part, determined by schools' internal midterm and final exams, which tend to test knowledge gained through rote memorization.

Thus, it makes little sense to focus on developing "competencies for the future" such as creativity or higher-order reasoning skills because these are not tested and therefore do not help students in their college applications. The increased importance of extracurricular activities is reducing the time that can be spent on studying, thereby adding to student stress and fuelling another area of competition. Thus, the FSP is becoming another battlefield where students, instead of leisurely exploring their various interests, are feeling rushed to identify club activities and volunteering opportunities that align with career goals so as to develop a strong and compelling personal narrative that sets them apart from other students.

The second reason many parents are hesitant to embrace the FSP is that the majority of employers at Korea's top companies and organizations still place a high premium on a degree from high-ranking universities. In Korea, the SKY universities—Seoul National University, Korea University, and Yonsei University—are equivalent to the Ivy League universities in the United States. Obtaining credentials from one of these prestigious universities is often a golden ticket to the highest-paying and most stable jobs and also the most powerful social networks.[51] There have been some changes in the job market, which has improved the job prospects for graduates from high schools or technical schools, but a four-year degree from a top liberal arts institution is still seen as more advantageous. In the last couple years, there have been reports that there have been more efforts on the part of major companies to hire high school graduates from technical schools and to depend less on university degrees to filter job candidates. However, in May 2016, it was reported that the Samsung Group will "drastically reduce" the number of entry-level employees it hires from technical universities and high schools. In 2015, the company had hired 14,000 entry-level employees from this pool for eight of its subsidiaries. However, in 2016, the company is "slimming down" its operations and hiring for six of its subsidiaries.[52]

In fact, the job market is not looking promising for new graduates from any type of high school or college. According to a study completed by newspaper Money Today, Korea's top 10 companies, including the Samsung Group, Hyundai Motor Group, and SK Group, are reducing the numbers of new employees being hired (regardless of whether or not they have a four-year college degree). In 2016, it is estimated that, collectively, these 10 companies will hire 78,400 entry-level employees, which is 3.8% less than the figures for 2015 (81,500 hires).[53] In these uncertain and volatile times, parents are advising their children with the belief that it is better to stick to established customs and pursue a four-year college degree to improve one's chances of entering into the highest-paying and most respected jobs.

As demonstrated here, parents' skepticism of the value of the changes brought on by the FSP is not without cause. Numerous changes within and outside of the education system are happening all at once, thus making it difficult to know what it takes to adapt, survive, and succeed. In the face of incomplete information, many parents are resorting to what is more familiar, which is making sure that their children are focused on the core academic subjects and performing well on high-stakes exams that test rote memorization, and making sure that students' extracurricular activities do not distract them from the main mission of academic excellence. From their perspective, parents are not trying to hurt their children by advising them to focus on academic subjects. Rather, these parents see it as a protection mechanism. They are not sure, but are hoping that if

their children suffer a short while during middle and high school, it will lead to a lifetime of financial stability and happiness.

II.V. GROWING SUPPORT FOR THE FSP VISION FROM PARENTS AND NGOS

Of course, not all parents are the same, and there are some parents who are taking a leap of faith in these volatile times with the belief that their children's happiness and well-being today matters more than societal definitions of success. Indeed, there are parents who are very supportive of the changes for a more creative and fun education experience for their children. The Player's Forum is an example of how some parents are already leading change outside of the education system. The Player's Forum is a series of seminars started by a website called Wisdome, which allows people to find and create events, and C.Program, a venture charity fund. It brings together parents, educators, and individuals from the non-profit sector who believe that adults should come together to brainstorm on how to allow children to play more to help them be healthier, happier, and more creative.

I attended the group's 16th forum in Seoul, which had four sessions: "Let's Play With Dad," "Let's Play at School," "Play for Everyone," and "The Neighbourhood Is a Playground." The speakers were as diverse as the audience itself, and the event began with a game that helped to create a playful atmosphere. I was most impressed by the first session because this was the first time I had attended an event where dads were talking about the importance of play in Korea.

The three dads who spoke for the first session shared their ideas about why play is important and gave specific examples of games, with pictures illustrating the games they like to play at home. Dr. Jungwon Lee showed an example of a riddle game he plays with his kids and suggested that, for dads to regularly play with their kids, they need to find a game that they will enjoy as much as the kids. Another dad who spoke, Youngmin Kwon, explained that he thinks play is important because it's an imaginary and safe place where kids can experience losing and learn that it's okay to lose. These dads' visions for play and childrearing have particularly significant implications for a country that is trying to help kids become happier, more creative, and more innovative.

In many ways, the opinions of these dads will carry significant weight in Korea and outside of the country because they are vouching for a different type of education system for their children, even though the dads personally have become very successful by navigating an older education system. For instance, Dr. Lee is the senior researcher for the Korea Electronics and Telecommunications Research Institute, which has topped rankings in the U.S. evaluation of patents, beating organizations such as the Massachusetts Institute of Technology (MIT), Stanford University, and the California Institute of Technology. Meanwhile, Kwon is the author of The Philosopher Dad's Humanitarian Way of Raising Kids and a graduate of Seoul National University's Western Philosophy program.

This snapshot of the Player's Forum shows that there are parents who are proponents of educational reforms and who want to help their children be more open and receptive to the new educational opportunities in their schools. However, in order for such parental organizations to benefit students and parents from all socioeconomic backgrounds, it is important to be more intentional about reaching out to parents from less privileged backgrounds.

Leading FSP teachers and schools show that the program does indeed have the potential to help students become happier, explore their dreams and talents, develop skills in creativity, improve their ability to work in teams, and express themselves. However, it is unreasonable to expect that the Grade 7 FSP semester alone can realize these multifaceted goals. Schools alone cannot change entrenched ways of thinking about academic and career success. Such changes will only be possible through time and concerted effort among Korea's societal actors. Teachers and parents who are proponents of an education system that fosters happiness and creativity will ultimately be key actors of change.

However, the successful nationwide implementation of the FSP faces significant resistance from parents who are concerned that it can encourage students to diverge from the regular college-to-work pathway. The complexities of the problems highlight the importance of co-ordinated efforts by various societal actors within and outside the education system to make sure that all children can be happier, develop creative skills, and have more time and freedom to explore their diverse interests and passions in middle school. Notably, Korea's second major educational reform, Software Education, does not pose a significant threat to these established customs, compared with the FSP, and thus seems to be facing fewer challenges from parents.

LEFT
Participants laugh as they listen to a speaker talk about how to play with kids in the "Let's Play With Dad" session at the 16th Player's Forum hosted by Wisdome and C.Program. *Photo credit: Player's Forum by Wisdome & C.Program*

III. SOFTWARE EDUCATION

III.I. AN INTRODUCTION TO THE SOFTWARE EDUCATION REFORMS

Software Education, which is defined as "the education of the ways of thinking that enable students to express creative ideas through software,"[54] was introduced as part of the government's announcement on the strategy to realize a software-centred society in July 2014. At that time, Vice Minister of Education Na Seung Il explained that "providing opportunities for structured software education from an early age at school, and identifying and educating individuals who have a talent in technology, is important to create an education system that produces individuals with creative-thinking capabilities and problem-solving skills, which are required in the creative economy generation."[55]

Since fall of 2014, select schools have pilot tested Software Education as Software Leading Schools or Software Research Schools. Selected elementary schools have to teach at least 17 hours, and middle schools at least 34 hours of software-related curriculum per year. High schools have to teach software-related topics education through the existing 'Information' elective course. They are also encouraged to offer opportunities to engage in software education through student groups, the Free Semester Program, and volunteering opportunities. Each selected school receives on average KRW10M (US$8,500).[56] In 2016, 682 additional schools were selected as a Leading or Research School, bringing the total to 900 schools—479 elementary schools, 321 middle schools, and 100 high schools—participating this year.[57]

In a 2015 press release, the Ministry of Education and the Ministry of Science, ICT and Future Planning revealed an extensive plan to introduce Software Education at all levels of education, from elementary to high school and even at the college level. Elementary and middle schools will face the most dramatic change because this Software Education will be mandatory at these levels beginning in 2018. Training

at the elementary level is especially critical to the success of this policy since elementary school teachers teach all subjects and there are no separate IT/computer teachers. By 2018, 60,000 elementary school teachers (30%) will receive specialized software education training and, within that group, 6,000 will receive in-depth training. In addition, 1,800 middle school teachers who are certified to teach IT/computers will receive additional training on software education.

The Software Education curriculum will be "easy and fun"[58] in the lower grades, with the use of unplugged education (e.g., board games) and visual programming languages to spark students' interest in coding and software. The curriculum will be progressively more technical and involve physical computing, algorithms, and computer programming as students become older. At the college and university level, there are plans to increase basic software education for students not majoring in computer science, and to provide more opportunities for students to double-major in computer science and a non-technical domain, such as a subject in the humanities.[59]

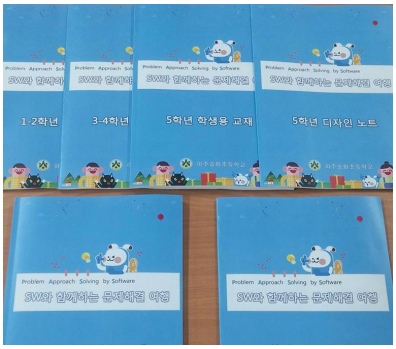
TABLE 2
Details of the Software Education curriculum changes released in 2015[60]

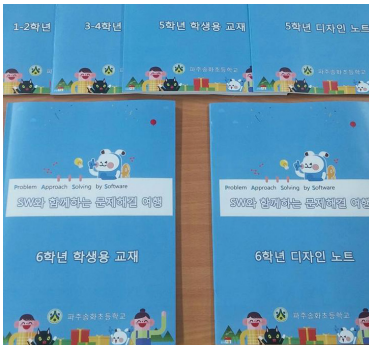
SCHOOL LEVEL	CURRENT CURRICULUM		CHANGES TO THE CURRICULUM	NEW COURSE CONTENT
Elementary School	**Practical ICT Course** (12 hours)	→	From 2019: **Practical Basic SW Education** (17+ hours)	Problem solving, Algorithm, Programming Growing a Sense of Ethical Use of Information
Middle School	**Information Course** (Elective Course)	→	From 2018: **Information Course** (34+ hours; Required Course)	Problem solving with computational thinking Basic algorithms and computer program development
High School	**Information Course** (In-depth Elective Course)	→	From 2018: **Information Course** (Normal Elective Course)	Using interdisciplinary thinking to build algorithms and computer programs

After the first group of 72 schools completed the Software Education pilot in 2014, initial survey results announced by the Ministry of Science, ICT and Future Planning and the Korea Foundation for the Advancement of Science and Creativity were mostly positive, noting some areas for improvement. According to student participants, 74% were satisfied with the curriculum. The opportunity to use new tools was rated as the number-one factor for why students enjoyed the software classes (30%), followed by the opportunity for active participation (28%). In terms of areas to improve, 39% of students and 32% of teachers expressed that there was not enough time allocated to software education, and 39% of teachers found that there was a lack of infrastructure (e.g., computer labs and technical resources).[61]

III.II. SELF-ORGANIZED TEACHER COMMUNITIES LEAD THE WAY FOR SOFTWARE EDUCATION

Although Software Education is still in its early stages of implementation, a sizeable group of elementary school teachers are already teaching the new curriculum, helping other interested teachers, and participating in research societies to prepare for the changes. Daegeon Cheon is a teacher at Paju Songhwa Elementary School, which is just outside of Seoul. His school was selected as a Software Leading School this year. Initially, there were three teachers, including Daegeon, who were interested in software education. Since then, the Paju Songhwa Elementary School Software Task Force Team has grown to six teachers who meet regularly to talk about software education. The group has even created a workbook series catered to the needs of their students by using materials from the Ministry of Education. They are planning to share the resource with other elementary school teachers.[62]



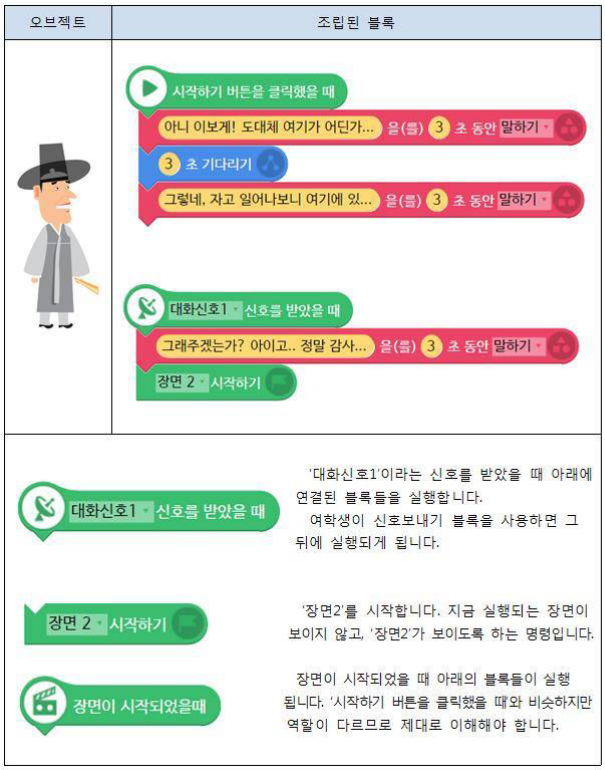


TOP
A student uses the Scratch visual programming platform to create a story about a ballerina.
Photo credit: Rufina Kyung Eun Park

BOTTOM
Daegeon Cheon, Eui-Nam Jang and three other teachers at Paju Songhwa Elementary School created this workbook series for software education.
Photo credit: Daegeon Cheon

ABOVE

In this activity, students create a story about a student from the present and a classical scholar from the Kingdom of Choson, a Korean kingdom that lasted from 1392 to 1897. On the left of the page, the classical scholar says, "Hello there! Where in the world am I? I am from Choson!" On the right side of the page is an example of a story that students can create with coding. The blue blocks create a command for the animated student to "wait 3 seconds." The yellow boxes in the red blocks are the dialogue for the female student character. The first box reads, "What?!! You came from Choson??" and the second one says, "Really? Let me first take you to my house…"
Photo credit: Paju Songhwa Elementary School Software Task Force Team



LEFT

This page is a continuation of the first activity. It includes dialogue for the classical scholar character, and the other parts of the page explain the different kinds of commands students can use. *Photo credit: Paju Songhwa Elementary School Software Task Force Team*

BELOW

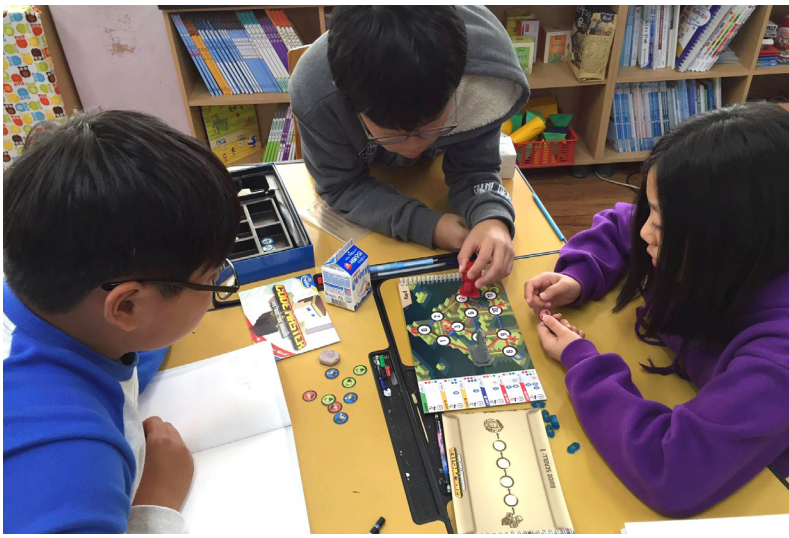
This activity teaches students about the problem-solving process and algorithms. The cartoon on the left explains a situation in the classroom where milk was distributed to the students, but some students did not take any, and the two students speaking to each other are discussing the best way to check which students did not take milk. The figure on the right side of the page is a bulletin board where the class can check which students did or did not take milk. The questions below the figure ask students to reflect on the proposed solution. *Photo credit: Paju Songhwa Elementary School Software Task Force Team*

ABOVE
Grade 6 students learn the basics of computational thinking (e.g., repetition, moving, order) using a board game in Inkyu Lee's class. *Photo credit: Inkyu Lee*

LEFT
A group of students play a card game to learn the basics of computational thinking before learning an educational programming language like Entry or Scratch. *Photo credit: Inkyu Lee*

Although one may think that schools in rural parts of Korea may struggle to provide quality software education, one school that is 168 km (104 miles) away from Seoul proves that this is not always true. Inkyu Lee is a teacher at Gujeong Elementary School in Gangneung, Gangwon Province, which is best known for its mountains, potatoes and proximity to the ocean. His school was selected as a Software Leading School in 2016 and he has been actively engaged in software education in the last couple of years. He taught unplugged software education to other teachers through the Regional Education Offices, has participated in teacher research societies, and even travels about three hours to Seoul when he can to participate in seminars and PD opportunities. Even though it is challenging for teachers in rural parts of the country because there is less activity happening there than in Seoul and Kyunggi Province, Lee explained that it is not difficult to find vibrant teacher communities online where he can get new teaching ideas.[63]

Elementary school teachers expressed confidence that it may be easier to implement Software Education than the FSP. According to Daegeon, introducing software education in elementary school was a relatively straightforward process. There was almost no opposition among the teaching staff when Paju Songhwa submitted an application to become a Software Leading School because becoming a Software Leading School does not require a significant change in the school timetable, as it is necessary for the FSP. Rather, the school curriculum is taught in the same way, with a couple of hours but dedicated for software education."[64] Also, the curriculum for the elementary level focuses on hands-on activities and sparking kids' interest in coding and physical computing, which does not require advanced technical knowledge on the part of teachers. Yongguen Kim, an elementary school teacher at a Software Leading School in Seoul agrees that, "previously, [computer education at the elementary level was about] expressing oneself through PowerPoint or Word, now it's about teaching how to use ideas ... techniques can be learned later."[65]



ABOVE
Students play the game 'Code Master', which teaches more advanced computational thinking than the other games introduced in the previous page.
Photo credit: Inkyu Lee

There are also various software-related PD opportunities and resources available for elementary school teachers through official and non-official channels. The national Ministry of Education as well as provincial and city-level educational bodies provide PD for teachers at Software Leading Schools, and more programs are available online.[66] Also, there are various software-related research societies that have specific focus areas, such as software-related educational tools or software policy. Some of these research societies are formed through official channels, and others are self-started by teachers. The research societies all have different characteristics, but they usually run seminars and PD opportunities, and create teaching resources.[67]

WHAT EXACTLY ARE STUDENTS LEARNING IN SCHOOLS THAT CURRENTLY OFFER SOFTWARE EDUCATION IN KOREA?

The answer to this question varies according to the types of resources and budget available at the school and the particular teaching style of each teacher. However, the following is a summary of some of the programs that were mentioned by the interviewees. In the very basic stages in elementary school, most teachers explained that the visual programming languages Scratch and Entry are the most widely used. Kids can create simple games, stories, and videos directly on the visual programming language platforms. However, to introduce students to physical computing, some teachers also connect simple devices and robots that can be made to move, make sounds, and light up using coding on the platforms mentioned above. There are also board games and worksheets available for teachers who want to teach "unplugged" software education, which means teaching computational thinking without a computer.

Other programs that are being used at more advanced levels, from elementary to middle school, to allow kids to make more advanced applications, machines, and devices include App Inventor; development boards such as Arduino, a micro-controller motherboard that is used to program simple repetitive tasks; and Raspberry Pi, a simple, general-purpose computer used with a Linux operating system that can perform multiple tasks. High school teachers who teach elective courses for students interested in pursuing a career in computer programming are also teaching professional programming languages such as HTML and JavaScript.

In addition to software teacher research societies, teachers have created their own online and offline communities on popular social networking sites to share information, news, and resources to enable better software education at the elementary level. One in particular, ATC, an association of elementary school teachers engaged in computer science, was mentioned by all of the elementary school teachers who were interviewed. The organization boasts over 4,600 members on its online social network platform. Moreover, on May 26, 2016, it signed a memorandum of understanding with Entry Education Research Institute, which created the visual programming language for kids called Entry, in which the institute pledged to donate 50% of all sales from its educational tools to ATC.[68]

Some teachers expressed that these networks and PD opportunities that are self-organized by teachers were more relevant and directly useful in the classroom.[69] The online communities are particularly helpful for teachers who are far away from the capital city, Seoul, or Kyunggi Province, where most of the bigger seminars and programs take place. Similar networks exist for middle and high school students, which have been developed from previous years. However, there has not been a great deal of effort to connect teachers from elementary to high school. Right now, "it is not very systematically organized, so everything depends on the capabilities of each individual, which is too bad," explained Soojung Park, a teacher at Seoul's Seongdong Global Business High School.[70]

III.III. THE DOUBLE-EDGED SWORD OF COLLABORATION WITH THE PRIVATE SECTOR

Similar to the FSP, the Software Leading Schools, their teachers, and self-organized teacher groups show the potential of Software Education to succeed. However, Software Education may face a slightly different set of challenges as Korea moves

ABOVE
Korean startup Hello Geeks' truck kit is an example of a device that can be connected to the computer. The company also creates videos that explain how to use visual programming languages to make the truck move. *Photo credit: Hello Geeks*

LEFT
Teachers gather on a Saturday afternoon to attend a PD session offered by the Naver Connect Foundation. They are learning how to maneouvre a robotic hamster by using the visual programming language and platform Entry. *Photo credit: Rufina Kyung Eun Park*

toward nationwide implementation beginning in 2018. The possible rise of after-school cram schools (hagwons) and private education to help students excel in software education poses two main problems. The first risk is that Software Education will lead to an increase in spending on private education, and therefore an increase in education inequality between students with high- and low-income backgrounds and also between students living in city centres and rural areas. The second problem is that these types of hagwons encourage unhealthy competition and rote memorization in software education, as they have done in the past in core academic areas such as mathematics and English.

On May 16, 2016, it was reported that the private education market is already taking advantage of parents' worries that they are not doing enough to prepare their children for the upcoming curriculum changes. As of February 2016, a coding kindergarten charging KRW2M (US$1,688) per month was promising kids would learn English from ages 3 to 5, and start coding from the age of 6. A software education hagwon was telling parents that students need to prepare from Grade 3 in order to be competitive enough to get into a specialty high school, and that it will also help students to get into prestigious universities such as Seoul National University or the Korea Advanced Institute of Science and Technology, the country's oldest research-oriented science and engineering institution.[71] Of course, it is unfair to state that all private software education programs are accomplishing nothing by increasing competition and rote memorization in software education.

Some private companies have a non-profit agenda and want to offer creative and fun programs when offering software education opportunities to teachers and students. For instance, Naver, the most popular search engine in Korea, has been active in offering educational opportunities related to programming for adults, creating programs and events for students, and also providing software education PD sessions for teachers through its non-profit organization called the Connect Foundation. The teacher PD programs were first launched in 2015 and, since

then, the company has developed a website that offers resources and information for teachers, parents, and students. One PD session I visited was training teachers to use a robotic hamster that can be manipulated by using visual programming language platforms like Entry. The session also provided colourful mazes and other handouts that can be used in the classroom.[72]

PD programs offered by private companies such as Naver sometimes fill a gap in rising demand from teachers for extra training. Eui-Nam Jang, a Grade 6 teacher at Paju Songhwa Elementary School, explained that the infrastructure for teacher PD in software education is still in the early stages of development and that Naver is one of the few companies providing this service with a non-profit agenda.[73] Heejung Kang from Gyeonggi International Trade High School, a public school that specializes in international trade, explained that she felt like she had to seek out PD programs on her own because they were few in number and most of them filled up very quickly.[74]

There are also smaller organizations that offer software education programs for students at a low price. Coding Club is an organization that offers software classes for students where they can learn how to create games, apps, animation, and other types of software by using programs such as MIT's Scratch and App Inventor or Naver's Entry. The class fees are kept to a minimum because volunteers help facilitate the classes and the organization also receives sponsorship that covers the fees normally associated with renting a space. Since Coding Club began in 2014, the organization stands by the motto, "anyone can learn coding and become a maker through technology."[75] Another similar organization is D.Lab, which offers students "an entrepreneurial experience through software education." Although it is a for-profit company, the CEO, David Song,

TOP
Students and teachers gather around a table to listen to a student present the game he created at Coding Club. *Photo credit: Rufina Kyung Eun Park*

BOTTOM
Students listen as the teacher explains the day's activity at D.Lab. *Photo credit: D.Lab*

explained that D.Lab offers something that schools and hagwons cannot by hiring teachers who have actual experience making and programming things and thus can provide feedback and more hands-on coaching to students on creating innovative products.[76]

Some private provisions of software PD programs for teachers and additional learning opportunities for students are valuable resources. They also present innovative ideas on how software education can be successful in public schools. However, even if these organizations have good intentions, they may exacerbate education inequality because the programs are accessible to a limited group of people. In addition to cost, distance is an obvious problem. Most of these organizations are clustered around Seoul and Kyunggi Province, meaning that teachers and students in these regions have more opportunity to improve their skills and acquire new knowledge about software education. Also, even if the distance factor could be solved through methods such as massive open online courses (MOOCs), a prerequisite of the coursework is that students enrolling in the course need a computing device that can support the required programs and software.

These private alternatives can increase the inequality in resources and knowledge that already exists within the public education system. Kyungchul Choi from Yebong Elementary School explained that the computers tend to be more outdated in older schools. An even bigger problem is that schools often do not have the extra budget to replace old computers with new ones. Teachers are already worried about the skills gap between students who will grow up with exposure to software education from elementary school and those who missed the opportunity in the transitional years. Soojung Park, a teacher at the Seongdong Global Business High School, explained that many computer science middle and high school teachers are attending PD sessions because they realize that, by the time their current students graduate and enter the job market, they will face competition from juniors who have had much earlier exposure to software education.[77]

It is possible that Korea's Software Education initiative will realize its goals faster than the FSP. This is because the technology sector and private companies can offer technical expertise, resources, and innovative ideas that are directly relevant to the intended curriculum. Also, parents are more likely to be supportive of Software Education than of the FSP because Software Education does not present such a drastic challenge to established teaching practices or affect the core academic curriculum linked to becoming college-ready. Ironically, however, the opportunity for collaboration among schools and the private sector also presents the greatest challenge in realizing quality and equitable educational opportunities in Software Education.

IV. CONCLUSION

This report examined South Korea's major educational reforms that are linked to larger plans of economic revitalization. Although the Free Semester Program and Software Education are still in their infant stages, teachers and Leading Schools demonstrate the potential of these policies to develop the skills and competencies young people will need in the creative economy.

However, there are various challenges that impede a complete transformation of the education system. First, teachers are having difficulty implementing changes with limited time, constrained budgets, and unequal opportunities to receive further training. Second, students are unable to fully explore their interests and passions in the FSP because they face enormous parental and societal pressures to succeed. Third, there is also an unequal distribution of supplementary educational opportunities to further skills and knowledge related to software education. Fourth, collaboration with societal actors outside of the education system is often necessary and valuable, but at times can pose sizeable risk to an equitable distribution of quality education.

The solution to realizing the goals of the two major educational reforms in all schools in Korea will come from a combination of forces from within and outside the education system. Teachers play a crucial role in transforming policy into tangible changes in the classroom, and thus require significant support to continue their efforts. Parents can be important partners in helping to facilitate an environment where students are more comfortable and happy about exploring their diverse interests. For example, forward-thinking parents who believe in the importance of play and creativity can relieve pressures and encourage students to explore their interests more earnestly. Also, tech companies can share their technical expertise with elementary school teachers who do not have a

background in computer science; they could be encouraged to improve access to this knowledge by distributing content and training through more democratic mediums such as online courses.

There are two important takeaways about education policy design that can be generalized from the case of Korea. First, collaboration between the education system and the larger society is often necessary and valuable, but must be pursued with caution. Teachers are the enablers who make educational innovation possible. They are at the "front lines" on a daily basis and are the ones who can transform a classroom and make learning more engaging, meaningful, and interesting for students. However, it would be a grave mistake to expect teachers to change the education system by themselves. As was demonstrated in this report, there are various dynamics beyond the school over which teachers have no control. For instance, students are confronted with different family and societal pressures that influence their choices and their willingness to try something different. Thus, educational changes need to be planned with careful consideration of the different spheres of influence on students' decision-making and engagement in school.

School-family partnerships and engagement is crucial because parents and family members should be seen as key partners in making sure that students are well-supported within and outside of schools. Also, parents can help one another by forming self-organized networks and exchanging information about how to help support their children. Of course, there should be intentional efforts to include parents from diverse socioeconomic backgrounds and regions, or else these networks can cause unequal access to information and therefore increase educational inequality. Collaboration with private actors—while they are more removed from the vision and mandate of public education—can also be desirable. For instance, tech companies can be valuable sources of technical expertise and PD on software education for teachers. However, similar to the case of self-organized parental groups, this can create disparity in training offered to teaching personnel and therefore a disparity in the quality of education for students.

Secondly, related to the last point, there needs to be a greater effort to realize excellence with equity through education policy. From the outset of the introduction of education reforms, it is important to recognize that schools have differences in endowed resources, teaching abilities, and student makeup. This type of data should be collected and examined to understand how to best serve each individual community. Examples of important questions to be asked related to Software Education would be: Which schools need additional funds to replace outdated computers? Which schools have a greater percentage of older teachers who received less training on computer science compared with younger teachers? As for the FSP, which schools have gyms and which are near swimming pools? Are some schools able to share facilities and offer programs together? Which schools have a greater percentage of students with special needs, disabilities, or language difficulties and require extra support? This type of information can then be analyzed to determine the appropriate support package for schools so that all students can have access to quality education.

The key here is that there should be an emphasis on quality with equity, not quality with equality, from the beginning of education policy design. An emphasis on quality with equity means being willing to sponsor one school more than another if one school has a greater need. On the other hand, focusing on quality with equality would mean that all schools receive the same amount of support, regardless of their prior endowment

of financial and infrastructural resources. In the case of Korea's transition from pilot phase to nationwide implementation of the FSP, it appears that there was more of an emphasis on quality first and equality later. The pilot phases of the FSP and Software Education provided policy-makers with success stories with which to generate more support and enthusiasm for continued reforms. Then, when it came to the nationwide implementation stage, all schools were provided with similar financial aid, teacher PD opportunities, and networks of community partners. This strategy brings praise for the high-performing schools while leaving struggling schools behind because it masks the different circumstances and resources available to each school and its community.

This report sought to provide a comprehensive overview and analysis of the current status of Korea's Free Semester Program and Software Education initiatives, within the broader context of Korea's economic revitalization agenda under the creative economy. The successes, challenges, and lessons from the case of Korea are important for the country to re-examine the progress of its processes of educational reform, and for other countries around the world to plan ahead for their own educational reforms. By borrowing lessons learned from Korea, it is to be hoped that, whatever type of major educational reforms other countries may introduce, they can be implemented in such a way that all children have equitable access to quality education that will allow them to be happy and pursue a life that is successful by their own definition.

RESEARCH NOTES

This section provides more details on how my research for the report was conducted.

I was in South Korea from March to April 2016 to conduct this research study. After returning to Canada in May, I continued to correspond with some of my contacts for followup questions. As mentioned in the Acknowledgments section, this study was made financially possible by a grant from the Asia Pacific Foundation of Canada and the Foundation's Yuen Pau Woo Travel Award for Post-Graduate Research Fellows. The details of each individual I met are also in the Acknowledgments section. The following is some additional information:

THE CREATIVE ECONOMY

To research the creative economy, I visited the Kyunggi Province Center for Creative Economy and Innovation and met with staff of Attocube, a resident startup of the incubator. I also interviewed personnel from NCSOFT, Kakao, and the Naver Connect Foundation, all of which have offices in the Pangyo Technovalley.

THE FREE SEMESTER PROGRAM

To research the FSP, I interviewed one official from the Ministry of Education and interviewed teachers and administrators from Songrye Middle School, Yebong Middle School, and Jamsil Middle School. All three are public schools located in Seoul or Kyunggi Province Province and had pilot tested the FSP as FSP Leading or Research Schools for at least one year prior to the program going nationwide in 2016. I conducted one focus group with 11 students from Songrye Middle School—pseudonyms were used to protect students' identities.

SOFTWARE EDUCATION

To research the Software Education iniative in Korea, I interviewed one official from the Ministry of Education and another from the

Ministry of Science, ICT and Future Planning, as well as teachers from the following schools: Bangsan Elementary School (Seoul; public), Paju Songhwa Elementary School (Paju, Kyunggi Province; public), Gujeong Elementary School (Gangneung, Gangwon Province; public), Seongdong Global Business High School (Seoul; public specialized high school), Gyeonggi International Trade High School (Bucheon, Kyunggi Province; public specialized high school), and Semyeong Computer High School (Seoul; private school). All three public elementary schools were selected as Software Leading Schools in 2016. I also interviewed the following private companies and NGOs that offered software education for youth between the ages of five and 19: Coding Club, Hello Geeks, the Naver Connect Foundation, and D. Lab.

FINAL NOTES

The views presented in this report may not necessarily represent the views of all students, parents, teachers, and other societal groups mentioned here. Given the time and financial constraints, I focused on interviewing schools, private companies, and NGOs that are leading Korea's educational reforms. Although the report is a helpful introduction to the topic, in order to gain a more comprehensive understanding of the successes and failures of the FSP and Software Education, it will be crucial for future reports to select a more representative group of interviewees that can better reflect the Korean population as a whole.

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