2018

WHITE PAPER ON ICT IN EDUCATION KOREA

summary

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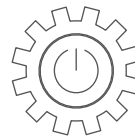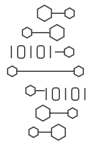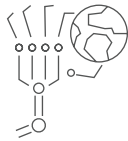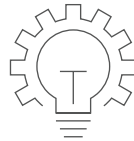Ministry of Education | KERIS
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2018

WHITE PAPER ON ICT IN EDUCATION KOREA

summary
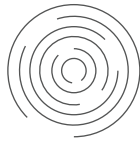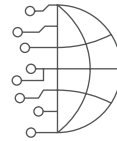
**WHITE PAPER
ON ICT IN EDUCATION
KOREA**

Ministry of Education | **KERIS**
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Top 10 News of ICT in Education in 2018

01 | The Ministry of Education Opened the Integrated Search Service for Education Assistance Policy, 'Education Assistance at a Glance'

02 | The Ministry of Education, Distributed Digital Textbooks and Provided Education of Software for Future Education

03 | The Ministry of Education, Established and Pilots 'ClassOnDot', Which is a Real-Time Interactive Video Class

04 | Reduced Social Costs by 192 Billion KRW through Online Submission of College Admissions Data

05 | 2018 E-Learning Korea

06 | 2018 Software Education Festival

07 | The Ministry of Education, Held a Groundbreaking Ceremony for the 'Integrated Disater Recovery Center for Education Information System'

08 | The Korea Education and Research Information Service-UNESCO, Hosted a 'Central Asia Regional ICT in Education Symposium'

09 | Korea, Leading the Innovation of 'Smart Education' in Myanmar

10 | The Korea Education and Research Information Service, Held '2018 Media and Information Literacy International Symposium'

1

The Ministry of Education Opened the Integrated Search Service for Education Assistance Policy, 'Education Assistance at a Glance'

The Ministry of Education opened the 'Education Assistance at a Glance (http://eduone.moe.go.kr)' service on March 19, which is a customized integrated service for education welfare and support policies for those who are in need of education policies. This Service is a consumer convenience-centered educational information service which allows users to receive real-time information, such as application period while providing customized educational support information when user's conditions are inputted. In addition, among the education support policies promoted by the Ministry of Education, about 60 welfare and support programs are provided, including programs providing economic support such as: education costs, tuition fees, programs such as education, experience and services.

The Ministry of Education plans to expand information on education-related programs of related ministries, municipal and provincial education offices and local governments through cooperation with related agencies to provide more education support information to consumer.

[Introduction Picture-1] 'Education Assistance at a Glance' Service Picture
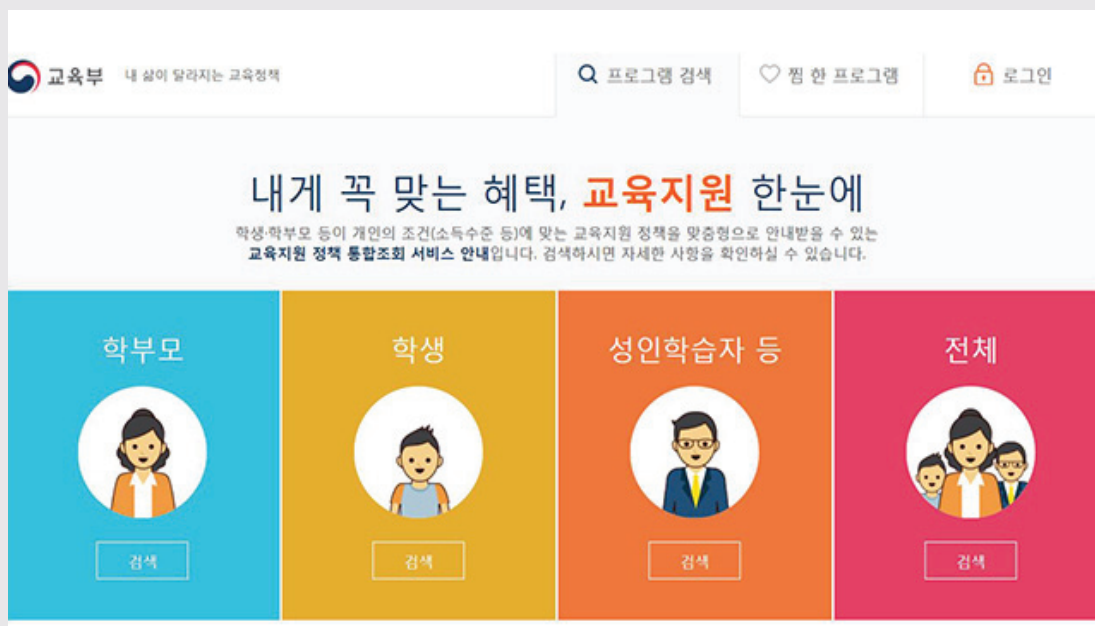
2

The Ministry of Education, Distributed Digital Textbooks and Provided Education of Software for Future Education

According to the revised 2015 curriculum, the Ministry of Education distributed social, science and English digital textbooks to third and fourth grade students, and first grade of middle school students. The Ministry of Education also applied the required software education to 1,351 schools that compiled information courses to first grade middle school students.

The digital textbooks, which are distributed online, include rich learning materials such as glossary, multimedia materials and evaluation questions, in addition to the contents of book-style textbooks. In particular, it has enhanced its learning effect by providing realistic contents that incorporates new digital technologies such as VR and AR.

For middle schools, the required software education will be applied to all students starting in the first grade beginning 2018 and ending in 2020. For elementary school students in the 5th and 6th grade, this program will be applied in 2019.

[Introduction Picture-2] Elementary School Students with Digital Textbooks

3

The Ministry of Education, Established and Pilots 'ClassOnDot', Which is a Real-Time Interactive Video Class

The Ministry of Education and the Korea Educational Development Institute have established an online public education program platform called 'ClassOnDot (www.classon.kr)' that enables real-time interactive communication, and have 11 municipal and provincial education offices conducted a trial operation. The 'ClassOnDot' system consists of education portal (www.classon.kr), which can verify class information and apply for classes, a video class platform that can interactively communicate with each other in real-time, a learning management system for managing learning history, and a manager system for managing classes and various statistics. The Education Portal organizes a menu for students to intuitively identify and use functions, and the real-time video class platform was equipped with various functions for effective classes, such as screen and data sharing, group discussion, class with blackboard, quizzes, etc.

2018 trial operation were conducted after-school and/or on weekends but the government plans to support the planning of organizing and operating within regular hours by developing an operating model and improving the system in the long-term.

[Introduction Picture-3] Online Public Education Program Platform

4

Reduced Social Costs by 192 Billion KRW through Online Submission of College Admissions Data

The Korea Education and Research Information Service has contributed to a total of 192 billion KRW in social cost savings through online provision of college admissions data for the 2018 college entrance exam. The online provision of college admission data began with the provision of electric data on the school life records from the regular admission of college entrance exams for 2005, and the college entrance exam acceptance information is provided additionally from the regular admission of college entrance exams for 2015.

According to an analysis of the results of online provision of college admission data for the 2018, it was found to have contributed to the reduction of social costs for applicants' application of 192 billion KRW, including 163 billion KRW in transportation expenses for students to submit admission data for each college and 29 billion KRW in labor costs for receiving admission data and comparing original documents for colleges.

For the 2018 college entrance exam, 2,491 high schools nationwide generated college admission data, while 3,850,546 million 546 college admissions data for 373 colleges during the nonscheduled admission and 661,832 admission data for 346 colleges during the regular recruitment period were provided in online.

[Introduction Table-1] Status on Provision of College Admission Data by Graduation Year   (Unit: Case)

| Graduation year	Nonscheduled admission		Regular admission	
	University received data	Number of student data provided	University received data	Number of student data provided
2017		3,124,300		415,996
2016		461,614		159,050
2015		130,792		46,850
2014	373 Schools	54,559	346 Schools	15,650
2013		39,516		10,985
2012		22,694		7,428
Total		3,833,475		655,959

5

2018 E-Learning Korea

 The Ministry of Education, the Ministry of Trade, Industry and Energy, the Ministry of Science, Technology, Information and Communication and the Seoul Metropolitan Office of Education held the 2018 e-Learning Korea 2018 at COEX in Seoul from September 13-15. Reflecting the interest of education and e-learning industries in responding to the environmental changes of the 4th industrial revolution, this year's event was organized with EduTech Fair, international conferences and various side events under the theme of 'New Leap Forward EduTech, e-Learning'. EduTech Fair operated more than 240 booths, with 121 companies from nine countries participating in future education technologies, including digital textbooks and software class demonstrations. In addition, 30 experts from domestic and foreign e-learning fields participated as presenters and 600 students and teachers interested in future education attended the international conference that lasted two days from July 14-15.

Meanwhile, the '2018 Korea-International Organization for Cooperation and Global Symposium on ICT in Education' was held jointly with UNESCO from September 11-13, and 30 high-level policy-makers from developing countries participated to discuss policies of each country, a teacher learning community and continuous professional development under the theme of 'The 4th Industrial Revolution and Education: Strengthening ICT Capabilities of Teachers'.

[Introduction Picture-4] 2018 e-Learning Korea Booth
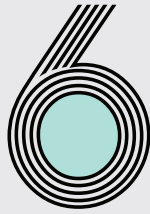
2018 Software Education Festival

The Ministry of Education and Science and ICT and the Busan Metropolitan Office of Education held the 2018 Software Education Festival (SW Education Festival) at the BEXCO exhibition hall in Busan from October 12 to 13. The SW Education Festival was held to enhance the public's understanding of school SW education and to promote social-wide SW education.

The theme of the 2018 SW Education Festival is 'Anytime, Anywhere, Anybody I am with SW Education!', the goverement operated the program so that anyone interested in SW education could experience SW education in an easy and fun manner and gain expertise. The event was held as a conference to discuss the future of SW education by experts from home and abroad. In addition, various experience-oriented programs including 'SW Changing Me, 100°C Student Lecture' which introduces positive aspects of oneself after receiving SW education in schools, have been highly received.

[Introduction Picture-5] 2018 Software Education Festival Site

7

The Ministry of Education, Held a Groundbreaking Ceremony for the 'Integrated Disater Recovery Center for Education Information System'

On November 19, the Ministry of Education held a groundbreaking ceremony for the 'Integrated Disaster Recovery Center for Education Information Systems' at the complex in the northwestern district of Chochiwon-eup, Sejong City. The Integrated Disaster Recovery Center for Education Information Systems is a center that preserves data from NEIS, EduFine, and work management systems operated by the Ministry of Education and 17 municipal and provincial education offices, and helps the rapid resumption of services in the event of a failure. It will be built as a disaster recovery system that converts and uses services when functions are difficult due to a real-time remote backup system that replicates and stores data held by the national center in a separate space in real time.

If the center is constructed, the facilities of 17 municipal and provincial education offices will be backed up in case of disaster or damage or information will be lost. The service will be switched to the center's disaster recovery system within 24 hours, enabling them to perform education and administrative tasks in a stable and continuous manner.

[Introduction Picture-6] A groundbreaking ceremony for the 'Integrated Disaster Recovery Center for Education Information Systems'
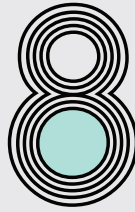
The Korea Education and Research Information Service-UNESCO, Hosted a 'Central Asia Regional ICT in Education Symposium'

'Central Asia Regional ICT in Education Symposium' was jointly hosted by the Korea Education and Research Information Service and UNESCO from October 24-26 in Dushanbe, Tajikistan. This symposium is UNESCO's official project to discuss ways to innovate education policies using information and communication technology.

The theme of the symposium was 'Strengthening the Education Information System (EMIS) to achieve the UN Sustainable Development Goals' which discussed ways to improve the education information infrastructure in Central Asia, which is relatively underdeveloped compared to other regions, through the convergence of information and communication technology and education. The Korea Education and Research Information Service introduced Korea's NEIS development process and use cases, supporting educational innovation in six Central Asian countries and contributing to exchanges and cooperation between Korea and major Central Asian countries.

[Introduction Picture-7] Central Asia Regional ICT in Education Symposium

9

Korea, Leading the Innovation of 'Smart Education' in Myanmar

The Ministry of Education hosted an international forum on 'ICT in education between Korea and Myanmar', and established an 'Advanced Pilot Classroom Utilizing ICT' in Myanmar and explore the ICT education policies of Myanmar. 'Project to Support Operation of Advanced Pilot Classroom Utilizing ICT' was established in 17 countries by 2011-2018, with smart classrooms containing laptops, smart pads and electronic blackboards in partner countries and supporting teacher training and class software for 5 years. Advanced classrooms built in Myanmar have been supplied with electronic blackboards for teachers based on touch systems, 50 laptops and 50 smart pads, as well as software for smart education such as video content production and class mirroring.

The forum included 'classroom innovation and field change' to introduce ICT in education policies at home and abroad, and 'Panel Discussions' on the direction of Myanmar's ICT in education policy innovation to share best practices in running advanced classrooms. In fact, lectures on coding education, such as power points and spreadsheets, organizing a teacher learning community for mutual guidance among teachers, and Scratch, were held for three days from July 19-21.

[Introduction Picture-8] Notice on Innovation of Smart Education in Myanma
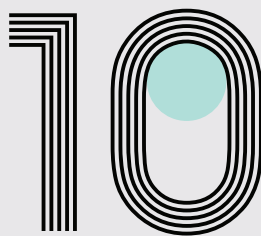
10

The Korea Education and Research Information Service, Held '2018 Media and Information Literacy International Symposium'

The Korea Education and Research Information Service hosted the first '2018 Media and Information Literacy International Symposium' on Media and Information at the Korea Press Center on November 8 with the Korea Press Foundation, the UNESCO Korea Committee, the Korea Media Foundation and the National Media Center Council. This symposium consisted of 'International Strategies and Cases for Enhancing Media and Information Literacy', 'Exploration of Digital Citizenship in Intelligence Society', 'Roles of Media and Information Literacy for Cultivating Democratic Citizens' and a comprehensive discussion. In each session, world-leading media and information literacy experts participated as presenters to share each country's educational policies and experiences related to digital citizenship.

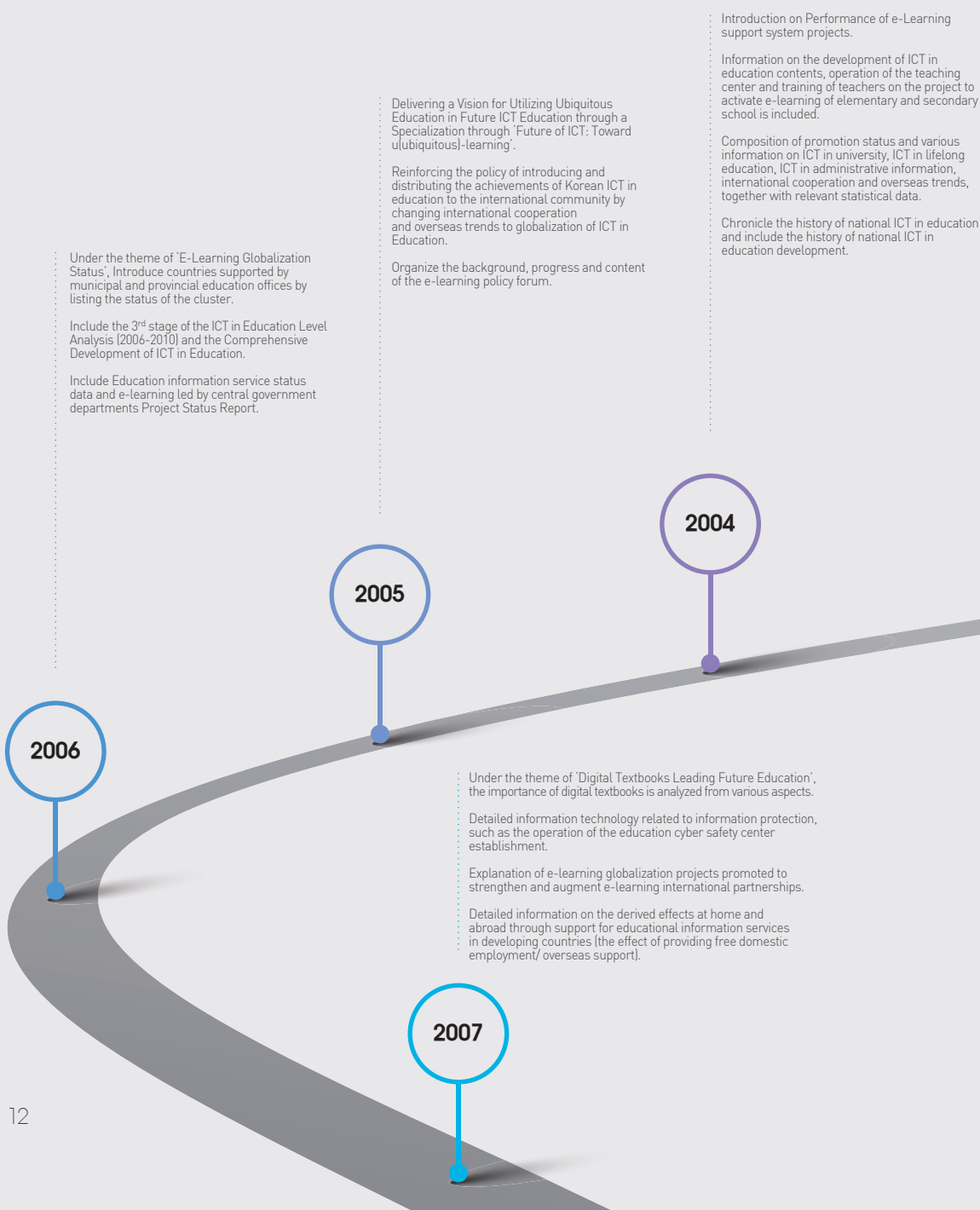Based on its experience in researching digital citizenship and conducting business, the Korean Education Research and Information Service, which has successfully organized the symposium, plans to continue making diverse efforts to lead digital citizenship education so that students can grow into future talent with digital citizenship.
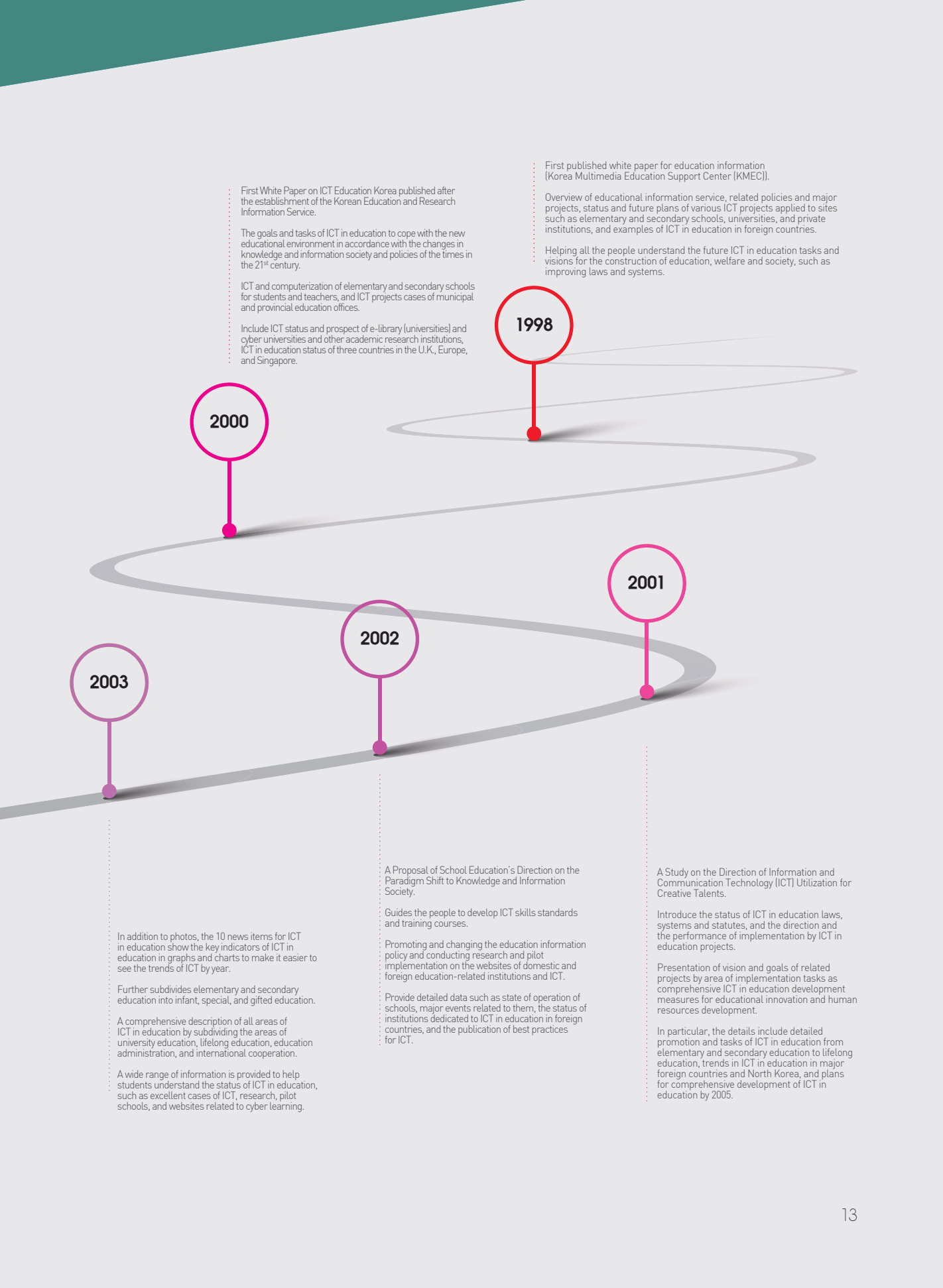
[Introduction Picture-9] 2018 Media and Information Literacy International Symposium

History of White Paper on ICT in Education Korea No. 20

◼ 1998–2017

Introduction on Performance of e-Learning support system projects.

Information on the development of ICT in education contents, operation of the teaching center and training of teachers on the project to activate e-learning of elementary and secondary school is included.

Composition of promotion status and various information on ICT in university, ICT in lifelong education, ICT in administrative information, international cooperation and overseas trends, together with relevant statistical data.

Chronicle the history of national ICT in education and include the history of national ICT in education development.

Delivering a Vision for Utilizing Ubiquitous Education in Future ICT Education through a Specialization through 'Future of ICT: Toward u(ubiquitous)-learning'.

Reinforcing the policy of introducing and distributing the achievements of Korean ICT in education to the international community by changing international cooperation and overseas trends to globalization of ICT in Education.

Organize the background, progress and content of the e-learning policy forum.

Under the theme of 'E-Learning Globalization Status', Introduce countries supported by municipal and provincial education offices by listing the status of the cluster.

Include the 3rd stage of the ICT in Education Level Analysis (2006-2010) and the Comprehensive Development of ICT in Education.

Include Education information service status data and e-learning led by central government departments Project Status Report.

2004

2005

2006

Under the theme of 'Digital Textbooks Leading Future Education', the importance of digital textbooks is analyzed from various aspects.

Detailed information technology related to information protection, such as the operation of the education cyber safety center establishment.

Explanation of e-learning globalization projects promoted to strengthen and augment e-learning international partnerships.

Detailed information on the derived effects at home and abroad through support for educational information services in developing countries (the effect of providing free domestic employment/ overseas support).

2007

First published white paper for education information
(Korea Multimedia Education Support Center (KMEC)).

Overview of educational information service, related policies and major projects, status and future plans of various ICT projects applied to sites such as elementary and secondary schools, universities, and private institutions, and examples of ICT in education in foreign countries.

Helping all the people understand the future ICT in education tasks and visions for the construction of education, welfare and society, such as improving laws and systems.

1998

First White Paper on ICT Education Korea published after the establishment of the Korean Education and Research Information Service.

The goals and tasks of ICT in education to cope with the new educational environment in accordance with the changes in knowledge and information society and policies of the times in the 21st century.

ICT and computerization of elementary and secondary schools for students and teachers, and ICT projects cases of municipal and provincial education offices.

Include ICT status and prospect of e-library (universities) and cyber universities and other academic research institutions, ICT in education status of three countries in the U.K., Europe, and Singapore.

2000

2001

2002

2003

In addition to photos, the 10 news items for ICT in education show the key indicators of ICT in education in graphs and charts to make it easier to see the trends of ICT by year.

Further subdivides elementary and secondary education into infant, special, and gifted education.

A comprehensive description of all areas of ICT in education by subdividing the areas of university education, lifelong education, education administration, and international cooperation.

A wide range of information is provided to help students understand the status of ICT in education, such as excellent cases of ICT, research, pilot schools, and websites related to cyber learning.

A Proposal of School Education's Direction on the Paradigm Shift to Knowledge and Information Society.

Guides the people to develop ICT skills standards and training courses.

Promoting and changing the education information policy and conducting research and pilot implementation on the websites of domestic and foreign education-related institutions and ICT.

Provide detailed data such as state of operation of schools, major events related to them, the status of institutions dedicated to ICT in education in foreign countries, and the publication of best practices for ICT.

A Study on the Direction of Information and Communication Technology (ICT) Utilization for Creative Talents.

Introduce the status of ICT in education laws, systems and statutes, and the direction and the performance of implementation by ICT in education projects.

Presentation of vision and goals of related projects by area of implementation tasks as comprehensive ICT in education development measures for educational innovation and human resources development.

In particular, the details include detailed promotion and tasks of ICT in education from elementary and secondary education to lifelong education, trends in ICT in education in major foreign countries and North Korea, and plans for comprehensive development of ICT in education by 2005.

◾ 1998−2017

As a special feature, it details the background, purpose, strategy, and tasks of 'the 5th Basic Plan for ICT in Education'.

The new add of 'Status of Operation of Overseas Information Education Course' and 'Building and Operating National-level Academic Performance Evaluation Information Service System'.

Detailed presentation of lifelong ICT in education by subdividing them.

The special feature of 'Software Education Policy Status and Future Plans', highlights the importance of software education in the wake of the recent arrival of a digital knowledge and information society, which is central to innovation, growth and value creation throughout society.

A Case Study on Software Education Policy in Major Developed Countries and Its Direction of Software Education in Korea.

Add of The OECD PISA 2012 Digital Skill (Digital Readings) evaluation results showed the international comparison statistics.

'The Present Status of ICT in Education in the City and the Provincial Office of Education' and 'Creating a Work Environment for School Education'.

In commemoration of '20th Anniversary of ICT in Education' the special features of Korea's history of ICT in education and its history of transformation are addressed.

From the start of computer education, which was the cornerstone of ICT, to the background of ICT in education and the status and performance of ICT policy are summarized.

New information includes software education-related policy implementation, National Center for Information and Curriculum (NCIC), basic education support site, local education finance notification portal system 'Local Education Finance Information' and K-MOOC (Korea Online Public Lecture Service).

2014

2015

2016

The 5th ICT in Education and various contents customized to the subject of knowledge and information society and future education are included.

The main statistics for ICT in education include the use ratio of SW education tools and the major results of OECD PISA 2015 ICT familiarity and literacy level of elementary and secondary students, including ICILS 2013.

New materials such as integrated information system of school facilities, information notification of credit card system, etc.

2017

Introducing the next generation of schools that are transformed into 'Digital Culture and Future Schools'.

Presentation of 'u-learning' learning system that applies design principles and ubiquitous technology and philosophy in future schools to the education field.

A Study on the Education Environment to reflect the Characteristics and Learning Capabilities of 'New Millennium Learners' in the 21st Century.

Examples of future schools in foreign countries, analysis of advantages and disadvantages, and direction of future education are included.

Detailed Analysis and Direction of Future School Implementation in Korea.

Analyze the medium and educational characteristics of IPTV and present the tasks and implementation strategies for the practical use of education.

The Ministry of Education and Science and Technology, which was merged with the Ministry of Education and Human Resources Development in 2008, seeks a new direction for information service.

Detailed Composition of Information System for Higher Education for strengthening national competitiveness.

Reviewing the major education policies of the new government in detail and suggesting the direction of ICT in education supporting them.

'Operating the Quality Management System of Finishing' is included.

New contents such as 'Operation of Education Information Notification System' and 'Operation of Local Education and Finance Integrated System'.

2008

2009

2010

2011

2012

2013

Under the theme of 'Changes in Education Information Policy due to Development of ICT', ICT in education promotion and lighting by elementary and secondary education, from the 1st (1996 to 2000) to the 4th (2010-2014).

New Kindergarten Information Notification System 'Kindergarten Notification'.

Provides statistics such as information service level measurement results.

Presentation of the progress, content, performance and future tasks of smart education implemented since 2011 through 'Smart Education Status and Future Tasks'.

New topics include operation status of elementary and secondary school information education courses, online classes and evaluations, operation of a system to support creative hands-on activities, and the operation of the joint use of learning materials (KOCW) by teaching of higher education.

Publish and distribute translated versions of Korean, English, and Spanish.

Presentation of smart education concept, detailed tasks, future vision, etc. through 'Strategies for Promoting Smart Education'.
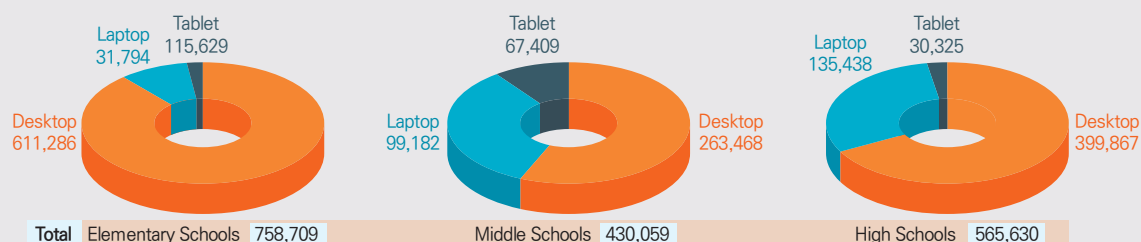
Add to 'Statistics of Education Information History' the use of home learning services for EduNets, NEIS.

Support for English, Spanish, and Japanese whitepapers.

Key Statistics of ICT in Elementary and Secondary Education

■ Status of ICT in education infrastructure

❶ Status of Computers per school

Elementary Schools
- Laptop 31,794
- Tablet 115,629
- Desktop 611,286

Middle Schools
- Tablet 67,409
- Laptop 99,182
- Desktop 263,468

High Schools
- Tablet 30,325
- Laptop 135,438
- Desktop 399,867

Total	Elementary Schools	758,709	Middle Schools	430,059	High Schools	565,630

※ Reference: kess.kedi.re.kr, 2018.4

❷ Number of students per computer

1) Number of students per computer by school grade (based on total PC)
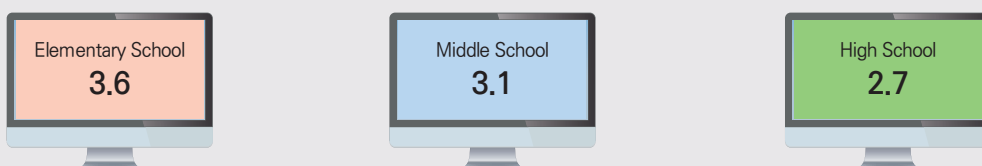
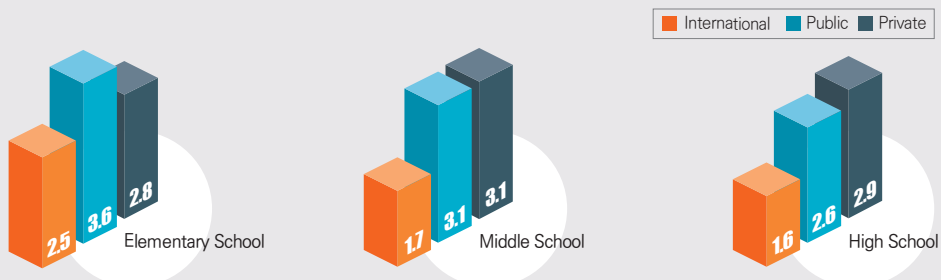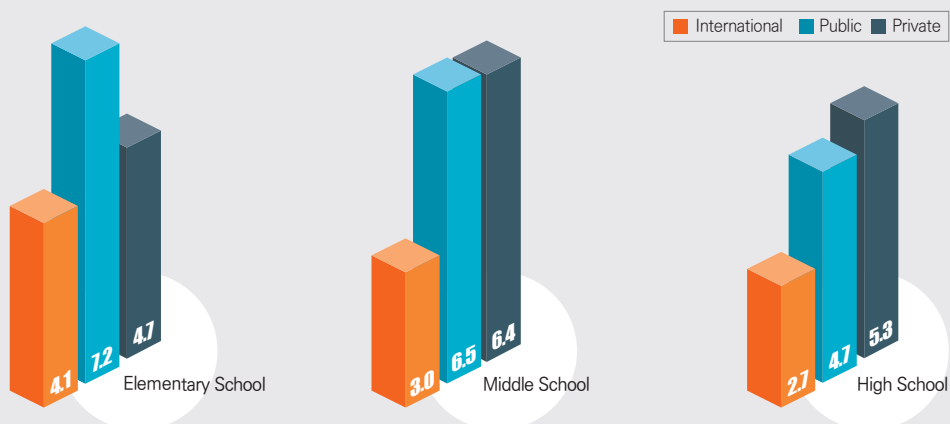| Elementary School	Middle School	High School
3.6	3.1	2.7

※ Calculation formula: Number of students/(Student+Teachers+Administrative+Other computers)
※ Reference: Educational Statistics Service (kess.kedi.re.kr), 2018.4

2) Number of students per computer by school grade (based on student PCs)
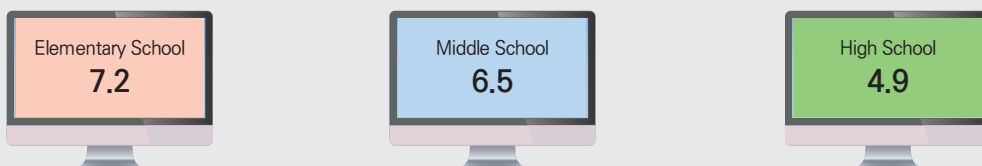
Elementary School	Middle School	High School
7.2	6.5	4.9

※ Calculation formula: Number of students/ Number of computers for students
※ Reference: Educational Statistics Service (kess.kedi.re.kr), 2018.4

3) Number of students per computer by type of establishment (based on total PC)

Legend: ■ International ■ Public ■ Private

Elementary School
- International: 2.5
- Public: 3.6
- Private: 2.8

Middle School
- International: 1.7
- Public: 3.1
- Private: 3.1

High School
- International: 1.6
- Public: 2.6
- Private: 2.9

※ Calculation formula: Number of students/(Student + faculty + administrative + other computers)
※ Reference: Educational Statistics Service (kess.kedi.re.kr), 2018.4

4) Number of students per computer by city (based on total PC)

	Elementary	Middle	High
Seoul	4.5	3.7	2.9
Busan	3.4	2.7	2.3
Daegu	3.4	2.9	2.5
Incheon	3.9	3.4	2.2
Gwangju	3.8	3.7	3.4
Daejeon	4.0	3.5	3.1
Ulsan	3.6	3.3	2.6
Sejong	2.0	1.0	1.4
Gyunggi	5.0	5.0	3.8
Gangwon	2.4	2.4	2.1
ChungBuk	2.8	2.7	2.3
ChungNam	2.9	2.6	2.5
JeonBuk	2.7	2.5	2.4
JeonNam	1.9	1.4	2.0
GyeongBuk	2.4	2.1	1.8
GyengNam	3.3	2.7	2.8
Jeju	2.7	2.0	2.4

※ Calculation formula: Number of students/(Student+Teachers+
   Administrative+Other computers)
※ Reference: Educational Statistics Service (kess.kedi.re.kr), 2018.4

5) Number of students per computer by city (based on student PCs)

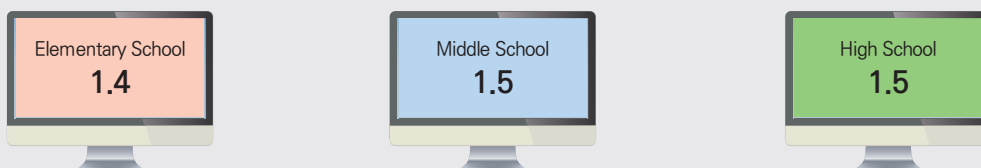|	Elementary	Middle	High
Seoul	10.6	9.3	5.4
Busan	6.7	5.4	4.3
Daegu	6.7	6.5	4.6
Incheon	7.5	6.3	3.5
Gwangju	8.8	9.5	6.9
Daejeon	8.7	7.7	5.8
Ulsan	7.0	6.9	4.4
Sejong	3.2	1.3	2.3
Gyunggi	10.9	11.4	7.0
Gangwon	4.7	4.9	3.5
ChungBuk	5.2	5.4	3.6
ChungNam	5.3	5.1	4.2
JeonBuk	5.3	5.0	4.2
JeonNam	3.0	2.3	3.4
GyeongBuk	5.0	5.3	3.7
GyengNam	6.2	5.2	5.6
Jeju	4.5	3.2	4.3

※ Calculation formula: Number of students/ Number of computers for students
※ Reference: Educational Statistics Service (kess.kedi.re.kr), 2018.4

6) Number of students per computer by type of establishment (based on student PCs)

Legend: International | Public | Private

Elementary School: 4.1, 7.2, 4.7
Middle School: 3.0, 6.5, 6.4
High School: 2.7, 4.7, 5.3

※ Calculation formula: Number of students/ Number of computers for students
※ Reference: Educational Statistics Service (kess.kedi.re.kr), 2018.4

Key Statistics of ICT in Elementary and Secondary Education

■ Status of ICT in education infrastructure

❸ Number of computers per teacher by school grade

1) Number of computers per teacher

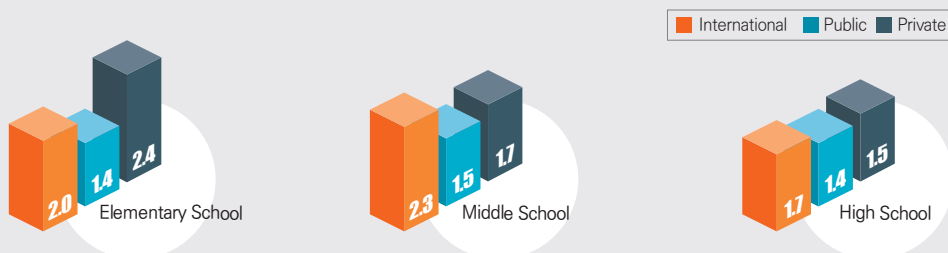| Elementary School	Middle School	High School
1.4	**1.5**	**1.5**

※ Calculation formula: Number of computers for teachers / Number of teachers
※ Reference: Educational Statistics Service (kess.kedi.re.kr), 2018.4

2) Number of computers per teacher by city

	Elementary	Middle	High
Seoul	1.3	1.5	1.5
Busan	1.5	1.7	1.7
Daegu	1.2	1.6	1.6
Incheon	1.6	1.5	1.5
Gwangju	1.6	1.5	1.5
Daejeon	1.3	1.4	1.4
Ulsan	1.5	1.3	1.4
Sejong	2.3	2.1	1.8
Gyunggi	1.1	1.1	1.1
Gangwon	1.5	1.6	1.4
ChungBuk	1.7	1.6	1.5
ChungNam	1.7	1.7	1.5
JeonBuk	1.7	1.8	1.6
JeonNam	1.6	2.1	1.6
GyeongBuk	1.9	2.1	2.1
GyengNam	1.6	1.7	1.5
Jeju	1.5	2.1	1.8

※ Calculation formula: Number of computers for teachers / Number of teachers
※ Reference: Educational Statistics Service (kess.kedi.re.kr), 2018.4

3) Number of computers per teacher by type of establishment

Legend: International | Public | Private

Elementary School: 2.0, 1.4, 2.4
Middle School: 2.3, 1.5, 1.7
High School: 1.7, 1.4, 1.5

※ Calculation formula: Number of computers for teachers / Number of teachers
※ Reference: Educational Statistics Service (kess.kedi.re.kr), 2018.4

❹ Status of Computer Labs by School Class

Classification			Number of laboratory (Average)
Total			1.3
School Level	Elementary School		1.3
	Middle School		1.0
	High School	Total	1.8
		Public	1.2
		Characterization	2.7
		Autonomy	1.1
		Special−Purpose	3.4
	Special		1.3

※ Reference: Korea Education and Research Information Service, 'A Servey on the Status of ICT in Education in Elementary and Second Schools', 2017.12

❺ Average number of teachers in charge of computer and information education

Classification			Teacher in charge of information and computer education	
			Total	Certified teacher
			Average number of teachers per school	Average number of teachers per school
Total			1.1	0.6
School Level	Middle School		0.5	0.3
	High School	Total	1.8	1.4
		Public	0.9	0.7
		Characterization	5.2	3.1
		Autonomy	1.2	0.2
		Special−Purpose	0.6	1.6
	Special		2.3	0.6

※ Reference: Korea Education and Research Information Service, 'A Servey on the Status of ICT in Education in Elementary and Second Schools', 2017.12

Policy and Performance of the Implementation of ICT in Education

◼ A Brief History of ICT in Education

Classification		2017	2018
ICT in Education Policy and Legal System		• Revised the Enforcement Decree of the Special Act on Information Notification by Education-related Institutions (2017. 1) • (tentative) Proposal of the Education Information Service Promotion Act (Plan) • Promote the revision of the copyright law system to promote the sharing of works for educational purposes.	• Enforcement of the Science, Mathematics and Information Education Promotion Act (2018.4)
Agency	National, municipal and provicial		
	Agency	• Unification of departments dedicated to preventing adverse effects by using the Internet (Ministry of Science, ICT and Future Planning → Korea Communications Commision)	
Education Research Information Activation	ICT in Elementary and Middle School	• Mobile support for handicapped students' teaching and learning support content • Add remote online classes for handicapped students	• 2015 The distribution of digital textbooks applied to the revised curriculum (Social, Scientific, English/Secondary 1st grade society, Science, English/High English) • 2018 SW social impact generation idea sharing event • Revision of the criteria for new accreditation and content screening of remote training institutes • Obtains Accreditation for Crezone and Good Content Service • Build and pilot '1:1 Learning Tutoring System'
	ICT in High school and Research	• Full-scale opening of the National University Resource Management Integrated Row and Finance System • Teachings-TV Overseas Lecture-themed Course Services provided by the British Ministry of Education • Revised the division function in the form of the curation service and lecture clip of KOCW	• ACU 10th Steering Committee Meeting • KOCW-Providing tie-up of Naver search services • Enactment of regulations on the operation of the National University Resource Management System / e-payment notification, and opening of messenger service
	ICT in lifelong and Vocation	• Reorganization of the notification information service website for academic credit back system • The first task of transforming the career network CareerNet into a cloud system is completed • Middle and Long Term Implementation of the Information Service Strategy Plan (ISP) of Career Qualification Information Service (PQI) System	• User-centered 'Neul-BaeUm' service reorganization (search service enhancement and location-based lifelong education institution information guidance, etc.) • Building an automatic connection system between the lifelong learning account system and the vocational training information network (HRD-net) • Reorganization of the website of the Central Multicultural Education Center

Classification		2017	2018
Education Research Information Activation	ICT in Administrative Information	• Improvement of NEIS function according to academic terminology maintenance • Improvement of NEIS function to check vaccination capacity • Improving the function of the personnel and benefits system of the school's accounting staff • Enhancement of User Training Environment for City and Provincial Office of Education	• Planning 4tth generation information service strategy plan • 17 municipal and provincial education offices introduce 'e-education ban' • Implementation of a project to revamp the local education finance information system (including the reorganization of the UI, resident participation budget, and the addition of new public items such as financial schools) • Proceeding the development of applied software for the establishment of a next-generation local education system. • Completed the second project of integrated information system for school facilities
	Information Standard and Information Protection	• Launch of EduTech Standardization Forum • Encourage standardization of human factors guidelines • Build guidelines for the use of the font and develop a font identification program • Building a subcommittee of the Cyber Security Center of the Ministry of Education • Proceeding the establishment of a comprehensive system for security of educational institutions • Advanced the service based on the international standards for electronic signature certification	• Development of Information Security (Information Security, Privacy) Level Assessment Indicators for Educational Institutions • Completing the design of the integrated disaster recovery center for the education information system
Globalization of e-Learning		• Uzbekistan Teachers' ICT Competency-Based Teacher Training Modular Guidance Development Project • Korea-Exchange Cooperation Forum on ICT in Education	• Promote e-Learning international consulting for 'Building a learning management system and finding ways to expand use of e-Learning content' for Cambodia • Proceeding a project to build a high-tech classroom in Rwanda, Myanma

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Special Edition

Establishment of 6th Basic Plan for ICT in Education (2019-2023)

[Background] The Ministry of Education has established a basic plan for ICT in education every five years in order to implement systematic ICT in education field. The 6th basic plan for ICT in education (2019-2023) was established to contribute to the development of education through information service as a future-oriented and effective plan by actively reflecting the demand for education policy and the demand for innovation in the future education environment due to social and cultural changes surrounding education and the development of knowledge and information technology.

{Grounds}

▸ Article 6 of the Framework Act on National Information Service
  (Construction of the Framework Plan for National Information Service)
  ① The government establishes a basic plan for national information service every five years for the systematic implementation of national information services.
  ② Includes information service in public areas such as administration, health care, social welfare, education and culture
▸ Article 7 of the Ministry of Education's Regulations for Information Service Processing (MOE Directive)
▸ Establish a basic education information service plan every five years by linking the education sector sub-plan with the national information service basic plan

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[Progress] To establish the 6th basic plan for ICT in education (the 6th basic plan below), the basic plan T/F for efficient and systematic promotion of work was organized, starting with the task report on how to implement the basic plan in the Ministry of Education. In addition, the government promoted the 6th detailed task preparation meeting (2018.9) involving the

municipal and provincial education offices and related agencies, along with the development of new tasks through the performance analysis of the 5th basic ICT in education plan, and was able to determine the estimated budget for policy tasks and ICT in education over the next 5 years by analyzing the detailed implementation tasks and budget collected. The 6th Basic Plan was developed and operated by the Education office, schools, related institutions, and experts to collect opinions from various stakeholders, and this Committee performed advisory roles on the direction and contents of the basic plan. The 6th draft of the basic plan, which was drawn up through such a process, was finalized after passing the deliberation and resolution of the 1st ICT Review Committee of 2014 on January 14, 2019, after receiving opinions from city, provincial, and related agencies through meetings of staff in charge of affairs, discussions, expert councils, and official documents.

[Main Performance] The basic plan for ICT in education was developed and implemented at each stage, starting with the first stage of the basic plan in 1996. The main characteristics of each step are as shown in [Table Figure-1]. Major achievements in 2018 at the end of the 5th basic plan for ICT in education (2014-2018) are 'Fostering Creative Talent through Convergence of Education and ICT', which is the 5th basic plan, which is to develop ICT service system, advance infrastructure, and expand information service to the overall area of education (Kindergarten, elementary, middle, high school, lifelong, vocation and welfare).

Looking at the details, There are ① Establishing a foundation for teaching and learning utilizing ICT such as SW education and digital textbooks to foster creative talent, ② Efforts to promote the sharing and distribution of academic and research information resources, including the expansion of overseas academic resources and the expansion of open lectures on the Internet, ③ Mitigating the imbalance of learning opportunities through online classes, such as providing national lifelong learning information and revitalizing the distribution of career information, ④ providing information on special education for handicapped students to secure their right to study, supporting for PC and telecommunication fees to reduce information gap among students from low-income families, and providing education opportunities to resolve information gaps for vulnerable people such as the operation of a system that takes care of

multicultural families, ⑤ Operation of the Education Information Statistics System to ensure the national right to know and to reduce the administrative work of unit schools through the enhancement of the utilization of information notification, and reduction of teachers' work, and activating the use of educational data, such as a project to improve educational administrative information system (NEIS) for reducing teachers' work and enhancing work efficiency, and improving information system services, ⑥ including the establishment of a comprehensive system for protecting educational institutions from cyber threats and damages, the creation of a safe personal information use environment for personal information protection, and the operation of information protection and talented training centers for information protection in each region to prepare for cyber threats and to promote talented future information protection personnel.

[Table Figure-1] Characteristics of the Basic Plan for ICT in Educational by each stage

Classification	Areas	Main Outcomes and Strategic tasks	Characteristics
Phase 1 (1996~2000)	• Built Infrastructure of ICT in Education • Developed and Distributed Educational Information Resources • Enhanced Education of Informational Technology • Digitalized Education Administration Information • Advanced R&D Information Foundation	• Developed a Stable Foundation for Implementing the ICT Education • Reinforced Information Accessibility through Building • Infrastructure of ICT in Education	• First Long-term Comprehensive Plan of ICT in Education • Linked to the ICT Advancement Master Plan
Phase 2 (2001~2005)	• Adapted to the Information-based Society • Created an Innovate Workforce • Promoted Partnership Information Culture • Developed Comprehensive Information Management System	• Successful Implementation of ICT Education • Universalization of e-Learning (cyber home schooling, etc.) • Establishment of NEIS • Administration Enhanced e-Scholastic	• Including Lifelong Education & Healthy Information Culture • Developed Information Indicators
Phase 3 (2006~2010)	• Developed Innovative e-Learning & e-Lifelong Learning Systems • Established e-Education Safety Net & Knowledge Management System • Globalization of e-Learning & u-Learning	• ICT Infrastructure Supplied • ICT Education Reactivation • NEIS divided into 3areas and Operated • Every Educational Area Grafted ICT	• Globalization of E-Learning & Performance Management • Transition of Informatization Projects to Regional & Local Agencies (90%)
Phase 4 (2010~2014)	• Training creative digital talent • Reinforced advanced R&D capabilities • Informatization of Communication and Convergence • Establishment of information infrastructure for education, science and technology	• Introduced and applied smart education • Researched on future education of ICT and pilot operation • Edufine, EDS service • Informatization of infant education	• Time and scope adjustment according to integration of education and science and technology departments • Establishing an integrated plan for education and science

Classification	Areas	Main Outcomes and Strategic tasks	Characteristics
Phase 4 (2010~2014)	(Strategies for promoting Smart Education) • Development and application of digital textbooks • Encouraged online classes and evaluations • Creating an environment for free use of educational contents • Reinforced teachers' ability to practice smart education • Establishment of cloud education service base	• Piloted development of digital textbooks • Conducted an online class • Discussed educational content copyright • Reinforcement of ICT capacity of teachers • Establishment of cloud education service base	• Limited elementary and secondary education
Phase 5 (2014~2018)	• Establishing a customized learning support system (kindergarten, elementary and secondary education) • Implementing a skills-oriented society (high education) • Lifelong vocational education that is linked to learning and work • A beautiful and caring educational welfare • Creating a healthy cyber culture	• Establishment of support system for creative teaching activities • Advanced the scientific information sharing distribution system • Establishing a lifelong learning system online • Resolving the digital divide among the socially caring • Establishing administrative and financial operation infrastructure for education	• Switched to a usage-oriented policy • Expanded the area of education information service to the whole of education (kindergarten, elementary and secondary schools, universities, lifetime, jobs, etc.)

[Environmental Changes] As a consideration in developing the 6th basic plan, the government paid attention to the changes in the surrounding environment surrounding ICT in education. First, the social environment changes are increasing the demand for solving congestion and improving the quality of life. This means that a 'sustainable development' to overcome changes in population structure, conflicts between generations, alienation due to polarization, and worsening ecological environment, such as the arrival of a low birth rate, aging society, and declining school age population, will emerge as an age value.

Second, open, sharing and communication have emerged as main values of policies due to changes in the administrative environment. This refers to the increased importance of policies in securing transparency in policies and the transition to an 'inclusive country' that grows together with consideration for various classes by promoting communication and sharing public information on policies through public participation, as well as providing data-based administrative services such as information connection, opening up and sharing the country's growth engine.

The third is the change in the paradigm of future education with the advent of the 4th

industrial revolution as a change in the technological environment. This means the importance of fostering future talent that can be flexibly dealt with and led by the advent of the era of the 4th industrial revolution, and the educational environment that will support it (transforming the national education paradigm, promoting information service policies to prepare for the convergence of future technology and education).

Fourth, global environmental changes are intensifying efforts by countries around the world of ICT in education. Recently, countries around the world recognize that ICT in education is a main driver of future national development and actively implement various information service policies to prepare for future education, and efforts to cope with each country's efforts to cope with changes in society, economy, and technology have emerged in various ways, such as readjusting ICT education environment, revising curriculum, strengthening teaching and learning capabilities, and establishing master plans at the national level.

[Limitations and Implications of Policies] Based on the analysis of the implementation performance of the 5th basic plan, which is the previous stage, the policy implications that should be included in the 6th basic plan were derived as shown in the following table.

[Table Figure-2] Limitations and Implications of the 5th Basic Plan for ICT in Education

Policy Limits of the 5th Plan	Future Direction
Insufficient ICT convergence education environment for fostering future talent	Future ICT education environment needs to be preemptively created for innovative future education, and systematic support is needed to enhance the ability of education participants such as students, teachers and researchers to utilize digital devices
Lack of open, sharing and utilization of educational information in preparation for the age of intelligence information	Need to increase the value and utilization of public data in education through the development of data-based education information services while responding to the paradigm shift in information utilization by upgrading educational services using intelligent information technology.
Limitations in the provision of inclusive education services throughout lifelong	Beyond elementary, secondary and higher education, support is needed to establish an education system that reflects the entire life cycle of the people and the needs of learners, and consideration is given to narrowing the gap in information services and establishing an online classes system that takes care of the underprivileged.
Lack of a policy foundation for the promotion of efficient information services	Establishment of a system of active communication for the expansion of educational information services and the formation of a consensus among the public and institutions for promoting information services, along with the readjustment of the legal system to strengthen the foundation for promoting efficient and continuous promotion of education information services.

[Picture Figure-1] Vision of the 6th Basic Plan for ICT in Education

Vision	Implementing a future intelligent education environment centered on people

Goal

[Future Type] Implementing ICT future education environment for realizing dreams and hopes
[Sustainable Type] Innovation of ICT in education encompassing primary and secondary as well as high education
[Customized Type] Providing education service for equal start with ICT
[Share Type] Implementing digital infrastructure to promote communication of educational information

Fields of Policy

4 Fields and 13 main policy issues (51 execution tasks)

Implementing future typed smart education environment	1. Establishment of teaching and learning support system fused ICT 2. Supporting the establishment of intelligent academic and research ecosystem 3. Reinforcement of the digital capacity responded to future social change 4. Establishment of future classroom where imagination becomes a reality
Innovation of sustainable ICT in education	5. Expansion of online education considering life cycle 6. Reinforcement of the information management system for lifelong education, career and vocation 7. Advance the educational and administrative service for increasing work efficiency
Realize customized educational service through ICT	8. Reinforcement of the equal welfare service based on ICT 9. Promotion of the opening customized educational information based on BigData 10. Establishment of safe operating system for each fields of educational information
Implementing shared typed digital infrastructure	11. Reinforcement of public policy communication channels 12. Establishment of integrated digital infrastructure for ICT in education 13. Secure the overseas information through exchange and cooperation

[Establishment of 6th Basic Plan for ICT in Education] Considering the limitations and implications of the policy of the previous phase of basic plan and the rapidly changing environment mentioned before, the 6th basic plan for ICT in education consisted of four goals and areas, 13 major policy tasks, and 51 implementation tasks under the vision of 'implement of person-centered future intelligent education environment'.

[Performance Indicators] The performance indicators for the management of the 6th basic plan established consisted of 17 indicators in 4 areas. The goal of achieving each indicator is

① to complete the development of digital textbooks by 2020 in the field of 'Creating a Future Smart Education Environment' and to establish a trial of next-generation RISS by 2022, to establish 2.9 million open academic information and achieve 5.4 million university licenses by 2023, ② 'Sustainable ICT in Education Innovation' and ③ 'Customized Education Services Realization through ICT' and ④ 'Digital Sharing Education Information Infrastructure'.

[Table Figure-3] Performance Indicators by 6th Basic Planning Field and Annual Discrimination Objectives

Classification	Indicator		Goal by Year				
			2019	2020	2021	2022	2023
Creating a future smart education environment	Digital textbook Development and Dissemination		(Elementary. 5 - 6) society, science, English (middle 2) science, English	(middle 3) science, English	-	-	-
	Next Generation RISS Development		ISP Establishment	1th construction (Public)	2nd construction (Agency)	Trial Operation	Stabilization
	Open Academic Information Establishment (Cumulative, Thousand cases)		2,637	2,707	2,777	2,847	2,917
	Number of use cases for college licenses (thousands)		6,303	4,588	4,873	5,158	5,443
	Wireless infrastructure expansion for elementary and secondary schools	Public and private (School)	4,440 (2018~2019)	2,882		-	-
		National (class)	50	66	65	-	-
Sustainable Education Information Innovation	Utilization of external institutions for integrated platform of career education (all cases)		700	725	750	755	800
	Number of e-Learning schools (Cumulative, School)		4,000	4,300	4,600	5,000	5,500
	Open lecture at a university Download (Thousand)		6,854	7,372	7,999	8,407	8,924

Classification	Indicator	Goal by Year				
		2019	2020	2021	2022	2023
Realize customized education services with ICT	Special Education Support User Satisfaction for Students with Disabilities (points)	77	78	79	80	81
	Number of learners supporting lifetime education voucher (accumulated, person)	10,000	17,500	30,000	45,000	60,000
Realize customized education services with ICT	EDS-based Business Mitigation Rate (%)	46.8	47.8	48.8	49.8	50.8
	Utilization of Notification in kindergarten (accumulated, million)	150	160	170	180	190
	Utilisation of school Notification (accumulated, million)	1,405	1,447	1,491	1,536	1,582
	University Alima Customer Satisfaction (points)	80.5	81	81.5	82	82.5
	Establishment of Integrated Disaster Recovery System for Educational Information System	Completion of the Center	Establishment of Disaster Recovery System	Opening and Stabilizing	Operation	Advanced

[Policy tasks and direction of implementation] The 13 major policy tasks of the 6th basic plan and the main direction of implementation by each task are as follows. ① Establishment of ICT Convergence Teaching and Learning Support System: Providing future education support system by expanding digital textbooks according to new curriculum, sharing and activating teaching, learning materials and content based on curriculum, and ② Support for the Establishment of Intelligent Academic and Research Ecosystem: Expanding Academic Information Services and Joint Utilization through the Establishment of Open-Access Environment, ③ Future Social Change Response Digital Capacity Enhancement: Building a self-directed online classes foundation, enhancing ICT education capabilities, and fostering a sound cyber ethics awareness, ④ Building a future classroom where imaginable ideas are realized: Development of customized education services, learning analysis using artificial intelligence, future models of teaching services, and development of digital education environment, which can be learned anytime, anywhere, and providing advanced education

during the first class, ⑤ Expansion of online classes considering life cycle: provision of education services encompassing elementary and secondary education and advanced education; response to diverse learning needs by age and characteristics of learners, ⑥ Strengthening of lifelong education and career and career information management system; expansion of lifelong education information links and customized education services by providing career and professional information, ⑦ Enhancement of education administration services to support diverse learning activities, increase customized education services by life cycle, and increase efficiency of work: On-time improvement of education and financial information system and operational efficiency according to changes in education policy, expansion of job reduction for teachers and staff, enhancement of competitiveness of universities by integrated management of national universities, ⑧ Enhancement of equal welfare services based on information service: enhancement of social weak, small- and medium-income families, improvement of education welfare services for equal starting line, and equal education security and education equality, ⑨ Promoting the opening of customized education information based on big data: Supporting the establishment of education policies by providing educational statistical information using big data and establishing a safe operation system for each education information field by promoting the private use of public data and ensuring the public's right to know, ⑩ Creating an environment for safe education information systems by preventing cyber breaches and establishing an integrated disaster recovery system for education information systems in preparation for disasters by strengthening the information security system for educational institutions, ⑪ Strengthening the channels of policy communication and empathy to the public: providing open services to guarantee the participation and rights of the people through educational policies, information provision and active communication channels, proposals, and policy discussions for parents, ⑫ Integrated education information service digital infrastructure: through integration of digital infrastructure in education field and development of new systems, efficiency and flexibility in operation of information system and creation of educational information resource sharing system; ⑬ Overseas information expansion through exchange and cooperation: Improving the level of national academic research and

strengthening overseas cooperation in education information by establishing a global system for joint utilization of academic in information and expanding the access channel for overseas academic information.

{Promotion System} As a promotion system for the successful implementation of the 6th basic plan, firstly, the Act and the system need to be readjusted for the promotion of systematic education information services. Establishment of a national system for promoting ICT in education, such as the enactment of the Education Information Service Promotion Act, and strengthening the momentum for implementing policies related to ICT in education by the central and local governments, should be prepared for future education by laying an institutional foundation for comprehensive systematic and continuous implementation at the national level.

[Picture Figure-2] A Schematic Design for ICT in Education
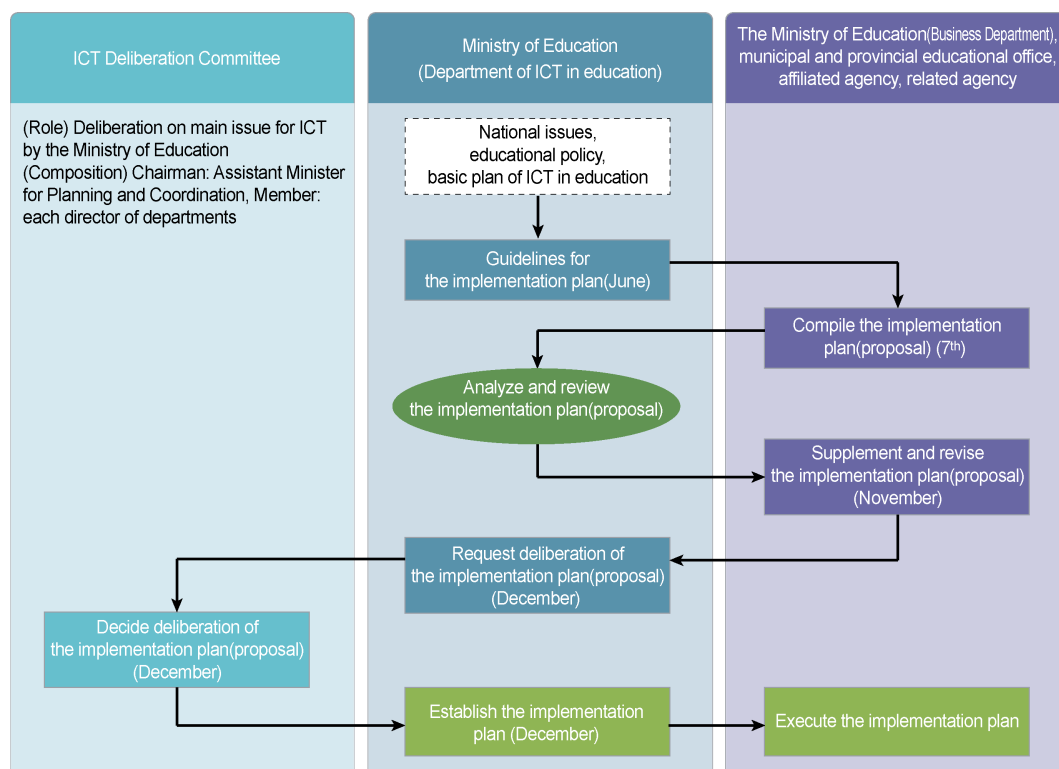
Second, it is required to vitalize the promotion organizations of the Ministry of Education, its affiliated agencies, and the education office of the municipal and provincial education offices. The Ministry of Education and its agencies will establish, review, and evaluate the basic plan for ICT in education, and the education office will form an information service promotion system for each city or provincial education office, and universities and related institutions will play a role in promoting the operation of the information service promotion committee of unit institutions.

Third, strengthening the cooperative system among the ICT in education promotion agencies and staff. The systemization and arrangement of consultative bodies can be regularized by considering the timing of implementation of existing education information services, and cooperation between agencies and agencies can be implemented in a timely manner by organizing operation methods. In addition, the performance presentation meeting can be held to provide a communication field with the municipal education office, its affiliated agencies, and related agencies, and to promote information sharing and work expertise among agencies.

{Evaluation and Feedback} An annual implementation plan was established and an evaluation system was established for the implementation of the 6th basic plan and for the establishment of a performance system. If the Education Ministry, its agencies, and the municipal and provincial education offices establish annual implementation plans (ICT in education implementation plans) and submit them to the Minister of Education, the ministry will evaluate the degree of implementation of the annual implementation plans by its agencies, municipal and provincial education offices every year (evaluate implementation of the plans) and reflect the results in the next year's implementation plan and review and decision to the Ministry of Education's ICT review committee. In addition, Feedback system was established for the Five-year basic plan, including a policy research plan, to establish the next basic plan, along with a performance indicator development and management system that could adjust and support the progress of major tasks by developing performance indicators that could identify the degree of implementation of major tasks presented in the basic plan.

[Mid- to Long-term Research Plan]

(The 1st : 2022.Top) A Study on the Vision and Major Tasks for the 7th Basic Plan
(The 2nd : 2022.Bottom) A Study on the 6th Basic Plan Performance and Limitation
(The 3rd : 2022.Bottom) A Study on the Policy for the 7th Basic Plan

WHITE PAPER
ON ICT IN EDUCATION
KOREA 2018

Introduction

Chapter 1.
ICT in Education Policy Outcomes and Promotion System

1. ICT in Education Policy Status

The process of development of ICT in education policy in Korea is divided into 1st phase: base creation (1996-2000), 2nd phase: expanding and settlement (2001-2005), 3rd phase: advancement (2006-2010), 4th phase: integration of education and technology (2010-2014) and 5th phase (2014-2018).

[Overview Table 1-1] Main contents of ICT in Education Master Plan: Phase 1 to 5

Classification	Areas	Main Outcomes and Strategic tasks	Characteristics
Phase 1 (1996~2000)	• Build Infrastructure of ICT in Education • Develop and Distribute Educational Information Resources • Enhance Education of Informational Technology • Digitalize Education Administration Information • Advance R&D Information Foundation	• Developed a Stable Foundation for Implementing the ICT Education • Reinforced Information Accessibility through Building Infrastructure of ICT in Education	• First Long-term Comprehensive Plan of ICT in Education • Linked to the ICT Advancement Master Plan
Phase 2 (2001~2005)	• Adapt to the Information-based Society • Create an Innovate Workforce • Promote Partnership Information Culture • Develop Comprehensive Information Management System	• Successful Implementation of ICT Education • Universalization of e-Learning (cyber home schooling, etc.) • Establishment of NEIS • Administration Enhanced e-Scholastic	• Including Lifelong Education & Healthy Information Culture • Developed Information Indicators

Classification	Areas	Main Outcomes and Strategic tasks	Characteristics
Phase 3 (2006~2010)	• Develop Innovative e-Learning & e-Lifelong Learning Systems • Establish e-Education Safety Net & Knowledge Management System • Globalization of e-Learning & u-Learning	• ICT Infrastructure Supplied • ICT Education Reactivation • NEIS divided into 3areas and Operated • Every Educational Area Grafted ICT	• Globalization of E-Learning & Performance Management • Transition of Informatization Projects to Regional & Local Agencies (90%)
Phase 4 (2010~2014)	• Training creative digital talent • Reinforce advanced R&D capabilities • Informatization of Communication and Convergence • Establishment of information infrastructure for education, science and technology	• Introduce and apply smart education • Research on future education of ICT and pilot operation • Edufine, EDS service • Informatization of infant education	• Time and scope adjustment according to integration of education and science and technology departments • Establishing an integrated plan for education and science
Phase 4 (2010~2014)	(Strategies for promoting Smart Education) • Development and application of digital textbooks • Encourage online classes and evaluations • Creating an environment for free use of educational contents • Reinforce teachers' ability to practice smart education • Establishment of cloud education service base	• Pilot development of digital textbooks • Conduct an online class • Discuss educational content copyright • Reinforcement of ICT capacity of teachers • Establishment of cloud education service base	• Limited elementary and secondary education
Phase 5 (2014~2018)	• Establishing a customized learning support system (kindergarten, elementary and secondary education) • Implementing a skills-oriented society (high education) • Lifelong vocational education that is linked to learning and work • A beautiful and caring educational welfare • Creating a healthy cyber culture	• Establishment of support system for creative teaching activities • Advanced the scientific information sharing distribution system • Establishing a lifelong learning system online • Resolving the digital divide among the socially caring • Establishing administrative and financial operation infrastructure for education	• Switch to a usage-oriented policy • Expand the area of education information service to the whole of education (kindergarten, elementary and secondary schools, universities, lifetime, jobs, etc.)

A. The 1st ICT in Education (1996~2000)

The main performances of general development plan of the 1st ICT in Education, which was promoted from 1996 to 2000, was to prepare ICT in education promotion system, stable infrastructure and institutional basis. First, full-scale promotion basis of ICT in education was prepared by establishing Korea Education and Research Information Service after integrating Korea Multimedia Education Center within Korean Educational Development Institute and Cutting Edge Scholar Information Center within Promotion of Learning Foundation in 1999

to promote ICT in education systematically and efficiently. Second, the main educational information service system and satellite educational broadcasting was opened. Third, information accessibility was reinforced by constructing world-class ICT in education infrastructure.

B. The 2nd ICT in Education (2001~2005)

The main performances of 'general development plan of ICT in education for educational innovation and development of human resource' are that teaching and learning activities were increased based on infrastructure built through the first development plan, and generalization was made by expanding social awareness about e-learning with the advancement of educational information service such as EBS and cyber home learning.

Also, it promoted the efficiency of educational administration through the establishment and advancement of NEIS. Meanwhile, it can provided high-quality academic information through the advancement of information distribution system.

Especially, it promoted various support projects to bridge the information gap so that it supported approximately 139,000 students with PCs and approximately 610,000 people with internet communication expenses.

C. The 3rd ICT in Education (2006~2010)

The 3rd Master Plan of ICT in Education, which was implemented from 2006 to 2010, was promoted with the objective to facilitate a u-Learning society and to build the talent powerhouse with 4 directions.

First, it tried to advance e-learning based teaching and learning system by creating knowledge of citizens and strengthening learning ability and to settle the field based ICT in education. Second, it prepared learner base learning system through ubiquitization of learning environment and progressed diverse pilot projects to maximize educational use of new technologies. Third, it continuously promoted international cooperation projects such as support on ICT in education policies of developing countries and business consulting to make

a leap in to a global leader of ICT in education. Fourth, it reinforced informatization support system of educational welfare about low-income brackets, handicapped person and Kosian for solving the gap between knowledge information and securing stability. In addition, it promoted various businesses to advance of ICT in education policies and services in the 3rd Master Plan and established Certification Authority Central of educational organization since 2007.

D. The 4th ICT in Education (2010~2014)

As Ministry of Education & Human Resources Development and Ministry of Science and Technology reorganized as integrated Ministry of Education and Science Technology (MEST) in March 2008, the 'Master Plan of ICT in Education for Science and Technology' which included education field and science and technology field was established and main directions areas follows.

First, it was to change informationization based on infrastructure to policies based on soft power cultivation. Second, it was to build environment of production, distribution and utilization of information by introducing the concept of digital learning-research ecosystem and to lead future education by connecting information and technology and learning and research in a virtuous cycle. Third, it was to create institutional and technological foundation which diverse subjects can participate and cooperate organically beyond the informationization centered on individual business. Fourth, it was to build decentralized governance system that can supply the software and contents that meet consumer's demand in national leading policies centering on existing hardware. Fifth, it was to prepare institutional system to support data based informationization policies.

E. The 5th ICT in Education (2014~2018)

In October 2014, the Ministry of Education established the 5th basic plan for ICT in education (2014-2018) to present the 5th strategic information system in five areas, including education, elementary and secondary education, higher education and academic research for capacity-oriented social development, lifelong and career education, education related to

learning and work, education welfare, special education, public information utilization and sound cultural composition. The 5th ICT in educational contributed to the formation of 'demand-oriented digital education' by expanding information services into areas of education as a whole (kindergarten, elementary, middle, high school, high school, life, job, welfare), focusing on developing ICT utilization systems and upgrading infrastructure.

[Overview Picture 1-1] Vision and Promotion Strategy of the 5th ICT in Education
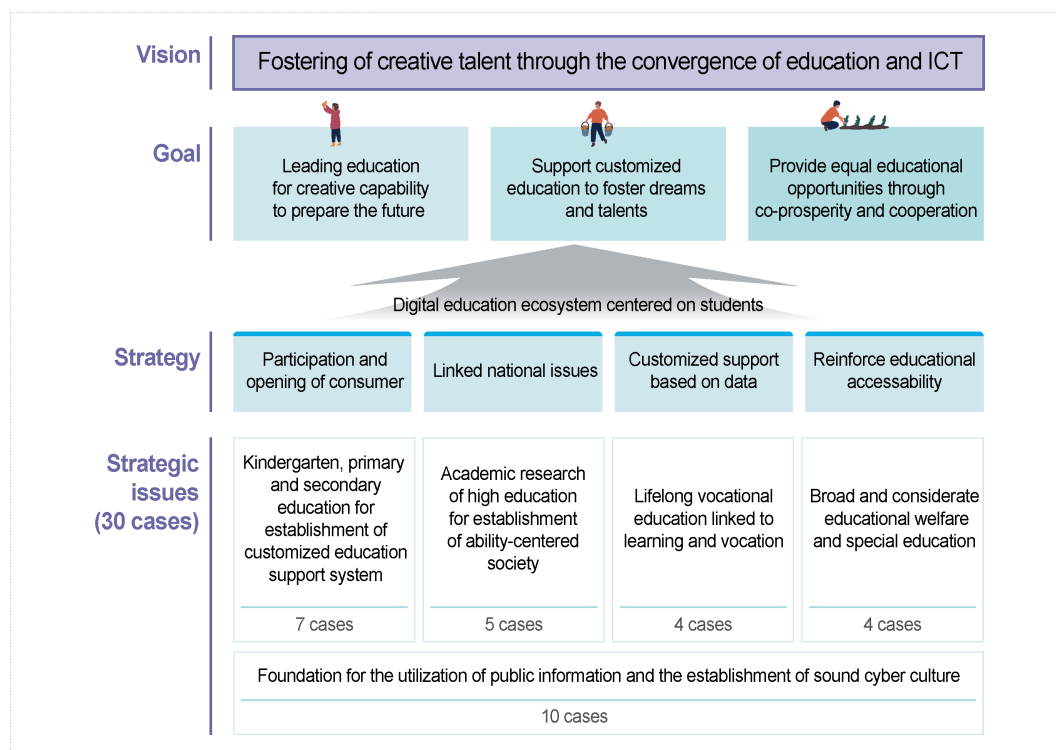
2. Promotion System of ICT in Education

ICT in education is promoted by organic cooperation of Ministry of Education, affiliated institutions, universities, metropolitan and provincial education offices and related organization. Ministry of Education is responsible for establishing, managing and adjusting master plan of ICT in education, metropolitan and provincial education offices is responsible

for ICT in education of kindergarten, elementary and secondary schools, and university is responsible for ICT in education of higher education. Related organization supports informationization tasks for kindergarten, elementary and secondary education, higher education, special education, lifelong education, job education, international education and teachers' training according to their specific duty.

[Overview Picture 1-2] Organization system of ICT in Education
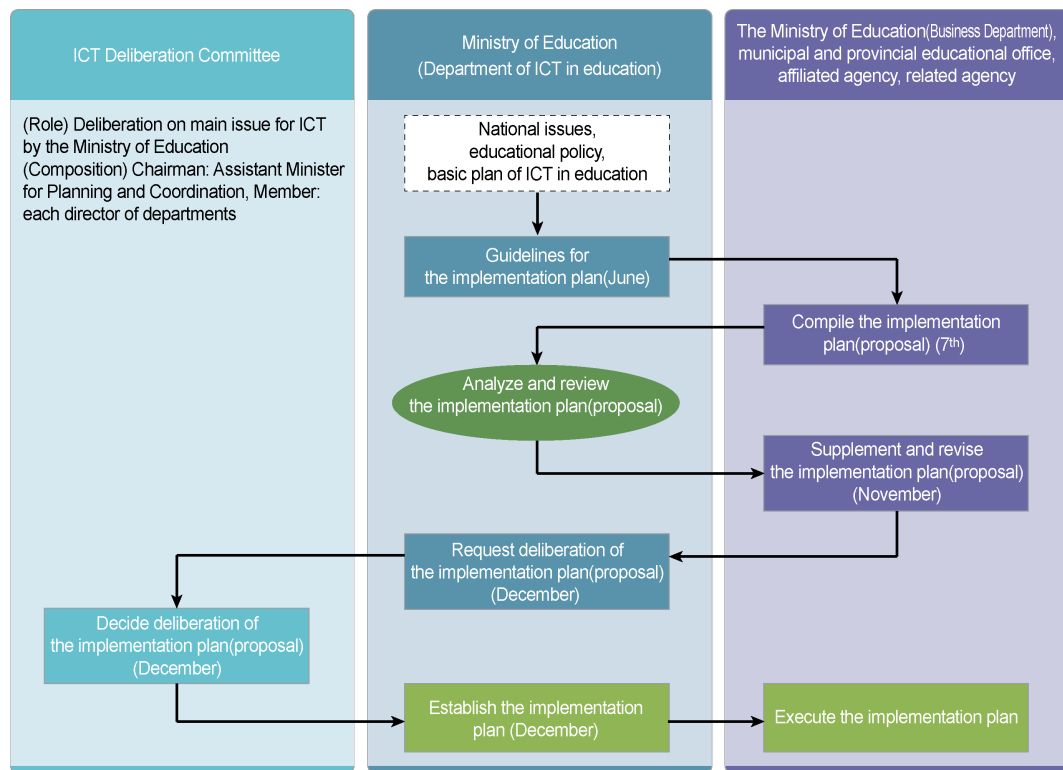
Chapter 2.

Main Status on Legal and Institution of ICT in Education

1. Overview

The legal basis for education and academic informationization in Korea, which was promoted since the 1970s, has been developed based on various legal grounds, such as the 「Education Relations Act」 and the 「Information Relations Act」. New technologies such as artificial intelligence, learning analysis, the Internet of Things, and robots are emerging, which have a huge impact on education content, methods and the environment. However, the legal system needs to be readjusted in the future as there is still a lack of legal basis for comprehensive, systematic and continuous implementation of ICT in education.

2. Trends on Legal and Institution of ICT in Education

A legal basis related to ICT in education such as the 「Education Relations Act」 and the 「Information Relations Act」 is fragmented and distributed, so there is no comprehensive legal system. For example, ICT in education is based on Article 23 of Fundamental Law of Education, academic informationization is based on Article 14 of Sciences Promotion Act and informationization of educational administration is based on Article 30 of Elementary and Secondary Education Act. As such, policies or legal basis for each business is distributed.

The 「ICT in Education Promotion Act」 was introduced in 2017 as a comprehensive law encompassing the entire information service of education, but it is still in the process.

Meanwhile, Information education of elementary and secondary schools is vital on a basis revised 2015 curriculum (Notification 2015-74, the Ministry of Education), and the 「Science, Mathematics and Information Education Promotion Act」 was enacted, allowing to establish diverse educational environments that serve as the basis for information education.

There are moves to push for legislation at home and abroad with the recent emphasis on media literacy. In the U.S., 10 states have completed or are pushing for the 「Media Literacy Education Act」, and Korea has also introduced two laws since 2017.

3. Status and prospects of ICT in Education Legislation

Education should be prepared for change in the era of the fourth industrial revolution due to the rapidly changing convergence of information and communication technology and education in the intelligent information society. In other words, AI (Artificial Intelligence), Learning Analytics, IOT (Internet of Things) and Robot (Robot) technologies have developed rapidly, and are seeking meaningful changes and innovations in education by converging new technologies in different areas of education.

To continuously improve and promote educational content, education methods, and the educational environment in response to these changes in the times, the fundamental legal system should be constantly researched and supplemented when the necessity arises. However, the government should carefully review and prepare whether the new ICT in education is acceptable under the existing legal system or whether it will come up with a new legal system.

Chapter 3.
ICT in Education: International Trends

1. Overview

A total of 17 'Global Trends of ICT in Education[1)]' are being published by Korea Education & Research Information Service on the agency's website in 2018. Among them, the main trends were compiled into seven topics. It were that ① a national policy for ICT in education, ② digital expertise of teachers, ③ innovation of schools through artificial intelligence, ④ innovation of schools through block chains, ⑤ platforms and Web services for education, ⑥ future schools using advanced technologies, and ⑦ vocational training through digital technologies.

2. Main Trends by Subjects

A. ICT in Education: National Policies

Many policies are being pursued to improve the informationization of school education not only in advanced countries but also in developing countries. The government is pushing ahead with policies such as wireless networks at schools, information infrastructure such as PCs for students, modifying curriculums including information education curriculums, and research schools. It's as follows if examine four of them.

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1) http://lib.keris.or.kr/searchA/dlo?briefType=T

The 'Digital Education Action Plan', announced by the European Commission to improve the digital capabilities of European citizens, presented three priorities and presented specific measures to address them after clarifying their objectives. The measures included supporting high-speed broadband at schools, spreading the school's self-assessment tool, 'SELFIE (Self-reflection tool for digitally capable schools)', for self-assessment of the school's ability to utilize technology in teaching, and creating a pan-European platform for digital higher education.

The New Zealand government has published 'Digital Technology' composed eight curricula (English, Art, Health and Physical Education, Language, Mathematics and Statistics, Science, Society and Technology). It is designed to help students design and produce their own objects using high technology and improve their 'computing thinking skills'. Integration into technical subjects will be carried out from 2018 and integration itself will be mandatory from 2020. The integrated 'Digital Technology' covers all elementary and secondary schools and consists of five areas: They are computing thinking power utilizing digital technology, digital design and development, physical design and development, process design and development, design and visual communication.

The Chinese and Japanese governments (the Ministry of Education) are encouraging and supporting the ITC in education of local governments by publishing the ICT in education policy at the national level. First of all, China's 'ICT in Education 2.0 Action Plan' presented various policies with the aim of overhauling the school's information service infrastructure and platform and enhancing the information quality of teachers and students by 2020. Among them, the real-name Internet learning space for teachers and students, the establishment of a lifelong electronic learning system, and the promotion of school's information service through ICT in education pilot areas and pilot schools are included. In Japan, the 'Five-Year Plan for School Education ICT Environment Improvement (2018-2022)' that provides about 10 trillion KRW (approximately 60 million KRW per school for five years) in order to improve the environment of the school's ICT in education infrastructure, and the results of measuring the level of school's ICT in education are published every year, from city to district and province. The survey items include the ratio of wireless networks in general classrooms and the ratio of

digital textbook maintenance. According to the findings released in 2018, Japan's ratio of digital textbooks to modify stood at 54.5 percent for elementary schools, 60.5 percent for middle schools and 14.1 percent for high schools, with a total average of 50.6 percent. The wireless LAN modification rate in general classrooms was 41.5 percent for elementary schools, 39.6 percent for middle schools and 23.8 percent for high schools, with the total average standing at 38.2 percent. In addition, the government can read about the activeness of the school's information service policy, including the revision of the 「School Education Act」 to promote the digital textbook policy.

B. Digital Professionalism of Teacher

In order to enhance teachers' digital expertise, huge budgets and extensive policies are being pursued for teachers in general and digital-related subjects. After establishing physical training facilities or setting qualifications, the government is strategically approaching by recruiting and selecting the desired teachers and schools. For example, the U.S. Department of Education of Wisconsin provides education for rural schools, library teachers and librarians, and also supports improving communication accessibility of educational facilities. Apple had been running a free coding learning program for 500,000 Chicago students called 'Everyone Can Code' since late 2017, in which it created a center building to improve the coding capabilities of Chicago teachers.

The Department of Education's National CS (Computer Science) Education Center will operate from 2018 to enhance the expertise of 8,000 teachers related in computing science subjects each year. About 84 million pounds (about 120 billion KRW) has been earmarked for this purpose.

In New Zealand, it is pushing for a policy to strengthen teachers' digital capabilities to prepare for future jobs. A website called 'Kia Takatu A-Mathihiko[2]' provides various online toolkits (Pīka) and related videos and self-assessment tools (Te Tokorima-ā-Mahuika) that help

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2) https://kiatakatu.ac.nz/

develop teacher expertise. A total of 12 million New Zealand dollars will be invested to improve the digital expertise of some 44,000 teachers.

C. School Innovation through AI

Trends in education using artificial intelligence in foreign countries can be divided into two main criteria. It can be divided into the types of real-time interaction between students and systems (content presentation according to student learning, real-time dialogue with students) and the types of student learning-related data (numeric, text, voice, video) that the system analyzes. A notable part of this is the analysis of emotions through students' facial expressions, which can be confirmed in New Zealand and China.

The United Arab Emirates Ministry of Education plans to provide an artificial intelligence-based customized learning system in four subjects (mathematics, science, English and Arabic) for students of 10 public middle schools in Abu Dhabi from 2018 and expand the number of students to be eligible in 2019.

In New Zealand and China, private companies are introducing artificial intelligence-type learning systems that enhance learning effectiveness by recognizing and interacting with emotions through students' facial expressions. In New Zealand, the company called Vector is offering free learning services to Auckland elementary school students through an avatar called 'Will' as known as 'digital teachers'.

Through its artificial intelligence-based facial recognition software called 'Mabao-su (妈宝秀)', China's Shindongbang Education Group not only classifies the photographs of infants by students, but also analyzes the background, objects and behaviors in the pictures to provide teachers and parents with features such as children's interest and interpersonal relationships. In addition, a company called TAL (好未来) in China is providing teachers and parents with concentration levels through students' behavior, posture and facial expressions during class, and will develop a customized learning evaluation system.

D. School Innovation through Blockchain

Blockchain is a 'Distributed Ledger' technology, which has advantages such as security, network and recordability, and various methods are being tried to use it for school education. New York City University can pay tuition with Bitcoin, and the U.S. Central New Mexico's Community College issues 'student-owned digital certificates' through blockchain. The Tunisian government has begun using blockchain to track the quality of school meals in free school lunch programs for the underprivileged, and the Indian government has decided to introduce a blockchain-based academic degree issuance system (India Chain) to solve the problem of academic forgery.

Meanwhile, blockchain-based platforms specialized in teaching learning services include 'Smart City University' built by the Smart Dubai office in the United Arab Emirates and the Dubai Future Foundation. This platform can be seen as a kind of lifelong education platform to improve the digital skills of the entire youth and citizens of Dubai.

E. Educational Platform and Web services

A growing number of platforms and Web services are providing free coding-related content and educational digital content at the government level (Ministry of Education), local government units or global companies.

In the case of coding, the U.S. state of South Carolina has launched a coding education platform called SC Codes[3], which provides free services to K-12 students and ordinary people, and Facebook has teamed up with Sphero to provide free coding courses (CodeFWD[4]) to fourth from eighth grade students and teachers in the U.S.

For digital content, Saudi Arabia announced it would provide all digital textbooks through the Ministry of Education's educational portal. Jordan has launched a MOOC-based platform called 'K-12 Edraak' for K-12 students and teachers, and currently offers video lectures and evaluation materials for middle school students. The language is Arabic, which will be

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3) www.sccodes.org
4) https://techprep.fb.com/codefwd/

expanded to other subjects in the future. Ministry of Education in Singapore hopes that through its online platform (SLS, Student Learning Space), which was established in May, students and teachers will lead to better teaching services. Ministry of Education in China also uses its 'National Education Resources Public Service Platform' to select excellent classes from more than 1 million video clips of classes installed by teachers, encouraging many other teachers to learn. Special schools as well as elementary and secondary schools are included in the list.

F. Future School utilizing High Technology

The state government of New South Wales, Australia, has decided to provide the latest digital kits, including robots, virtual reality viewers and 3D printing, to all government elementary and secondary public schools from October 2018. It is a digital package with a total of 660 kits, with a budget of about 18.4 billion KRW to do so. It also plans to study teaching method for education on the latest technology.

Education Office in China in Anhui Province plans to operate the 'Wisdom Campus' policy, which can be seen as a kind of 'smart school', in some 300 elementary and secondary schools in the jurisdiction in 2018, and establish it in all schools in the province by 2020. Through the Wisdom Campus, it will push for the establishment of 'automatically sharpening through a professional task evaluation system', 'digital textbooks', and 'blackboardless classrooms and Internet classrooms'. China's education platform company 'Baidu Education' constructs Smart Classroom (Wisdom Campus) at 121 schools in Sangyeoyu, a poverty-stricken area in Jiangxi Province, provides free high quality content and analyzes various learning data to support customized teaching lessons for teachers and students. It also has advanced technical features such as providing VR content and VR devices, analyzing students' learning conditions and utilizing apps on smartphones.

G. Vocation Training through Digital Technology

In response to the rapidly changing information society, countries around the world are providing free or paid training and internship programs to help students find jobs by educating

them on digital skills such as coding, and are investing huge amounts of resources.

In March, the Pennsylvania State Government announced a 'PASmart' policy for human resources development through STEM education. This policy includes STEM and computer science education in K-12 sectors, as well as internship programs and worker retraining programs in STEM and computer science-related companies. About $7 million is expected to be invested for the internship program, and about $3 million for the worker retraining program (Externship), and website was established. (pa.gov/smart)

The United Kingdom government plans to form an 'Institute of Coding (IoC)', which is coding education consortium, to improve the digital skills of the people and invest about 30 billion KRW. Notable point is not to directly educate adults on digital capabilities, but to promote activities such as preparing relevant industry standards and credentials (education for fostering adult digital capabilities) or studying job digitization, and sharing best practices and business outcomes through five universities (Broadcasting University, Aston University, Coventry University, London's Curie University, and Bath University).

The African Development Bank has launched the 'Coding for Employment Program', which is a coding technology training program for youth and women in Africa. Rockefeller Foundation, Microsoft and Facebook are joining as partner organizations. The aim is to foster the technological talent needed for future development in Africa by easing the digital divide and supporting local youth to find promising jobs amid the rapidly growing youth population in Africa. By 2025, the company aims to train about 50 million teenagers in coding technology, with 25 million of them employed.

Part 1
ICT in Elementary and Secondary Education

Chapter 1.
Policies of ICT in Education

Establishment of ICT in Education and Implementation Plan by Municipal and Provincial Education Offices

1. Project Overview

According to Article 7 of the Framework Act on National Informatization and Article 8 of the Regulations for Information Service Processing of the Ministry of Education, the Ministry of Education prepared a systematic implementation plan of the Fifth Basic Plan for Education Information Service (2014-2018), and promoted the 2018 ICT in Education plan to support the government's increasing demands for information and communication technology changes in the education information service sector, including the fourth industrial revolution and new technologies.

2. Project Promotion Status

The project status of the ICT in Education implementation plan of the Ministry of Education, the municipal and provincial education offices and related agencies in 2018 was a total of 27 agencies, 693 projects and a budget of about 630.6 billion KRW, with the project

budget increasing by 111.6 billion KRW (24.5 percent) and the number of projects increasing by 13 (2 percent).

[Table 1-1-1] Overview Table of an Annual Budget (Based on May, 2018)   (Unit: Number, Million KRW, %)

Institute	Number of Project in 2017	Number of Project in 2018	A Closing Account in 2016	A Closing Account in 2017	Budget in 2018	Budget in 2016~2018 (Total)	Increase and decrease compared last year	Budget increase and decrease rate (%)
Ministry of Education	16	15	30,525	50,472	82,100	163,097	31,628	62.7
Municipal and Provincial Education Office	474	639	274,246	375,249	517,741	1,167,236	142,492	38.0
Affiliated Agency	5	5	0	1,789	1,524	3,313	△265	△14.8
Related Agency	35	34	27,360	27,809	29,316	84,485	1,507	5.4
Total	680	693	426,499	455,319	630,681	1,512,499	111,687	24.5

A. Status by Project and Strategic Task

The budget for municipal and provincial education offices was based on projects such as establishing and operating EduFine (29.2 percent), supporting information devices (PCs, etc.) (10.4 percent), distributing software (9.2 percent), supporting informatization (8.9 percent), and NEIS (4.2 percent). The project with the biggest budget increase was the EduFine-related budget, which accounted for 87.8 percent of the total budget increase.

[Table 1-1-2] Status of Budge by Strategy   (Unit: Number, Million KRW, %)

Strategy	Budget in 2018	Increase and decrease budget compared last year	Increase and decrease rate compared last year
[Strategy 1] Kindergarten, Elementary and Secondary Education for the Establishment of a Customized Learning Support System	245,196	23,908	10.8
[Strategy 2] A Study on Higher Education and Academic Studies for the Capability-Centric Society	14,851	2,468	19.9
[Strategy 3] Lifelong and career education that links learning and work	3,838	1,013	35.9
[Strategy 4] Education welfare, and special education that is generous and considerate	45,653	△2,295	△4.8
[Strategy 5] The Foundation for the Utilization of Public Information and the Establishment of a Healthy Cyber Culture	321,143	150,269	87.9
Total	630,681	175,363	38.5

The project budget by strategy accounted for 38.9 percent of [Strategy 1] with 245.19 billion KRW, 2.4 percent of [Strategy 2] with 14.85 billion KRW, 0.6 percent of [Strategy 3] with 3.83 billion KRW, 7.2 percent of [Strategy 4] with 45.65 billion KRW, and 50.9 percent of [Strategy 5] with 321.140 billion KRW, 89.8 percent of the total budget.

B. Status by Project type

If look at the budget by type of project, there are six planned projects, accounting for 0.9 percent of the total project, with a budget of 2.29 billion KRW set aside, accounting for 0.4 percent of the total budget. 101 projects (14.6 percent), 234.65 billion KRW (37.2 percent), 432 (62.3 percent), 317.25 billion KRW (50.3 percent), and 154 (22.2 percent) were supporting information service policies, with 76.47 billion KRW (12.1 percent).

[Picture 1-1-1] The Increase and Decrease by Project and Budget of Municipal and Provincial Education Office

(Unit: Million KRW)
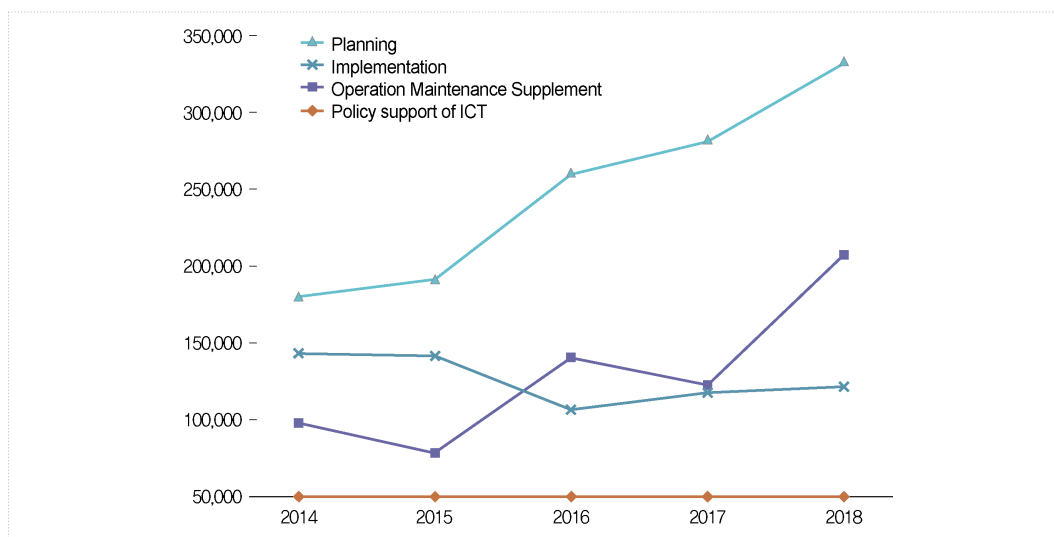
C. Status by Type of Project

According to the size of the budget for each type of project, 23 new projects, which is 3.3 percent, were worth 67.7 billion KRW (10.7 percent), and 670 projects (96.7 percent), which is

about 562.9 billion KRW (89.3 percent). The size of the budget for new projects is relatively weak compared to those for continued projects. Accordingly, it is necessary to make efforts to secure budget for new projects to enhance the importance of information service projects and competitiveness in education.

[Picture 1-1-2] Status of budget by type of project in municipal and provincial education offices (Unit: Million KRW)

Seoul	Buan	Daegu	Incheon	Gwangju	Daejeon	Woolsna	Sejong	Gyeonggi	Gang-won	Chung-Buk	Chung-Nam	JeonBuk	JeonNam	Gyung-Buk	Gyung-Nam	JeJu
		1,527				65		422					275	9		
10,140	571	2,916	1,063		12,762	7,474	10,465	34,015	8,255	9,733	8,356	10,927	10,437	12,362	18,422	153
28,207	18,095	30,903	19,070	22,530	16,401	7.628	3,628	15,168	9,069	14,422	8,656	11,709	21,659	27,996	12,123	17,171
8,494	4,446	2,375	5,697	38	917	1,342	421	9,037	8,053	2,900	4,013	3,758	9,243	5,647	4,018	2,568

3. Future Plans

The municipal and provincial education offices and related agencies should establish a system that can supplement areas that are insufficient and expand areas that are well-run by managing performance according to their own implementation plan every year. In addition, the Ministry of Education should coordinate overlapping projects and share best practices with each other by readjusting the implementation plans promoted by the municipal and provincial education

offices and related agencies, while supporting each other to reflect the specificity of each city or province.

In addition, the 6th basic plan for future-oriented and effective ICT in Education (2019- 2023) will contribute to the development of education information service by proactively responding to changing educational environment and actively reflecting the demand for education policies.

Section 2. Operation of the National Curriculum Information Center (NCIC)

1. Project Overview

The National Curriculum Information Center (NCIC) launched the service in 2011 with the aim of smoothly disseminating and promoting national education courses. Recently, the need for increasing the demand for the implementation of specialized curriculums of unit schools, such as the liberalization of curricula, has been increased in connection with the growing need for the distribution of data to support them.

2. Main Content of Project

The main contents of NCIC's operation project are presented in summary as follows.

First, it is focusing on operating NCIC homepage normally. In particular, the government is striving to resolve problems and errors that occur during the operation of the website, and to cope with complaints such as questions and answers related to the utilization of installed data. In addition, NCIC operation status is investigated by examining visitor statistics and website usage patterns and is used as basic information for maintaining and repairing the homepage.

Second, it publishes information on international trends research projects, including data on state-level education courses and follow-up measures provided by the Ministry of Education, the organization and operation guidelines of 17 municipal and provincial education offices, and the outcome of international trends screen projects conducted by the Korea Institute of Curriculum and Evaluation, and provides original education process files from 61 countries around the world.

[Picture 1-1-3] Contents and procedures of the NCIC's operation project

| Operate System | → | Emerge issues and requirements | → | Analyze and Summarize requirements | → | − DB datafication
− Load data
− Resolve other problems | → | Test, supplement and revision | → | Operate system normally |
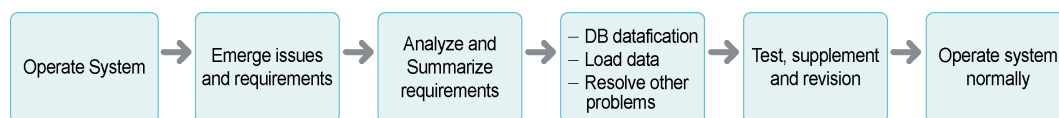
※ Reference: Lee, Geun Ho, et al (2017). Maintenance of The National Curruculum Information Center (NCIC) Homepage

3. Main Outcomes

Major achievements of NCIC's operation in 2017 include the maintenance, repair and operation of NCIC homepage (2017.1-12017. 12.31) research project to disclose new data on the national curriculum and to suggest the smooth provision of services to the people of the curriculum. As a result, a total of 510,365 people (an increase of 1.76 percent from the previous year) visited NCIC's website in 2017 to enhance KICE's status as a national education curriculum research and development center and solidify policy coordination with relevant departments (the Ministry of Education) in public service.

[Picture 1-1-4] Number of visitors accessing the NCIC (March, 2017~February, 2018)   (Unit: Person)
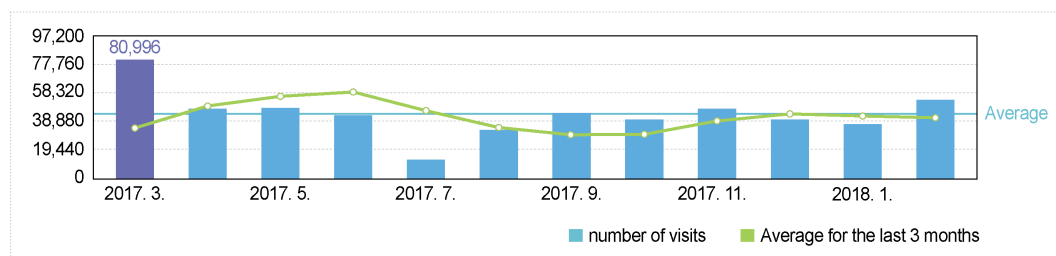
4. Future Plans

Based on the inspection and demand investigation of the current system, the following issues should be considered to establish the mid- and long-term measures for revitalizing the operation of The Curriculum Information Center.

First, NCIC's professional and smooth operation and management requires the formation of

a dualistic structure of 'system management and operation team' and 'data management and operation team'.

Second, it is necessary to devise measures to enhance utilization by providing menus and information contents provided to users in a selective and careful selection from information and data provided by NCIC. Specifically, when new national curriculum data is generated, only the original text download service is provided instead of the existing inventory service. In addition, English translation and application of the latest curriculum (revised 2015 curriculum) is urgently needed for English websites.

Section 3. Development and Application of Digital Textbooks

1. Project Overview

Textbooks are for students used for school education. Until now, Korean textbooks have played an important role in enhancing the level of national education as an important educational tool that specifically embodies and communicates the national curriculum to students. However, it has been pointed out that too much knowledge is summarized and compressed in the textbook, which leads school classes to an infusion-based education centered on knowledge transfer, and is lacking in drawing students' interest and motivation. Based on the development of information and communication technology, digital textbooks have begun to supplement the limitations of booklet textbooks and seek them as a tool to lead changes in classroom classes. After research and development, readjustment of the system, pilot application and effectiveness verification, the application of general schools was promoted from 2018.

2. Promotion Status

A. Development and Distribution of Digital Textbooks

Korea's digital textbooks are being developed by applying the e-book standard (EPUB 3.0) and Web standard (HTML5) technology in accordance with the 'Guidelines for Digital Textbook Production' of the Ministry of Education and the Korea Education and Research Information Service.

A total of 85 digital textbooks are available as of August 2018, 81 of which are digital textbooks according to the revised 2015 curriculum, and 4 of those are social studies and

science and digital textbooks subject for fifth-grader to the 2009 revised curriculum. In addition, development of digital textbooks for fifth and sixth graders and second graders of middle schools, which will be applied in 2019, is underway.

B. Establishment and Operation of Digital Textbook Service Platform

In order to support teaching and learning using digital textbooks by teachers and students, service platforms such as the viewer, learning community, Wedorang, account authentication and integration system are established and operated. Digital textbook viewer is a program dedicated to the teaching and learning support of digital textbooks with the functions of downloading textbooks, viewing textbooks, and supporting various teaching methods and studies. Wedorang is a social network service on a per-class basis to support real-time sharing of opinions, data mounting and management, sharing activities and creating learning portfolios for teachers and students.

With digital textbooks, Wedorang supports PCs, laptops, smart pads and smart phones, and as digital textbooks are introduced in line with the revised 2015 curriculum, digital textbook viewers are reorganized by applying browser-based rendering engines to enable stable operation in various operating systems.

C. Support the Use of Digital Textbooks and Strengthen Teachers' Competency

The 2009 revised curriculum digital textbooks were applied mainly to research schools to verify their effectiveness from 2014, and teachers and students of ordinary schools who wish to use digital textbooks were authorized to use them voluntarily from 2015. The use of digital textbook has been gradually expanding since 2018 due to the introduction of new digital textbooks, application of realistic contents and promotion of wireless infrastructure for elementary and secondary schools, and the number of schools with digital textbook usage records stood at 7,171 as of August 2018.

[Table 1-1-3] Status of Schools Utilizing Digital Textbooks (2014~2018)   (Unit: School)

Classification	School Level	2014	2015	2016	2017	2018. 8
Research School	Elementary	81	71	86	43	33
	Middle	82	63	42	29	18
	Total	163	134	128	72	51
Public School	Elementary	-	1,063	3,085	3,637	4,876
	Middle	-	395	1,800	2,182	2,244
	Total	-	1,458	4,885	5,819	7,120
Total	Elementary	81	1,134	3,171	3,680	4,909
	Middle	82	458	1,842	2,211	2,262
	Total	163	1,592	5,013	5,891	7,171

※ Criteria for the number of schools with a record of using (connected) digital textbooks of teachers or students
※ As of August 31, 2018

Instructor teachers are selected and nurtured every year for training in the use of digital textbooks. Thirty four classes (one for city and provincial elementary and one for secondary research) are operated every year to facilitate research on digital textbooks. Following the adoption of digital textbooks for the revised 2015 curriculum, the guidebook and online and offline training programs were revised, and supporting data for the use of the newly introduced real-world contents are also being developed and distributed. Since January 2018, the government has been actively promoting teacher training (collective training, school visiting training, etc.) to promote digital textbooks, briefing sessions, and consulting for schools using them.

3. Main Outcomes

A. Enhancing the Platform for Developing and Providing Realistic Digital Textbooks

Digital textbooks have been developed and applied, and related technologies have been accumulated and the delivery platforms have been enhanced by continuous improvement in response to site demands and changes in the information and communication environment. Applying e-book standards (EPUB 3.0) and web standards (HTML5) technology, Windows,

Android and iOS operating systems were supported simultaneously, while realistic digital textbooks containing realistic content with new technologies were developed in the revised 2015 curriculum, enabling indirect experience of phenomena that are difficult to experience in real life. Learning community Wedorang is continuing to develop by supporting communication and collaboration, learning records management, and process-oriented assessment while teaching and learning. As a result, Wedorang KRW the grand prize in the public service sector at 'Mobile Awards Korea 2018' in April 2018.

B. Increasing Capability of Teacher and Changing Lectures in Classroom

In digital textbook classes, teachers help students learn self-directed, and promote diverse activities, not as transporters of knowledge. As a result, the class has been transformed into a focus of student activities, such as self-directed individual learning, information exploration, discussion, and project activities.

[Picture 1-1-5] Changes in Classes Before and After Using Digital Textbooks (5 point scale)   (Unit: Point)

Results of pre and post examination of research schools in 2016

Results of pre and post examination of research schools in 2017
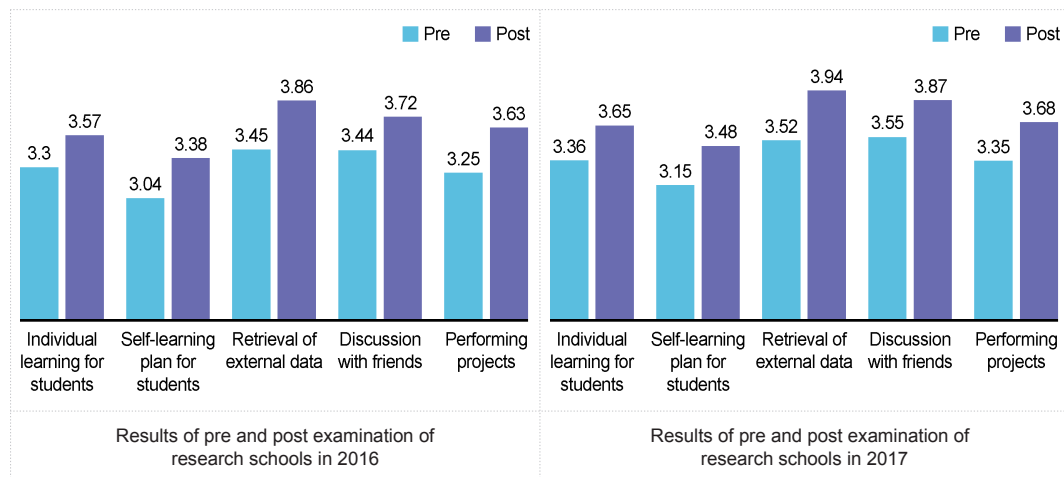
Examples of digital textbook classes centered on student activities include 1,700 class videos developed by research schools and class research institutes, and 12,000 teaching and learning programs through Edunet, T-Clear. (www.edunet.net)

C. Increase Students' Competency through Digital Textbook Classes

According to the results of the effectiveness test for researching digital textbook on schools from 2014 to 2017, digital textbooks are consistently effective in improving students' abilities, including self-directed learning ability, creativity and innovation ability, information utilization ability, collaboration ability, critical thinking, and learning effectiveness, and enhance the interest and satisfaction of classes.

[Picture 1-1-6] Changes in Students' Capability Before and After Using Digital Textbooks (5 Point Scale)

(Unit: Point)

Results of pre and post examination of research schools in 2014

Results of pre and post examination of research schools in 2015

Results of pre and post examination of research schools in 2016

Results of pre and post examination of research schools in 2017
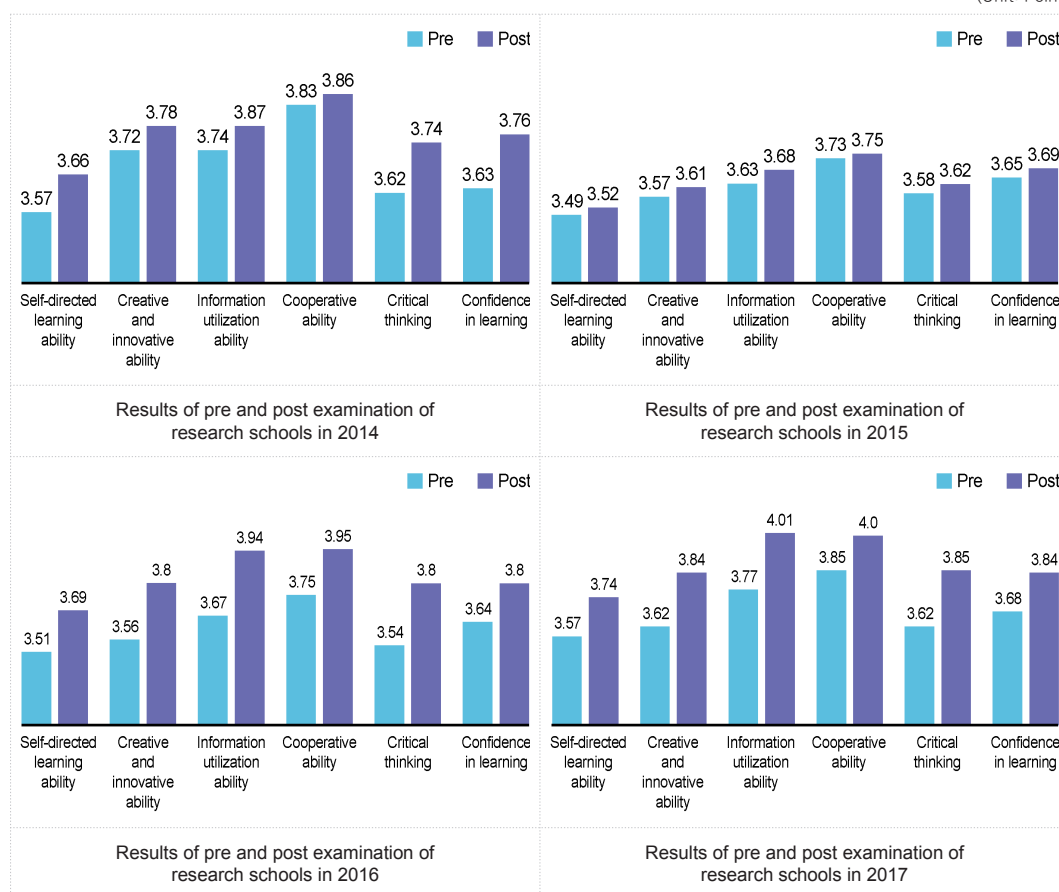
4. Future Plans

In 2019, new digital textbooks will be distributed to fifth and sixth graders in elementary school and second graders in society, science and English subject, while realistic content first applied to third and fourth graders in elementary school will also be expanded to fifth and sixth graders in elementary school, first and second graders in middle school and science subjects. Research schools and leading schools for the generalization of digital textbooks will also be operated at 900 schools nationwide, and the establishment of wireless infrastructure for elementary and middle schools to utilize digital textbooks will also be carried out in parallel. In addition, it is expected to promote digital textbooks, improve classroom classes through them, and improve student competency as teachers, students, and parents are preparing to provide briefing sessions and training, operation of instructors and field support teams, development and distribution of application models and support materials.

Section 4. Software (SW) Education

1. Project Overview

The government began to discuss software education through 'Software (SW) Central Society Realization Strategy Report Meeting' jointly held in July 2014 with the Ministry of Education, Science and ICT (formerly Ministry of Science, ICT and Future Planning), the Ministry of Trade, Industry and Energy and the Ministry of Culture, Sports and Tourism after recognizing the need to cultivate talent people with computing thinking skills required in the rapidly changing world education trend. After the revised 2015 curriculum for elementary and secondary schools was announced in September 2015, software education was required to be completed for 17hours in elementary schools from 2019 and 34 hours in stages from 2018.

The Ministry of Education and the Ministry of Science and ICT have developed and implemented comprehensive plans, including human and material infrastructure, such as building a quality environment, finding and spreading good cases, and fostering a culture of correct software education and promotion, in order to successfully settle the necessity of software education in elementary and secondary schools that will be implemented in phases from 2018 according to revised 2015 curriculum. In addition, the 「Act on Promotion of Science, Mathematics, and Information Education」 was amended and enforced to provide a legal basis for the development and promotion of information education

2. Status and Outcome of Major Projects

The Ministry of Education together with the Ministry of Science and ICT sought to establish a 'Plan for Promoting Software Education' to prepare a foundation for the necessity of software education and to promote systematic software education centered on schools. As part of this project, the government established a cooperative system with the school's field,

city and provincial education offices and related experts through research and development school management and policy consultation, and actively reflected the opinions to promote software education.

In addition, the Korea Education and Research Information Service has been promoting various projects in accordance with the Ministry of Education's initiative, including strengthening the ability of teachers in charge, operating software education research and leading schools, and developing and distributing educational materials in order to successfully settle the necessity of software education and revitalize school-oriented software education.

A. Reinforcement of Teacher's Professional Competence

The Korea Education and Research Information Service is pushing for training to establish a human foundation for the essentialization of software education as the 'National Initiative Project' in accordance with the revised 2015 curriculum for software education. In order to strengthen the teaching ability of teachers in charge and to provide a foundation for the promotion of training for software education by the municipal and provincial education offices, remote and collective training is operated by the Ministry of Education, the Ministry of Science, Technology and ICT, the Metropolitan Office of Education, the Korea Education and Research Information Service and the Korea Foundation for the Advancement of Science and Creativity. Various training programs are carried out for each school grade and contents by dividing the target and contents of the training among the promotion agencies.

[Table 1-1-4] Training Plan for Teacher's Competence (Unit: Person)

School Class	Course Name	Number of course	Form	Institute	Number of people
Elementary· Middle	① Training for Leading Instructors	30	Collective	Ministry of Education / KERIS	200
Elementary	②-1 Remote (basic) training for elementary	15	Remote	Municipal and Provincial Education Office	20,000
	②-2 Remote (advanced) training for elementary	30			20,000
	②-3 Training for elementary	More 15	Collective	Municipal and Provincial Education Office	16,180

School Class	Course Name		Number of course	Form	Institute	Number of people
Middle	③-1 Remote training for middle		30	Remote	Municipal and Provincial Education Office	3,510
	③-2 Training for Middle		15	Collective	Ministry of Education / KERIS	500
Elementary · Middle	④ Core Instructor Training	Elementary	30	Collective	Ministry of Education / KERIS	2,129
		Middle			Ministry of Science and Technology/Korea Foundation for the Advancement of Science and Creativity	600
	⑤ Professional training		45		Ministry of Science and Technology /Korea Foundation for the Advancement of Science and Creativity	100
	⑥ A visit to all elementary schools		More 2		Municipal and Provincial Education Office	6,040
	⑦ Manager Training		3～4			4,700
	⑧ Other municipal and provincial self-Training			Remote · Collective		

※ Reference: Ministry of Education, '2018 Software (SW) Training Plan for Competency Reinforcement', 2018.3

B. Discovering and Spreading the Best Software Training Models

1) Operation of Software Education Research School

The Ministry of Education has designated and operated software education research schools since 2015. The designated research schools carry out research tasks related to software education, such as organizing and applying software education in the regular curriculum for two years according to the revised 2015 curriculum, exploring ways to promote software education outside the regular curriculum, developing software education professors, learning methods and evaluation models, operating teachers and computer rooms, and enhancing awareness of software education.

[Table 1-1-5] Status of designation by municipal and provincial software education research school

Classification	Seoul	Busan	Daegu	Incheon	Gwangju	Daejeon	Ulsan	Sejong	Gyeonggi
Elementary	1	1	1	1	1	1	1	1	1
Middle	3*	2	1	1	0	1	1	0	3
High	1	1	1	1	1	1	0	0	1
Total	5	4	3	3	2	3	2	1	5
Classification	Gangwon	ChungBuk	ChungNam	CheonBuk	CheonNam	GyeongBuk	GyeongNam	Jeju	Total
Elementary	1	2*	2	0	1	1	2	1	19
Middle	1	0	0	0	1	0	1	0	15
High	0	2	0	0	1	1	1	0	12
Total	5	4	3	3	2	3	2	1	46

* Including National Institute of Permanent Research (2 school): Seoul National University Woman Middle School, Cheongju University Elementary School

2) Operation of Software Education Leading School

The Ministry of Education and the Ministry of Science and ICT have designated and operated software education leading schools to enhance the application of software education programs to school sites. The Korea Education and Research Information Service and the Korea Foundation for the Advancement of Science and Creativity are supporting the operation of municipal and provincial education offices and leading schools, and the discovery and spread of outstanding cases and software education.

[Table 1-1-6] Status of Software Education Leading School in 2018

Classification	Seoul	Busan	Daegu	Incheon	Gwangju	Daejeon	Ulsan	Sejong	Gyeonggi
Elementary	70	39	47	31	18	27	17	4	217
Middle	40	18	37	27	17	8	8	4	89
High	31	15	11	8	8	2	5	1	54
Total	141	72	95	66	43	37	30	9	360
Classification	Gangwon	ChungBuk	ChungNam	CheonBuk	CheonNam	GyeongBuk	GyeongNam	Jeju	Total
Elementary	55	37	48	55	77	60	106	14	922
Middle	18	16	21	23	48	32	32	4	442
High	8	7	9	11	21	24	14	4	233
Total	81	60	78	89	146	116	152	22	1,597

C. Development of Software Education Teaching/Learning Materials and Information Services

The Korea Education and Research Information Service will develop 60 contents for middle

school teaching methods and study support in 2017 and 35 contents for elementary school teaching method and study support in 2018 to serve Edunet and T-Clears. The contents are modular contents of 3 to 5 minutes per episode, with various forms of data such as video, animation, simulation and augmented reality based on the revised 2015 curriculum.

D. Support Autonomous Software Training Activities

It supports the Software Education Curriculum and Research Society to create a voluntary research atmosphere and revitalize the community of teachers in charge of software education. The Software Education Curriculum and Research Society establishes a community among local teachers to conduct research voluntarily and share the results among five research topics, including supporting software education activities centered on student participation, role model of the association, research on experience and activity-focused class data, research on supporting career and experience activities, and research on real-life and social problem-solving software education materials.

[Table 1-1-7] Status of Software Education Curriculum Research and Support for Student Clubs in 2018

Classification		Seoul	Busan	Daegu	Incheon	Gwangju	Daejeon	Ulsan	Sejong	Gyeonggi
Curriculum Research	Elementary	1	2	2	2	1	1	1	1	5
	Middle	2	1	2	2	1	1	1	1	5
	Total	3	3	4	4	2	2	2	2	10
Club	Elementary	12	7	6	7	4	4	4	3	19
	Middle	12	7	5	6	5	5	4	3	19
	Total	24	14	11	13	9	9	8	6	38
Classification		Gangwon	ChungBuk	ChungNam	CheonBuk	CheonNam	GyeongBuk	GyeongNam	Jeju	Total
Curriculum Research	Elementary	3	2	2	2	3	3	3	1	35
	Middle	3	2	2	2	3	3	3	1	35
	Total	3	3	4	4	2	2	2	2	70
Club	Elementary	7	6	7	8	9	9	9	4	125
	Middle	7	6	8	8	8	9	9	4	125
	Total	24	14	11	13	9	9	8	6	250

E. Promotion of Software Education to Raise Awareness and Expand Base

In order to spread the correct awareness of software education, schools and municipal and provincial education offices are pushing for parent training and briefing sessions. To this end, the

Korea Education and Research Information Service produced promotional videos and distributed them to the municipal and provincial education offices so that they could raise correct awareness by introducing the need and policies for software education.

In addition, it promoted an event to share positive changes in students and schools through software education and to promote understanding of the meaning and value of software education for students and parents (2018 Fair of Social Impact Create Idea Utilizing Software) while developing 'Parents Experience Program' textbooks and disseminating them to municipal and provincial education offices.

3. Future Plans

As software education has become essential in the revised 2015 curriculum, various projects have been carried out to prepare human and physical infrastructure and various conditions for successfully settling on the school site, and have contributed to the successful establishment of the first grade of middle school in 2018. In the future, the government will gradually inspect sites from various perspectives for promoting and expanding school site-oriented software education and pursue diverse projects to ensure that the software education pursued by the revised 2015 curriculum can be realized.

Section 5. Activation of Online Classes

1. Project Overview

The online class activation project aims to enhance students' right to choose their own subjects and their right to study by providing online classes with the demand for various curricular studies of students who are difficult to cope with in a unit school.

2. Promotion and Operation Status of Online Classes

The online classes began in 2011 as part of the 'Strategies for Implementing Smart Education' (Ministry of Education, Science and Technology, 2011). Since then, it has been operating so far in 2018 after undergoing related policy research, pilot operation and revision of laws. As of the first semester of 2018, 1,303 middle and high schools nationwide and 8,948 students are using online classes.

3. Main Outcomes of the Activation Project of Online Classes

First, the foundation for supplementing school education using digital technology was laid. The number of high school students who applied for online classes increased from 708 in the first semester of 2013 to 5,454 in the first semester of 2018, and the number of middle school students also increased from 1,331 in 2015 to 3,494 in the first semester of 2018.

Second, it has contributed to ensuring students' right to choose subjects and their right to study. In the case of high school classes, 47.4 percent of students applying for online classes and 48 percent of electives were found to be contributing to guaranteeing not only the right to study for non-transferable subjects, but also the choice of student subjects for rare electives

that cannot be provided by unit schools.

Third, the function of formative evaluation was implemented in 2015 curriculum learning contents, and the foundation for internalization of learning was laid through the development of final assessment questions and the provision of unit schools.

4. Future Plans

Due to external educational environment changes such as the application of the revised 2015 curriculum, the expansion of student-centered individual education, and the development of intelligent information technology, interest in online classes is increasing. The following tasks should be implemented for the internalization and revitalization of online classes in the face of the intelligent information society.

First, it is necessary to expand the guarantee of students' right to choose subjects by expanding the content development for optional subjects according to the admission of the high school credit system. Second, it should lay the foundation for an online classes system through the promotion of securing full-time teachers and establishing an organization dedicated to online classes. Third, an online evaluation system should be established to manage learning quality and analyze learning effects. Fourth, internalization of learning management and future teaching-learning systems through upgrading LMS system functions as learning platform should be prepared.

Section 6. Improvement and Operation of the Student Evaluation Support Portal

1. Project Overview

The Student Evaluation Support Portal (https://stassess.kice.re.kr) has been developed to provide systematic on-site teaching support for the professionalism and capacity improvement of teachers' assessment, which has been emphasized more by changes in student evaluation direction, and is operated with the aim of providing various data on student assessment. In 2018, detailed functions were improved to enhance user convenience and use of the Student Evaluation Support Portal that completed the re-organization work in 2017. In addition, various materials were mounted to support the education policy to support the process-oriented assessment of school sites, and various performance assessment tools developed in line with the expansion of the revised 2015 curriculum, as well as various student assessment-related data such as the report of the research schools and class studies, to provide a foundation for the enhancement of teacher evaluation capabilities.

2. Status of use

The main users of the Student Evaluation Support Portal are elementary, middle and high school teachers. Looking at the status of users, the number of users of portals increases in February and August, mainly at the beginning of the semester, and there is a high demand for searching for criteria for achieving the curriculum.

[Picture 1-1-7] Status of the Student Evaluation Support Portal Use by Month (Unit: Person)
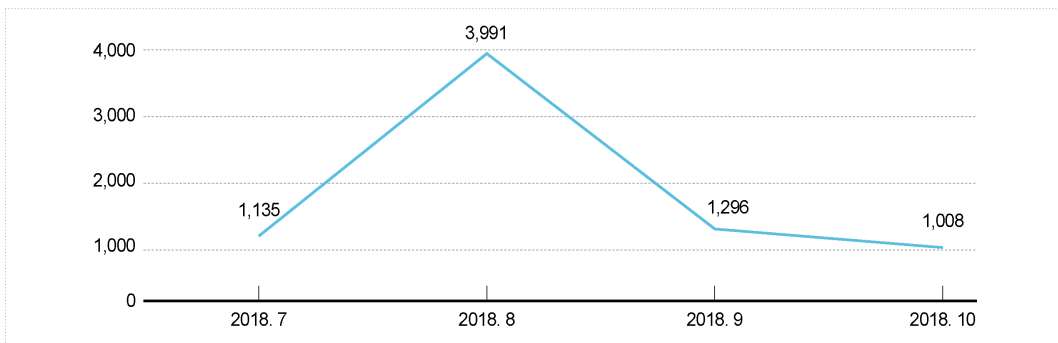
3. Main Outcomes

The major achievements of the Student Evaluation Support Portal, which provides various student assessment support materials through the enhancement of its functions in 2018, are as follows:

First, various materials to support course-oriented assessment, which is currently being emphasized at school sites, were introduced and shared through the Student Evaluation Support Portal, and thus played a role in supporting education policies. Second, a system was established to support student evaluations of teachers linked to teaching education by developing and installing various performance assessment tools based on the revised 2015 curriculum. Third, the foundation was laid to enhance the evaluation capacity of teachers in Korea by disseminating training materials related to various student evaluations, reports on classes and evaluations of research schools and class research meetings, and course-oriented assessment operations.

4. Future Tasks

Various development strategies are needed to improve teachers' expertise and to establish themselves as a teacher support system in the mid- and long-term, using the Student

Evaluation Support Portal, developed to disseminate necessary student assessment data at school sites.

First, the current Student Evaluation Support Portal is equipped with performance assessment tools and training materials developed at the national level. More diverse and creative classes and assessment materials should be shared by preparing measures to provide various student assessment-related materials developed at the municipal and provincial education offices as well as at the national level.

Second, we should actively promote what the Student Evaluation Support Portal is and what role it can play. Third, it will be necessary to develop and distribute various data by subject and school level. Currently, the Student Evaluation Support Portal has many textbooks that focus on Korean, social, math, science and English. If various subjects and school-level materials are developed, the utilization of the Student Evaluation Support Portal will be higher. In addition, development measures will have to be prepared for various written and essay-type tasks, project-type tasks, and so on, as well as performance evaluation tasks.

Section 7-1. Training for ICT in Teacher
: KERIS Operation of a Comprehensive Education Training Center

1. Project Overview

The Korea Education and Research Information Service (KERIS) has continuously developed and operated various education, academic and information service training courses for teachers. However, as the demand for training for education information service increased rapidly due to changes in the educational environment and the need for proactive implementation of education policies in preparation for the entry into the intelligent information society, the need for dedicated training institutions to drive the national level of education information service emerged.

The Korea Education and Research Information Service applied to the Ministry of Education in 2016 for the approval of the establishment of a comprehensive education training center in order to contribute to the development of education by developing training programs suitable for the demands of education sites and social change trends based on its excellent expertise and know-how in the field of education, and was approved in 2017. The KERIS' comprehensive education training center is a training institute dedicated to the informatization of education, and is helping to nurture key personnel along with support for related education policies.

2. Main Project and Project Status

The KERIS' comprehensive education training center develops and operates new training courses in the field of education information service in cooperation with the business division in accordance with the ministry's entrustment of policy issues by the major business areas. In order to support future education of education sites and train core personnel in accordance

with the advent of the intelligent information society, the government has developed demand-based specialized training courses for information services that reflect the latest trends for elementary and secondary school teachers and provide them in a variety of ways. In 2017, it promoted 50 types of training courses in elementary and secondary education, education administration and finance, academic research, and global cooperation for 11,080 related experts, including elementary and secondary teachers and education administration positions.

KERIS has been pushing for training operation and management focusing on unit projects. However, following the approval of the The KERIS' comprehensive education training center in July 2017, the training integrated operation system was established to reduce unnecessary administrative difficulties and to establish a unified, customer-centered professional training operation and management system. As a result, the total number of 18 types and about 4,960 people are managed by integrated management of the results of the training courses operated.

The KERIS' comprehensive education training center drew out the requirements for the operation of the training center and established the organization and operating environment in order to comply with the requirements for approval of the establishment of the comprehensive education training center and to faithfully implement the operation plan. The training center made operational regulations for the operation of training centers, prepared standards and management systems for training operations at the company level, and sought to enhance the quality of training for institutions by securing human and physical resources necessary for training operations, such as instructor pools specialized in the field of education, science and information services, and handbooks on the use of external training facilities. In addition, the training center has established and operated a comprehensive education training center homepage to enhance convenience for the trainees, and plans to develop a roadmap for mid- to long-term development of the training center in order to find ways to enhance the quality of the training center and a foundation for sustainable growth.

3. Future Plans

A role of the KERIS' comprehensive education training center is to lead the development of field-friendly specialized training courses that promote changes in education paradigm against the intelligent information society based on the expertise and know-how possessed by the institution. Accordingly, the agency plans to develop new training courses for each development stage of the training center in the long term in connection with major projects of the agency to establish a regular operation system. Through these efforts, the government aims to systematically implement timely policy training that distinguishes it from other training institutes so that education policies in preparation for the intelligent information society can be successfully settled on the site, and to fulfill its legal duties as a training institution dedicated to education, academic and information services by contributing to the development of the workforce development at the national level.

Section 7-2. Training for ICT in Teacher
: Operation of Remote Education Training Center

1. Project Overview

Remote education training has become an important key means of training teachers' jobs as ICTs such as the Internet and personal computers have developed. The continuous increase in the number of teachers with remote training requires systematic management and supervision to improve the quality of remote education. According to the current state of operation in February 2018, 38 accredited remote education training centers (7 public institutions, 12 universities, and 19 private training institutes) are operating.

2. Main Project and Project Status

A. Status of Accreditation and New Accreditation of Remote Education Training Center

New accreditation agencies for remote training institutes are showing a decreasing trend. In particular, one institution was accredited as a remote training center in 2017 after none of the new accreditation agencies were recently established from 2013 to 2016.

[Table 1-1-8] Status of Accreditation of Remote Education Training Center   (Unit: Institute)

Classification	2009	2010	2011	2012	2013	2014	2015	2016	2017
New Accreditation	4	3	2	2	0	0	0	0	1
Closed Institute	0	7	2	6	3	2	2	0	0
Number of Remote Education Center	52	48	48	44	41	39	37	37	38

※ Excluding remote education training centers under the municipal and provincial education offices

B. Review on the contents of the training course at the Remote Education Training Center

Since the Korea Education and Research Information Service was designated as a Remote Education Training Support Center in 2009, the number of applications for content screening to open new training courses at remote education training centers has been steadily increasing.

[Table 1-1-9] Status of Review on the contents of the training course at the Remote Education Training Center

(Unit: Case, %)

Classification /Year	2013	2014	2015	2016	2017
New Application	358	486	550	602	475
Number of Acceptance	278	302	365	372	329
Acceptance Rate(%)	77.7	62.1	66.4	61.8	69.3

C. Evaluation of Remote Education Training Center

The Remote Education Training Support Center has conducted an annual 'Operation Assessment' since 2011 to check the operation status of remote training centers and to manage the quality of remote training, and since 2016, and it has conducted an assessment every two years according to the characteristics of the institutions of remote training centers (public and university/civilian).

[Table 1-1-10] Result of Evaluation of Remote Education Training Center

(Unit: Case)

Classification /Year	2011	2012	2013	2014	2015	2016	2017
Target Agencies	43	42	40	38	36	19	18
Excellent Agencies	26	29	6	5	13	2	5
Average Agencies	-	-	23	22	12	8	7
Inadequacy Agencies	17	13	11	11	11	9	6

※ Subject to evaluation in 2017: Private (18 institutions) / Evaluation in 2018: Public and university (16 institutions)

D. Development of the Remote Education Training Center Cooperation System for the Promotion of Remote Training

The Remote Education Training Support Center sought to promote mid- to long-term operation of remote education training centers by establishing comprehensive development

plans for the needs, suppliers and professionals of remote education training.

The first one has been pushing for joint development of contents to prevent and enhance overlapping development of contents by city and provincial education training centers since 2016, and is currently carrying out a joint project to develop contents for a total of 10 types of remote training centers in 2018.

The second one is to develop a total of 21 types of remote training contents in 2018 by integrating the project for developing remote training contents in the national education policy field, which was promoted as an individual project by the Ministry of Education.

Third, in order to systematically and reliably manage the information of teachers generated by remote education years, the institute established a system for managing the recipient information of remote education training center in 2015 and has been operating it since March 2016. The teacher's information will be used as statistics to maximize their future training results.

3. Future Plans

The Remote Education Training Support Center plans to pursue the project with the following points in order to promote the Remote Education Training more continuously.

First, the operational evaluation indicators will be improved and applied for quality control of remote education centers, and operation management will be further strengthened through corrective orders and consulting for insufficient centers.

Second, it will play a leading role in the development of high-quality remote training content to improve teachers' job volume. It will play a role of reflecting the requirements of relevant institutions and sites, and by applying and disseminating new training patterns and educational content as a result of changes in IT technology.

Third, the quality of training for remote education will be further strengthened through the content review of remote training content. The review will be strengthened so that it does not violate the content of remote life and individual rights and interests, national, social, and

ethical values, thereby increasing credibility.

It is expected that the operation support and management of remote education training centers will improve teachers' job and induce changes in education sites.

Section 8. Talented Education of Information Security

1. Project Overview

Since August 2014, the Ministry of Education has established and operated an Information Protect Education Center for Talented for the early discovery and development of 'White Hacker' experts for middle and high school students. The university was selected as the site of four universities nationwide (capital, Chungcheong, Yeongnam, Honam) and has selected a total of 360 students each year to train core professionals.

[Table 1-1-11] Major Activities of Information Protect Education Center for Talented by Year

Year	Major Activities
2014	• Select Information Protect Education Center for Talented in 4 region (2014.8.12.) • Operate Information Protect Education Center for Talented in 2014 (2014.9. ~ 2015.1.) – Completion of the 1st Class of Information Protect Education Center: 299 People
2015	• Operate Information Protect Education Center for Talented in 2015 (2015.2. ~ 2015.12.) – The 1st Information Protect Competition (2015.10.) – Completion of the 2nd Class of Information Protect Education Center: 321 People
2016	• Operate Information Protect Education Center for Talented in 2016 (2016.2. ~ 2016.12.) – The 2nd Information Protect Competition (2016.10.) – Completion of the 3rd Class of Information Protect Education Center: 330 People
2017	• Operate Information Protect Education Center for Talented in 2017 (2017.3. ~ 2017.11.) – The 3rd Information Protect Competition (2017.11.) – Completion of the 4th Class of Information Protect Education Center: 351 People

※ Reference: Ministry of Education, Basic Plan for Information Protect Education Center (Proposal)

2. Promotion System

The Ministry of Education is in charge of the operation of the Information Protect Education Center for Talented, including the establishment of basic plans for the information protection and the implementation of operational evaluations, while the Korean Education and Research Information Service is in charge of practical progress and management, support

for operational evaluations, and exploring measures for internalization. The Information Protect Education Center for Talented in each district establish and operate plans on a yearly basis for recruitment of students, operation of curricula, and guidance and management of students.

In addition, the government organized 'Information Protect Education Center for Talented' for the Ministry of Education, the Korean Education and Research Information Service and the heads and operators of Information Protect Education Center for Talented in each district, starting in 2015 in order to promote the operation of the center. Through this council, it is working to discuss operational issues such as student recruitment and public relations, and to internalize issues such as improvement of the curriculum and sharing cases of excellent activities.

3. Main Promotion Project

A. Selection of Students at the Information Protect Education Center for Talented

The Information Protect Education Center for Talented will select a total of 360 students from 4 regions, 90 students by each region, by organizing classes by subject (basic, advanced,

[Table 1-1-12] Status of Selection at the Information Protect Education Center for Talented by region (Unit: Person)

Region	Class-fication	2014			2015			2016			2017		
		Apply	Select	Complete	Apply	Select	Complete	Apply	Select	Complete	Apply	Select	Complete
Capital	Seoul Women's Univ.	462	90	86	353	90	88	288	90	90	292	90	88
Chung Cheong	Kongju National Univ.	78	73	67	117	90	80	152	90	87	173	90	89
Yeong Nam	Daegu Univ.	107	89	80	105	90	77	153	90	84	141	90	88
HoNam	Mokpo National Univ.	80	80	66	106	90	76	84	81	69	131	90	86
Total		727	332	299	681	360	321	677	351	330	737	360	351

※ Reference: Ministry of Education, Basic Plan for Information Protect Education Center (Proposal)

specialized) among middle and high school students across the country who have dreams and talents in information protect fields. The education period runs for about eight months from March to November every year, and 80 percent of the 100 hours of classes will be completed when they are present, and the benefits listed in the school's life data will be given.

B. Operation of Curriculum for the Information Protect Education Center for Talented

The Information Protect Education Center for Talented has conducting education on general basic knowledge in the field of information protection and human resources training with creative thinking, problem-solving skills, the right personality and ethics. In addition, the center operates intensive education (3 nights and 4 days) during vacation, field visit experiences, participation in specialized programs, and guidance on presentations of projects and academic papers, including research institutes and security companies related to information protection.

[Table 1-1-13] Common Curriculum Operation Hours of the Information Protect Education Center for Talented (2017)

(Unit: Hour)

Classification		Aptitude Education for Information Protection			Technical training for Information Protection				Total
		Personality /Ethics	Career search	Total	Theory	Practice	Participation activity	Total	
Middle	Basic	12	4	16	5	25	10	40	56
	Advanced	12	4	16	3	26	10	39	55
High	Basic·Advanced	12	4	16	4	26	10	40	56
	Specialized in High	12	4	16	Discretion		10	10	26

※ Reference: Ministry of Education, Basic Plan for Information Protect Education Center (Proposal)

C. Operation of Information Protect Competition

The Information Protect Education Center for Talented promoted 「The 3rd Information Protect Competition」 in 2017 to improve interest and motivation for learning by providing students with real experience and opportunities for verification and evaluation of skills In

November 2017, the 'The 3rd Information Protect Competition' was held to introduce their teams and announce how to solve competition problems after the team competition was concluded so that they could share cases linked to learning activities. The award of the Korean Education and Research Information Service and the Information Protect Education Center for Talented were given, and the award of efforts was given to encourage participation.

D. Evaluation of the Information Protect Education Center

The evaluation of the Information Protect Education Center for Talented shall be conducted annually, based on Article 23 paragraph 4 of the 「Act on the Promotion of Specific Education for Brilliant Children」. In August 2017, an interim inspection was conducted to check the operation status of the Information Protect Education Center for Talented. After the completion of the training program in December, the operation evaluation was carried out by organizing a quantitative and qualitative assessment for the entire operation, from the stage of the operation plan for the current year to the preparation, program operation and completion of the training program.

4. Future Plans

The government will conduct an annual inspection on the overall operation of the center, including the organization system, selection and education of students for education, and performance management, and will continue to strive to check the adequacy of the center's operation and train high-quality future information protectors. In addition, the government plans to efficiently manage future information protect human resources by preparing a management system for career status, such as employment and advancement of graduates of information protection and gifted children.

Section 9. Establishment of ICT in Education Environment

1. Project Overview

The ICT in Education was promoted in earnest from 1996, and the teaching materials, educational environment and educational methods of kindergarten, elementary and secondary Schools were improved, and the environment was established to share and learn information anytime and anywhere. At this juncture, the high-speed National Network project was launched in 1995. In addition, as the government stopped providing subsidies for high-speed National Network projects in 2005, the fees increased significantly, and as a countermeasure, 'Plan for Providing Public Information and Telecommunication Services' was established in March 2005 to provide free school Internet services to elementary, middle and high schools and all education institutions nationwide, including not only downtown areas but also islands and mountains.

The era of the 4th industrial revolution, which has been discussed recently, is where everyone and things are connected by hyper-connected networks and data is constantly collected and accumulated. Such data can be analyzed and utilized on its own based on intelligence information technologies such as artificial intelligence and big data to create new value added. In accordance with this hyper-connected intelligent revolution, the main objectives of education have changed from the existing knowledge transfer method to fostering creative and problem-solving skills of students and creative convergence-type talent with self-directed learning.

The Ministry of Education is planning to develop digital textbooks that can be customized for the intelligence information society, and distribute them to schools and use them for classes through the 'Notification on Classify Elementary and Secondary School's Textbooks by National Qualification (2016. 8. 29)'. Digital textbooks that have the status of textbooks for textbooks will be gradually distributed to social studies, science, English and high school English (5 types qualified by nation) from the third grade of elementary school to the third grade.

With changes in educational environment and teaching methods and the development of information and communication technology, the school information service environment is expanding on a wireless basis from existing wired lines, and in accordance with the revised 2015 curriculum, wireless infrastructure for elementary and middle schools is needed to expand the use of digital textbooks that introduced realistic video contents such as virtual reality and augmented reality in 2018.

2. Promotion Status

The project to expand wireless infrastructure for elementary and secondary schools is to invest about 200 billion KRW over the next five years until 2021 to expand four wireless-enabled classrooms and up to 60 smart terminals at 7,900 schools. In April 2017, the Ministry of Education selected National Information Society Agency (NIA)[1] as exclusive charge organ, and signed a business agreement to provide technical support for 'Planning to Expand Wireless Infrastructure for Elementary and Secondary Schools to Activate the Utilization of Digital Textbooks'. The National Information Society Agency signed a business agreement with 17 municipal and provincial education offices in June 2017 to 'Build the School's Wireless Infrastructure in 2017' and is pushing for detailed projects, including the introduction of wireless networks, wireless infrastructure management systems and smart terminals to build wireless infrastructure at 635 elementary schools nationwide with 13.7 billion KRW in funding.

[Picture 1-1-8] Phased expansion of wireless infrastructure in schools (Proposal)

2017	2018	2019	2020~2021
Elementary schools in islands and counties (653 schools)	Elementary schools without wireless AP (1878 schools)	Elementary and middle schools without wireless AP or less than 4 (1852 schools)	Elementary and middle schools with wireless AP less than 4 (3602 schools)
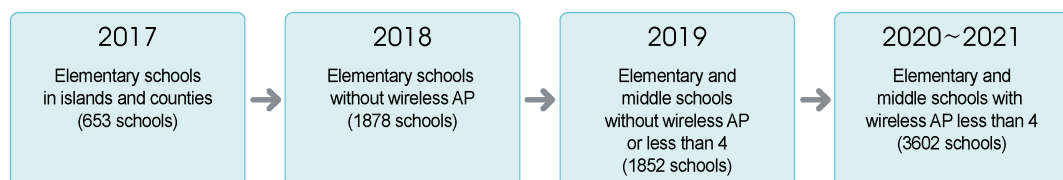
1) The National Information Society Agency can provide support for the management and operation of information and communication networks of national agencies based on Article 14 of the Framework Act on National Information Service (such as the establishment of the National Information Society Agency).

3. Main Outcomes

Through the school net service, the major speed of the school's Internet network was 50 times faster than free from 2 to 10 Mbps in 2009 to 400 Mbps in 2017. In addition, the school net service is the nation's cheapest Internet rate system, with the 400Mbps base rate cut by about 96 percent from 1,2534,000 KRW in 2008 to 459,000 KRW in 2017.

The school's wireless infrastructure construction project is promoting for detailed projects in three categories: wireless network, wireless infrastructure management system and introduction of smart terminals, and will complete the construction of two classrooms and 50 smart terminals with wireless access at 679 elementary schools nationwide by March 2018. In addition, 645 more schools were supported through the demand survey by the municipal and provincial education offices and 34 more selected through the nationwide public offering to encourage voluntary participation and activation of teachers. In addition, the wireless infrastructure management system was established by four municipal and provincial education offices, including the Daegu Metropolitan Office of Education, to operate their own wireless AP controllers and authentication systems, while 12 municipal and provincial education offices were established to integrate and control wireless communication networks and terminal management systems established at the central technical support centers. Based on school demand, the three operating systems of Android, iOS and Windows were introduced.

[Table 1-1-14] Establishment of Wireless Infrastructure in school

Classification	Wireless Communication Network	Manage System of Wireless infrastructure	Smart Device
Content	Implements wireless AP, PoE switch, and AP controller in 679 schools nationwide.	Establishing a wireless communication network/terminal management and authentication system in connection with 12 municipal and provincial education offices	Introducing the Smart Terminal for Android, iOS and Windows 3-operating systems

4. Future Plans

The school information service environment has been continuously upgrading its external network through the school net service, using 400Mbps speed, and the wireless-based education network has been gradually expanding through the project to expand the wireless infrastructure of elementary and middle schools since 2017. However, the speed of the school's internal network is still low due to the aging of information and communication equipment and cables and poor performance. Therefore, the government should improve the quality of the wireless infrastructure built on the school site through projects to improve the quality of the school's information and communication infrastructure, as well as improve the speed and satisfaction of the school's information and communication infrastructure, in order to diagnose and improve the communication infrastructure problems of the nation's elementary and secondary school networks in 2018.

In order to foster creative-convergence type talent following the fourth industrial revolution, the educational environment and teaching methods should change, and customized classroom classes that utilize multimedia-based mass-capacity content such as digital textbooks and realistic videos in real time should be possible. To this end, the school information service environment should be continuously improved and educational contents and services should be converted to a cloud base so that they can be easily accessed anytime, anywhere. Thus, in the mid- to long-term, it is necessary to actively respond to the development of ICT and future education environment by establishing a school Internet network with ultra-low broadband delays, providing universal and economical information and communication services nationwide, and operating measures to reduce the burden of school management.

Chapter 2.
Teaching·Learning Support Service

Education Information Sharing and Distribution Service 'EduNet'

1. Project Overview

Since its opening in 1996, Edunet has played a role as a national level education information service supporting public education normalization and school education activities. It continues to develop and secure teaching contents based on curriculum, improve UI/UX optimized for users, distribute search programs for public use, expand user participation and expand links with private portal services.

Edunet in 2016, which marked the 20th anniversary of its opening, promoted the service reorganization in order to support the national education policy and focus its capacity on essential services that can actively support the education policy in line with the demands of the school site, and started the formal service under the new name Edunet.T-Clear in April 2017.

2. Promotion Status

A. Status of Main Service

As of February 2018, there are about 360,000 teachers who signed up for the service in

national wide, and it is a representative education information public service that basically allows users to use about 530,000 educational information for free without logging in. In order to establish itself as a comprehensive portal site for the provision of education-wide information such as teaching materials, evaluation data, and activity data, the company is continuously seeking to improve the service by collecting opinions from users of the service at all the time.

Edunet.T-Clear is divided into class research (316,434 cases), teacher specialization (22,001 cases), education policy (31,989 cases), and sharing (216,924 cases), and service operation consists of securing contents, quality control, sharing, distribution and service provision.

Content is secured through self-development and cooperation with public and private institutions and provided through quality control processes. Quality control carries out verification of whether or not personal information and harmful elements of contents are included and technical compatibility and accumulates optimized contents through reorganization and others. In addition, the data in service is provided by paying copyright fees for free use by anyone without the burden of copyright or usage, or by securing and providing copyright-free works.

This diverse collection of content provides services in an intuitive, flexible UI/UX, taking into account the changing user experience of users. In addition, the government has distributed data retrieval programs for public use to schools and educational institutions across the country to help users conveniently find the information they want conveniently.

3. Main Outcomes

Edunet and T-Clear linked to influential private services such as Naver and IamSchool, and strengthened the distribution of search programs for service data. In addition, the government focused more on establishing a user-centered service system and strengthening quality of service management. As a result, the daily average number of visitors to the service is showing an increasing trend with a use indicator measuring service utilization performance quantitatively.

[Picture 1-2-1] Status of daily average visitors to EduNet and T-clear services per year (Unit: Person)
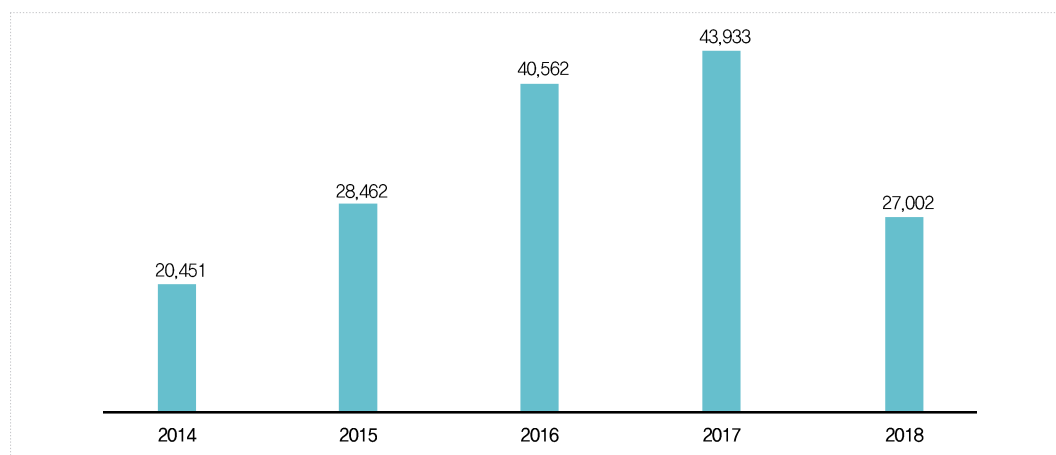
※ Calculation of statistics between 2 months (January to February, winter vacation due to academic calendar) for 2018
※ Reference: EduNet and T-Clear statistics management system, 2018.2

In November 2017, Edunet T-Clear obtained 'Good Content Service Certification' hosted by the Ministry of Science and ICT and conducted by the Korea Database Agency to prove its excellence in quality of service management objectively. It has been certified by the public as an excellent service that can be trusted and used by the public by comprehensively reviewing the content distribution environment, convenience, quality control, and customer management.

4. Future Plans

In the future, Edunet.T-Clear will continue to develop its services through the continuous integration of various teaching and learning materials and national education policy information, securing contents that teachers can use in their classes, revitalizing learning communities, and strengthening links with influential private services.

Section 2. The Cyber Learning System

1. Project Overview

The Cyber Learning System is an online free learning service aimed at realizing public education and easing the educational gap between regions and classes by supporting students' self-initiated learning and improving classroom classes for elementary and secondary schools. Starting with a pilot service (which was provided under the name of cyber home learning at that time) in 2004, the Cyber Learning System currently operate services with 17 municipal and provincial education offices.

2. Promotion Status

The Cyber Learning System is promoted with an organic system by the Ministry of Education, the municipal and provincial education offices, and the Korea Education and Research Information Service. First of all, the Ministry of Education secures the basic plan and budget for the Cyber Learning System, supports revitalization of municipal and provincial education offices, and the municipal and provincial education offices (such as the Information Center) operate the services in various forms, including setting up annual service plans, supporting class operation, developing and operating specialized services, and supporting autonomous learning operations.

Meanwhile, the Korea Education and Research Information Service has established an integrated platform in 2017 and opened it in March 2018 to support the education office's Cyber Learning System. It also develops and serves curriculum contents, evaluator's questions contents, video description, and basic content of the Cyber Learning System. The Cyber Learning System site contents develop and distribute school-level, target grades, and subjects in

different stages of curriculum application by collecting diverse needs of users, and develop and provide contents for mobile devices that are linked by basic-understanding-deepening level by planning unique content. In particular, the revised 2015 curriculum contents were produced and provided in the form of clip-type least-unit subject video content to enhance learning effectiveness and content utilization.

In addition, it also provides services for self-development in certain cities and provinces and for finding and using specialized content that can be shared nationwide.

3. Main Outcomes

As of August 2017, the number of student members in (old) Cyber Learning was 1.664,124 and the daily average number of logins was 27,843. The daily average number of logins continued to increase since 2005 when the tally began, until 2009, when the figure peaked in 2009, but it decreased in 2017 continuously.

This can be attributed to a combination of factors, such as the delay in the provision of content applied to the 2009 curriculum revision, the learning management system centered on the PC environment currently being built and operated, and the different statistical extraction methods due to the work to improve the functions of cities and provinces. However, since the new Cyber Learning System opened in March 2018, new statistics are required because it utilizes the existing membership system and other new membership systems.

4. Future Plans

The Cyber Learning System, a new platform service that is different from the previous one, is expected to be an important task to settle field friendly Cyber Learning System service by collecting diverse field opinions. In addition, in order for diverse strategies for revitalization

beyond settling new services to be connected to actual service utilization in the future, versatile reviews will be needed about cooperation between the promotion systems and ways to collect opinions from the site.

> ## Section 3. Establishment and Operation of Basic Education Improvement Support Site

1. Project Overview

'Ku-Cu (www.basics.re.kr)', which is basic education improvement support site, is a central-level portal site that provides information on student screening, diagnosis questions, and teaching for underachieved children to support basic education. In addition, inspection tools and related programs for screening and diagnosing various causes of poor learning reflect the needs of the site are developed and continuously installed.

2. Promotion Status

It provides diagnostic and evaluation data for screening and diagnosing underachieved students in elementary, middle and high schools, 3R's (reading, writing and calculating) data for supporting basic learning, and teaching materials such as Korean, math, social, science, and English for correctional education.

The data by subject is provided by comparing data by subject and dividing it into data by subject, depending on whether or not it is relevant to the subject. The materials for each subject matter of the school provide study materials for each subject related to the subject. Comparisons and subject-specific data provide inspection tools to diagnose the causes of poor learning, causes of poor learning, and information on learning support by type.

It also provides various programs for teachers to use for guiding underachieved students, including learning motivation and teaching coaching, and carries online classes programs on the characteristics and guidance of underachieved students.

3. Main Outcomes

The site that supports basic level of education utilizes site visitor statistics as a performance indicator, and continuously monitors the menu most frequently used by the users to understand the needs of the school site in the future. Based on this, the school is also useful in developing and disseminating teaching support programs for underachieved students.

[Picture 1-2-2] Site visitor statistics to basic education improvement support site (2017. 3~2018. 2)

Site visitor
668,666
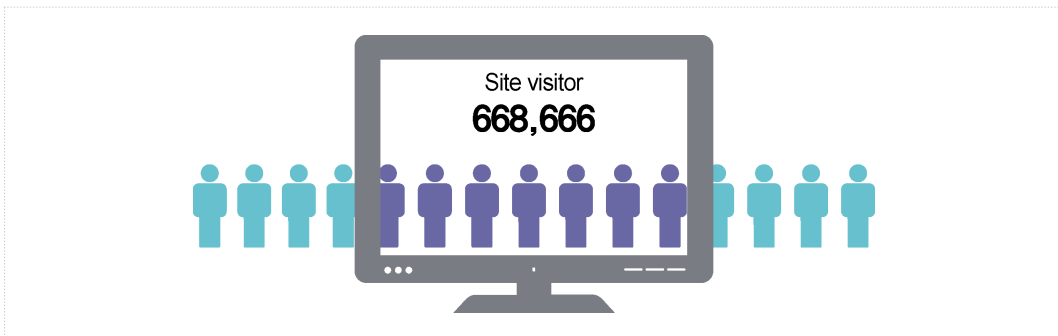
※ Reference: www.basics.re.kr, 2018.8

[Table 1-2-1] Mainly used menu of basic education improvement support site

Ranking	Menu	Data collection method
1	Elementary Education – Curriculum – Math	Statistics Program on Site Menu
2	Elementary Education – Basic Learning – Basic Learning Material	
3	Elementary Education – Curriculum – Korean	
4	Material by Subject – Material by Theme – Elementary	
5	Elementary Education – Basic Learning – Introductional Material	

※ Reference: www.basics.re.kr, 2018.8

In order to enhance the field utilization of the data newly developed and loaded on the basic level of education support site, 17 city and provincial education offices are continuously promoting scholarships and city and provincial education centers' staff. It conducted workshops and training on the contents of new inspection tools or learning programs, such as the Emotional Behavior Environment Question (EEEQ) for underachieved students, and the Korean Language Learning Program (ChanChan Han-gul) for elementary school students.

[Table 1-2-2] Performance of Workshop and Training utilizing Basic Education Improvement Support Site

Date	Name of Workshop and Training	Subject
2017, 3. 9~ 3.10	Workshop of Scholars in Support of Improvement of Basic Education in 2017 : Using the information and inspection tools of the Basic Education Improvement Support Site	Staff who are Responsible for Basic Education Improvement Support Site in 17 municipal and provincial education offices
2017. 4.10~ 4.11	2017 Training for Operational Staff of the Learning Comprehensive Clinic Center : Guide and use of the Basic Education Improvement Support Site Program	Staff who are Responsible for Learning Comprehensive Clinic Center in 17 municipal and provincial education offices
2017, 9. 4~ 9. 5	Workshop on Basic Education Improvement Support Site in the first half of 2017 : Guide to the new program of the Basic Education Improvement Support Site	Staff who are Responsible for Basic Education Improvement Support Site in 17 municipal and provincial education offices
2018. 1.11~ 1.12	2017 Performance Sharing Workshop to Basic Education Improvement Support Site : Guide to the new program of the Basic Education Improvement Support Site	Staff who are Responsible for Basic Education Improvement Support Site in 17 municipal and provincial education offices

4. Future Plans

With society and the rapidly changing educational environment, it is necessary to expand practical support which meet the needs and needs of the field for underachieved students. The direction of improvement is as follows.

First, the development and distribution of high-quality content suitable for the characteristics and needs of the underachieved students should be made. Second, a system of teaching-learning support for underachieved students should be prepared to cope with changing educational environment and teaching methods, etc. Third, in addition to the learning-related features of underachieved students in recent years, a cooperative system among various experts and related professional organizations should be prepared for the understanding and training of field teachers on clinical features such as anxiety, anger, and depression.

Section 4. Comprehensive Support System for Reading Education

1. Project Overview

The Ministry of Education is supporting teachers' reading education research groups and student reading and book writing clubs with various national initiated projects, while the Korea Education and Research Information Service has been promoting the ICT in school libraries in connection with the ministry's policy. In particular, the government is continuing to carry out projects to upgrade the system, including maintenance of applied software and enhancement of functions, to mitigate the stable operation of the comprehensive reading education support system and operation and management of school libraries.

Major services provided by the comprehensive reading education support system include support for school library work and Internet-based reading education. Teachers and students are using the service in various formats, including online content, in addition to existing offline materials. Meanwhile, the Ministry of Education, the municipal and provincial education offices, and the Korea Education and Research Information Service are working on the project to inform school libraries by sharing their roles according to their characteristics and authority in order to enhance the operational efficiency of the comprehensive reading education support system.

2. Promotion Status

In order to establish a non-activeX environment, which is recommended by Ministry of Government Administration and Home Affairs, output solutions and standard security APIs of comprehensive reading education support system are modified using HTML5 method, and are applied sequentially to cities and provinces, and the Government Administration and

Home Affairs Ministry is aiming to complete the application within this year. Meanwhile, it is pushing to develop a reactive web to enhance accessibility to the comprehensive reading education support system.

Next, the project to improve bibliography integration and management functions was carried out to solve problems such as inefficiency and inaccurate bibliography statistics due to duplicate surges in school libraries. It is currently piloting an improved service at the education office in Ulsan, and will be gradually introduced and operated depending on the situation of 16 municipal and provincial education offices.

Meanwhile, the Seoul Metropolitan Education Office and private companies are developing the OPEN API as a countermeasure against the need for a program to reliably support RFID links to school library work support systems. It is expected to be developed and distributed to municipal and provincial education offices within the year 2018 and used as a basic program to support the implementation of the ICT in school library project at each unit school.

In order to improve the convenience of users of the Central Service of Reading Education, the government also promoted the sharing of related materials or on-site cases through menus such as the school library (operational manuals and instruction videos), reading education (reading activities, reading materials room), and humanities education (published cases of humanities education schools, case book of students' humanities club).

3. Main Outcomes

First of all, if look at the status of school and registered students enrolled in the school library support system, which is a sub-system within the comprehensive reading education support system, 11,814 schools registered in the DLS as of the end of February 2018, and 6.315,306 students. Over the same period in 2017, 76 schools increased, with 249,664 students increasing.

On the other hand, high school students accounted for the largest number of students with 170,072 cases, followed by elementary school students with 1,091,940 and middle school

students with 1,027,953. The number of subscribers is 6,315,306, with each student applying for reading activities at 0.6 cases.

4. Future Plans

The tasks to be pursued in the future to activate the comprehensive reading education support system are as follows: First, what has been consistently proposed through consultation and civil petitions on ways to diagnose and improve pending issues in the comprehensive reading education support system is that it is urgent to push for upgrading the system to enhance usability. To this end, the government should prepare for establishment of a plan for upgrading the comprehensive reading education support system.

Second, it is the management of the representative book in the city and province where the bibliography integrated system is established. Efforts need to be made to enhance the quality of book selected as representative book as overlapping book are merged. As part of its objection, positive review is needed on the introduction of measures to boost participation of school field experts through the operation of leading teachers by school level.

Section 5. Operation of EBS Service

1. Project Overview

A. Promotion Purpose

'EBS High School Lecture' is a representative educational service of Korea provided to implement the EBS's founding purpose of supplementing school education and developing democratic education. The EBS high school lecture service is aimed at supporting public education and easing the educational gap between local and social classes by providing excellent educational content to students that can replace private education. To that end, the company operates various teaching services for students and teachers, including 'Strengthening content for the first grades and second grades of high school in order to support high school education', 'Strengthening campaign for students who give up math', 'Call service for high school teachers based on image pattern recognition', 'Providing free textbook support services for Korean files for teachers', and 'Providing EBS teaching materials management system and teacher support services'.

2. Promotion Status

The EBS high school lecture service is pushing for various teaching support services to serve as a ladder for Korea's education hopes. Major projects for 2018 include providing free textbook lectures for school exams, establishing a system to strengthen the competitiveness of contents, and developing questions and commentary services based on artificial intelligence to prepare for the fourth industrial revolution.

A. Providing Free Textbook Lectures to Prepare for School Exams

To address the educational gap and support high school learning, the government cooperated with all publishers issuing authorized textbooks to provide customized lectures for each textbook that directly teaches major high school first-year subjects, not EBS textbooks, to schools where the revised 2015 curriculum is applied. In other words, 32 textbooks in four subjects, Korean, English, integrated society, and integrated science, were produced as a course regardless of their share of textbooks, so as to narrow the educational gap between cities and rural areas and help students with missing classes learn on their own.

The newly developed textbook lectures are designed to be used in various ways to improve classroom classes in high schools. It is produced as a basic concept learning class consisting of 32 to 36 lectures per course, 'Special Lecture of Textbook', and 'Textbook Summary just before the exam', a special lecture on test preparation consisting of 8 to 10 lectures, so content can be selected and utilized according to the purpose of use by learners and teachers.

The EBS textbook lecture is a service created by combining the know-how in producing EBS, which has accumulated over the years, and analyzing the use needs of students and teachers through field opinions such as the Education Office, the teachers' consultative group and the students' online bulletin board. The EBS textbook lectures are expected to contribute to the revitalization of public education as a useful learning content for students who want to reinforce their basic academic background or find Internet lectures that are readily available anytime, anywhere, as well as for teachers who offer student-participatory classes.

B. Development of AI based Personalized Question and Description Service

A truly personalized learning system is being established to move beyond the limitations of traditional teaching methods in which one teacher teaches a large number of students to a new educational paradigm. Based on big data technology, the company will analyze learners' learning types and levels, and introduce a service in late 2018 that will provide customized learning content by using artificial intelligence technology to map learning resources based on individual levels. When learners take pictures of EBS textbook problems using mobile devices,

AI-based course recommendation service that recommends customized courses through prediction of learners' achievements and preferences will be possible as well as services that provide problem solving and interpretation by level.

[Picture 1-2-3] AI-based personalized course recommendation service
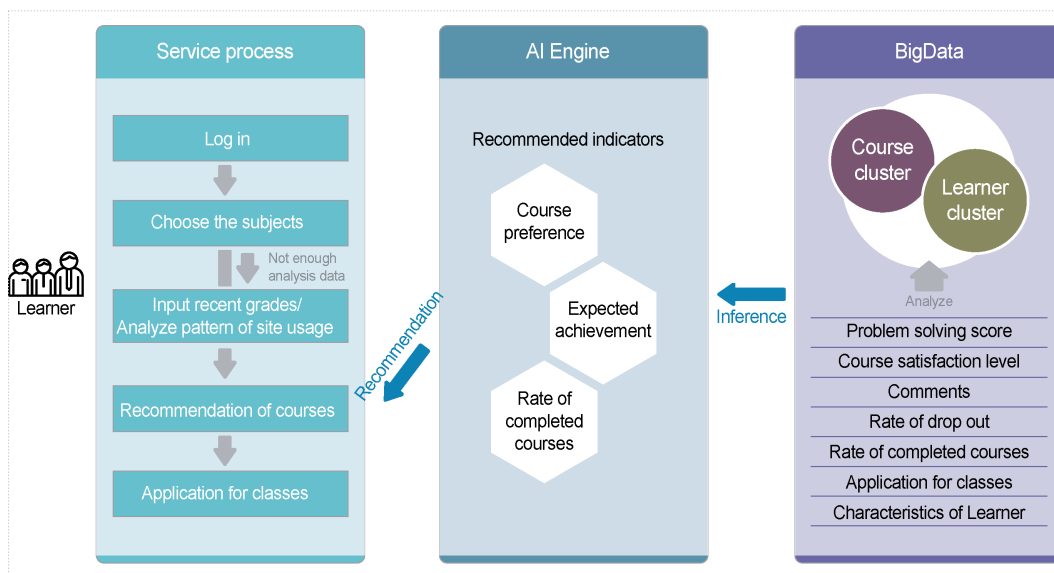
3. Main Outcomes

EBS and Korea Research conducted a survey on the satisfaction of EBS high school classes from November 6 to December 13, 2017 on 1,050 students, 500 teachers and 1,000 parents across the country through a group interview, telephone/visit survey. According to the results of the survey, the utilization rate of teachers was 93.1 percent for students and 98.2 percent for teachers, 5.1 percent higher than that of students, while the recommendation rate was 92.2 percent for teachers and 65.3 percent for parents, 26.9 percent higher than that of parents.

According to a survey by business of EBS high school lecture and analysis research team, the estimated annual private education cost through the service of EBS High School totaled 1.08 trillion KRW in 2017, and 802,000 KRW per student was saved. In addition, the economic value of

[Picture 1-2-4] Evaluation of Satisfaction of EBS High School Lectures and Textbooks
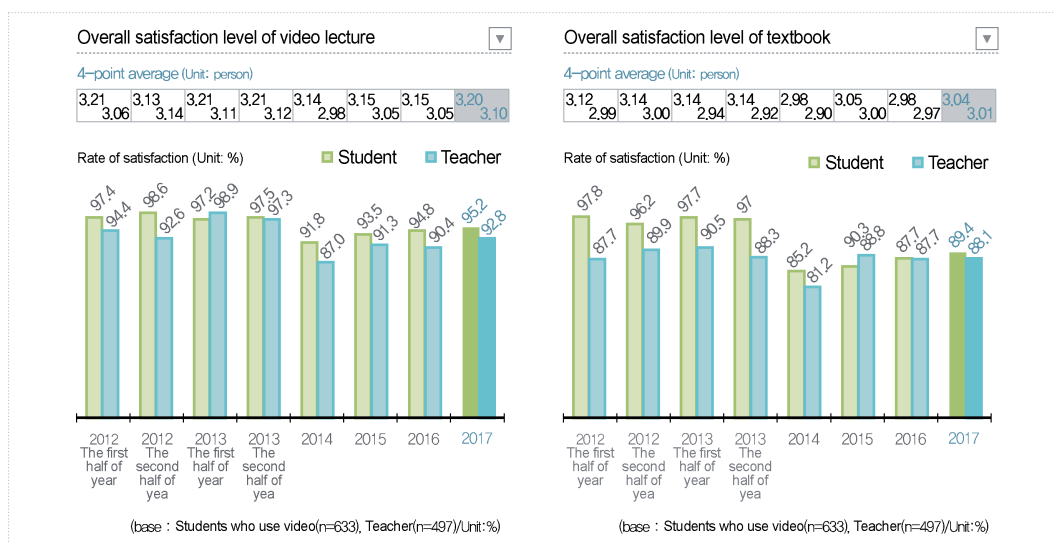
the program was calculated to 498.3 billion KRW for students who want to receive private education but were unable to receive it due to cost burden.

[Picture 1-2-5] Annual Private Education Cost Reduction Market Value and Private Education Cost Savings per Student
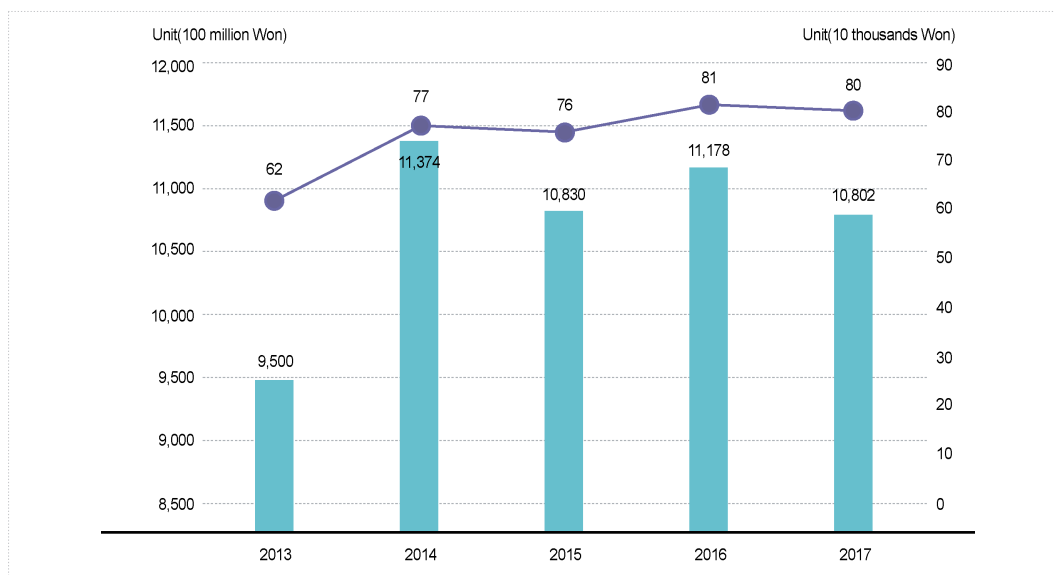
※ Reference: EBS, EBS A Study on the Project Performance Analysis and Improvement of the CSAT Course, 2017

4. Future Tasks

Since the policy of linking EBS high school lectures to the College Scholastic Aptitude Test was implemented in 2004, student and teacher utilization rates and satisfaction in EBS high school lectures and additional services have steadily increased, and the household burden has been eased by reducing private education costs.

In the future, EBS needs to establish a close cooperation system among the Ministry of Education and schools to provide learning contents and services to learners through EBS high school lectures to enable them to learn effectively against the CSAT and school grades, and to continuously support teaching content and services to enable teachers to have efficient classes through its teacher support center. In addition, EBS should lead the education paradigm shift through the implementation of future education services based on artificial intelligence technology, and ensure that everyone, regardless of region and income, is provided with quality education.

Section 6. Air and Correspondence Middle and High School

1. Project Overview

Air and Correspondence middle and high schools are regular middle and high schools that are set up with the aim of continuing their studies and providing opportunities for students with less than secondary school backgrounds and those who stop studying. Since the establishment of Korea Communications High School for the first time in 1974, the Korea Educational Development Institute (Air and Correspondence middle and high schools support center) has commissioned 16 municipal and provincial education offices (excluding Sejong City) to support and operate Air and Correspondence middle and high schools nationwide.

2. Promotion Status

A. Status of Air and Correspondence Middle and High Schools

Broadcasting middle schools has been on a constant rise since two schools were first established in Gwangju and Daegu in 2013, with three additional schools being opened in 2018, Juseong middle school in ChungBuk, Cheonan middle school in ChungNam and Pohang middle school in GyeongBuk, with 4,476 students attending 174 classes in 23 schools nationwide. As of 2018, 42 Broadcasting high schools were set up nationwide, with 9,881 students enrolled in a total of 393 classes. The overall number of students decreased year-on-year, but the number of students in their 60s and 70s increased sharply, as the majority of those graduating from broadcasting middle schools entered the broadcasting high school.

B. Status on Development and Operation of Curriculum Contents for Air and Correspondence Middle and High Schools

As the curriculum of air and correspondence middle and high schools follows the general principles of national education courses, content for the operation of air and correspondence middle and high schools is developed accordingly. As the revised 2015 curriculum was applied annually from 2018, the government established a plan to develop contents for air and correspondence middle and high schools subject to the revised 2015 curriculum for the third year from 2017 to 2019, and development for the second year is underway as of 2018.

3. Main Outcomes

Major performance and outcome related to operation of broadcasting middle and high schools can be presented in six areas, including expansion of installation and operation support during broadcasting, enhancement of basic education support considering learner characteristics, development of first year of broadcasting and high school contents according to the revised 2015 curriculum, support of establishment of broadcasting school character and career classes, operation and activation of learning experience qualification and cyber education system.

4. Future Challenges

The following tasks should be implemented in future for internalization and activation of broadcasting middle and high school operations. First, efforts should be made to reduce gaps between cities and provinces in relation to the deployment of teachers and administrative practitioners for operation during broadcasting middle schools, operation of cooperative schools and instructors, and payment of additional points and allowances. Second, improvement of learning activities and assessment issues is needed in connection with the development of learning content for the revised 2015 curriculum. Third, it is necessary to enhance students'

understanding of the learning experience accreditation system. Finally, web accessibility and compatibility should be ensured so that students in broadcasting middle and high schools do not experience any inconvenience dependent on a particular web browser in using the cyber education system, such as taking remote classes and using learning materials.

> Section 7-1. **Establishment of a Creative Teaching and Learning Activities Supporting System**
> : Development and Application of the Automatic Scoring Program for Korean Texts

1. Project Overview

Since the subjective questions are prepared by students themselves, there is an advantage over the optional questions in measuring their ability to conduct higher thinking. However, it is difficult to use the subjective question in a large-scale evaluation due to the realistic restriction that scoring is tricky. To solve this problem, research on automatic scoring began in the 1960s, mainly in the English-speaking world. Currently, dozens of programs have been developed and applied actively, laying the foundation for automatic marking of essay questions as well as single-answer questions.

Compared to this, our departure is far behind.[The Korea Institute for Curriculum and Evaluation (KICE) considered how to process Korean grading by machine, and then developed a plan to develop an automatic scoring program for Korean language starting in 2012 and conducted research sequentially over five years. In the early 2012-2013 period, the company started developing an automatic scoring program at the word and phrase level, and even developed a sentence-level automatic scoring program between 2014 and 2016. The development of the automatic scoring program for Korean language is based on the judgment that it needs to be carried out step by step with a mid- to long-term perspective, considering the current level of Korean language processing technology and the Korean evaluation situation.

2. Promotion Status

The Korean automatic scoring program is aimed at accurately and efficiently processing

sentence-level answers for large-scale evaluations, such as academic performance evaluations. Thus, by clustering and providing answers according to language similarity using machine learning methods, it was developed into a system that could be more easily graded while ensuring scoring accuracy. After designing the prototype type in 2014, it was refined in 2015, and in 2016, the program was enhanced compared to the previous year by improving scoring performance and user convenience.

3. Main Outcomes

The sentence-level automatic scoring program is largely divided into 'language processing stage' and 'scoring stage'. 'Language processing stage' is the stage in which language information from best answers and student answers is analyzed to facilitate automatic scoring at the scoring stage, while 'scoring stage' is the stage in which students apply scores by extracting the necessary qualities for automatic scoring from the results of language analysis of best answers and students' answers and clustering semantically similar student answers.

Automatic scoring was applied on a trial basis to the question of the national level academic performance assessment in order to analyze the scoring performance after developing the sentence level automatic scoring program. In addition, the standard score determined by multiple experts on the same answer was prepared several times, and the automatic scoring score results calculated through the program were compared with the full match. As a result, conclude was achieved that the current sentence-level automatic scoring program allows scoring of one sentence with relative accuracy, and that the two or three sentences can be graded at a reasonable level.

[Table 1-2-3] Results of pilot application of the Korean sentence level automatic scoring program

Applied Subject		Applied Result
Questions on the Performance Evaluation of Academic Performance in 2014~2015	Korean 5 Questions Social 1 Question Science 1 Question (7,500 answers each)	•1 Write answer: 92.8% perfect match between scores is excellent
		•2 Write answer: The complete match between scores is 83.8%, usually
		•3 Write answer: The complete match between scores is 88.2%, usually

※ Reference: Korea Institute of Curriculum and Evaluation, 'Development and Application of Automatic Scoring Program at Korean Script Level', 2016.12

4. Prospect

The Korean automatic scoring program is meaningful in that it was the first to establish a machine-based grading system for student answers in a large-scale evaluation. Based on the results of the study on the automatic scoring program in Korean, four patents were applied. However, another period demand follows to celebrate the achievement of automatic scoring of sentence-level statements. It is now recommended to write more than one paragraph, not just one or two sentences, in a large-scale assessment. It is necessary to devise a program to prepare for this.

For now, the government can keep in mind the development of a program that can grade one-paragraph answers that are highly restricted in completing tasks in consideration of our educational reality and Korean language processing skills. In other words, if students are asked to write a paragraph with constriction of form or content such as 'writing with a specific type form', 'state opinions under some conditions', 'summary writings given' and 'inference before and after given writings', a sentence-level program using rules and statistics based on the Korean language processing technology accumulated so far, some automatic points can be applied to upgrade the current sentence-level program.

Furthermore, if it wants to ask for freer writing, it is necessary to introduce artificial intelligence-related technologies into the automatic scoring program at the level of the paragraph in earnest. In other words, if an entity plans to develop a paragraph-level program in the future, it needs to implement and utilize in earnest artificial intelligence technology (such as deep learning) that is much more advanced than the current one. With the fast-paced Korean research climate, we expect this to be achieved in the near future.

> ## Section 7-2. Establishment of a Creative Teaching and Learning Activities Supporting System
> : the Creative Personality Education Net (crezone.net)

1. Project Overview

Since its official opening in 2011, the Creative Personality Education Net (crezone.net) has developed into an online platform by operating services that support information on creative experience activities and programs. The purpose of the Creative Personality Education Net is to find and develop contents for creative education and systematically spread them to educational sites to enhance their utilization. Therefore, it aims to contribute to the improvement of students' thinking ability through the development of diverse and high-quality creative experience programs and spread content suitable for changing times. It also focuses on improving the system due to rapid changes in the environment. In addition, it is striving to develop reliable contents by obtaining certificates for good contents service from public trust-based government agencies.

2. Promotion Status

The Creative Personality Education Net provides diverse contents centered on consumers. The main targets are teachers, students and parents. Content composition categorizes them as creative education, creative experience activities, field experience learning, sustainable development education, Crezone blogs and parents' creative experiences.

Meanwhile, the Creative Personality Education Net operates an online platform for creative education and has been promoting user convenience through improved functions. In order to enhance accessibility to the website, functions based on time-sensitive issues were added along with continuous function checks.

It shares 'Crezone News' contents that are operated by the Creative Personality Education Net in conjunction with related agencies. To spread the access path so that users accessing large portals can enter the creative personality education net. Contents targeted for elementary school students were reprocessed and shared, and website links were posted in the logo. It also created a subscription section exclusively for the Creative Personality Education Net in the parents' school notification application. It introduced useful creative education contents and allowed users to enter the creative personality education net.

3. Main Outcomes

The Creative Personality Education Net is checking the use of content through major performance indicators. These indicators also have difficulty in managing user convenience and accessibility, including quality of content, on a regular basis. In order to revitalize creative experience activities, the target was raised by about 5% every year compared to the previous year's performance. Since it managed performance indicators in 2015, it has exceeded its performance level compared to its goal until 2017. Meanwhile, the satisfaction survey of 1,271 people in 2017 showed 80.4 points, up 2.2 points from the previous year.

In addition, it obtained 'Good Content Service' certification in 2018 and secured public confidence as it received quality certification for online content services. The average score of the evaluation group for users of the Creative Personality Education Net was 3.88 points, higher than that of the entire participating institutions.

4. Future Plans

In the future, the Creative Personality Education Net will move away from the acquisition of one-way and passive information as an online platform that participates and creates together. To that end, the government established a plan to create an educational mindset for future

society and to spread contents that incorporate the trend of changing times.

First of all, it is developing customized contents that utilize future technologies and is planning to apply AI-descriptive automatic evaluation and learning contents to its website. In addition, location-based services that incorporate map APIs will be provided using address information of creative experience resources and programs.

In addition, we will continue to seek ways to enhance the use of the educational site through the excellent contents of the Creative Personality Education Net. The school aims to create a culture of research and development of content that will be used by teachers on their own in education sites by supporting teachers' research institutes.

> ## Section 7-3. Establishment of a Creative Teaching and Learning Activities Supporting System
> : 1:1 Learning Tutoring Services

1. Project Overview

As an educational institution, EBS has provided equal educational opportunities and promoted projects to supplement public education without discrimination against underprivileged people or regions. In July 2017, EBS launched a project to establish a tutoring service by utilizing EBS's work to enhance self-directed learning effects and drastically change the limits of traditional education. Specifically, a project to establish a service system was carried out to present learners optimized questions and directions for individual learning, such as problem solving and error notes, for textbooks and problem books sold by EBS. System construction was completed in November 2017, and full-scale service was conducted after data accumulation for artificial intelligence services and Chat-bot function test period.

2. Promotion Status

A. Promoting System and Task

Intelligent service platforms for learners, teachers and operators were developed to provide 1:1 learning tutoring services. The platform is composed of PC and mobile base and is designed to be linked not only to the current EBS CSAT learning system, but also to newly developed machine learning solutions and artificial intelligence services. The newly deployed machine learning solution was designed to provide content for 1:1 learning tutorials, and based on features such as unstructured data clustering, structured data pattern analysis, and learning/classification functions for unstructured data (learning objects) were implemented. In

addition, a big data system and a data analysis system were developed to store and analyze system users' (students) learning and service use behaviors, and responses to questions.

In addition, a content system and a learning model were developed for math subjects. The learning system was developed by including not only high school but also elementary and middle school curriculum contents, and implemented so that students could infer the units of sub-school and grade levels that should be learned for the understanding of a particular unit when the concept or application of that unit decreases. At this time, EBS also developed a function to present content based on the student's sincerity and evaluation scores. Level assessment algorithms have also been developed according to the question establishment and response by question so that the level of learners can be assessed by unit and subject in a learning system diagram. Finally, chat-bot and problem solving have been implemented in an open API format so that engines can be used in educational institutions other than EBS.

B. Main Service Contents

1) Learner-based AI Problem Recommendation Service

It has developed and operated a problem recommendation service that presents only necessary problems to learners. For example, for learners who give up math, the lower-level topic of the learning system is provided, and for those who lack the concept of middle school level even though they are high school students who are about to take the national college entrance exam, the concept of middle school courses is provided in the unit in which they are learning. On the other hand, for learners who are able to solve 'Medium and Upper' levels of problems, it was done by providing the highest degree of difficulty to improve the adaptability of the problem with high difficulty.

It also recommends questions suitable for the learner's level, so that the answer to the question is logged to induce adaptive problem solving based on the result of the question pool, and it provides recommendations for re-regulating difficulty levels according to the response or proceeding to the next step.

2) Customized Explanatory Service for Textbooks and Questions

It provides a smart education service that allows learners to learn on their own with their own textbooks. When a learner captures and transmits questions which cannot be solved their own on a mobile device, artificial intelligence analyzes the problem and presents the learner with a problem-solving process and answer. The problem-solving process provides different levels of difficulty depending on the learner's level and makes it easier for anyone to use the interactive interface.

3) Artificial Intelligence-Based Learner-Customized Service

For middle- and lower-level learners, choosing a course is difficult. Accordingly, it will provide customized courses recommendation services based on artificial intelligence. In order for learners with similar learning patterns within the same achievement group to take courses, EBS has developed and operated a function to recommend courses that are not taken by the learner, but to add analysis figures for major courses of interest and instructors to the level of interest and preference derived from the learning analysis stage.

4) Chat-Bot Service

The 'Danchoo' service in the form of chat-bot was implemented, an interactive interface that identifies students' intent to ask questions, curricula, content, instructors and textbooks, and links them to the service. It was done by providing general services and information or learning tutorials by grasping the users' intentions through chat-bots, away from the way they used to choose their own menu.

3. Main Outcomes

1:1 Learning Tutoring Service integrates learning resources and supports teaching activities for students through continuous machine learning, and acts as a helper for self-directed learning. By doing so, learners will be able to learn self-directed learning with only their

textbooks, and will drastically change the limits of traditional education.

These future-oriented customized services will serve to address regional gaps, income gaps and the underprivileged to provide fair educational opportunities and complement public education. It will also improve private education, which is overspending on private academy classes, extracurricular classes, etc.

4. Future Plans

Starting in 2019, the company plans to upgrade its service to solve questions in math courses and recommend courses. It will expand the service-providing subjects from math to the entire subjects, including Korean, English, Korean history, social and science subjects. The automatic answer and question solving process for a problem will also be improved to enable customized learning by adjusting the difficulty level according to the learner's level.

In addition, it is planning to expand and establish chat-bot, questions solving, and questions recommendation services through a standardized open API method so that they can be used by various organizations other than EBS. Developed questions-solving engines will also push for continuous tuning and upgrading, allowing more sophisticated recommended services to be provided through the analysis of data collected.

Chapter 3.
Establishment of ICT Linked Customized Education Services

1. Project Overview

  With the advent of the intelligent information society, it was necessary to establish an educational system and environment to foster future talent that could actively cope with the rapidly changing social environment. The need to establish a customized learning environment considering individual factors, such as students' interest and individual learning achievement based on differences in learning conditions, is being raised, and the use of customized content centered on the needs of each organization by unifying educational content developed and serviced through unified management. In response, the Ministry of Education specified 'Providing Intelligent Learning and Analysis Services and Establishing a Content Distribution Platform' as its national tasks of 'Creating a Future Education Environment and Implementing Safe Schools'.

2. Promotion Status

A. Establishment Intelligent Learning Analysis Service

  Intelligent Learning Analysis Service collects and analyzes learner's learning activity data and provides customized learning prescriptions based on individual learning levels and interests.

First of all, the government will collect and analyze learning activity data of learners based on e-learning sites, digital textbooks, and Wedurang, which are currently operated as online learning services, to provide customized diagnosis and learning prescriptions, and gradually expand the scope to various online learning services.

As a base material for supporting personalized learning, the government will establish a 'Learning Map' that establishes inter-topic relationships (causal and reference relationships, etc.) by analyzing the subjects and achievement criteria of the 2015 curriculum and connects learning resources. Through experts in each subject, the government will design a basic conceptual map of the digital learning resource map, focusing on Korean, math, social, science, English, and history textbooks for third and sixth graders in elementary school and first and third graders in middle school. The subject and achievement criteria information of built-in curricula is 'Linked Data[2]' represented as semantic, and it is implemented as and made available for public use. Content and learning resources related to future topics, achievement criteria, etc. can be used and expanded by connecting them to digital learning resource maps.

By collecting and analyzing learning activity data, students are provided with individual learning analysis results which are form of dashboard visualized, such as individual learning levels, strong and weak points, preferences, comparisons with other learners, customized content information, and learning paths, and by providing teachers with analysis data by students and analysis data comparing the same grades in other classes/schools, etc.

B. Establishment a Content Distribution Platform

The content distribution platform provides content by level to support customized learning by developing, collecting and securing diverse content to create an open content distribution environment that shares and distributes content for free education with public, private and individual participation. Starting from 2018, the government plans to develop, collect, secure, and utilize contents with elementary and secondary content in public sectors, and gradually

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2) Express semantic relationships by modeling the subject and achievement criteria information in RDF (Resource Description Framework) format

expand the contents into excellent contents by private and individual. The government implements an integrated management system for collecting and securing diverse forms of contents such as multimedia data, videos, and realistic contents, and standardizes and manages metadata and classification system information for managing detailed information according to the types and characteristics of contents.

3. Future Plans

Starting in 2019, the company plans to establish a customized learning environment for each individual through the establishment and pilot application of ICT-linked education services, and gradually strengthen the 'collection, analysis and management' system of rich learning content and learning data through the expansion of links with various online learning services to provide AI-based learner customized education services. In addition, the government plans to create a win-win education ecosystem for the public and private to unify the 'Collection, Management and Utilization' system of educational contents for educational purposes to share and spread them and to establish a student-centered future education environment.

Chapter 4.

Standardization of Educational Information and Establishment of Environment for Using Copyrighted Materials

Section 1. Standardization of Educational Information and Edu-Tech R&D

1. Project Overview

The process of developing international standards and national standards is a long-term task that requires approval by the SC36 Working Group, reviews of a group of experts consisting of members of the National Institute of Technology and Standards and Voting in accordance with international protocols and standards-making procedures, from the discovery of standards proposals and topics, to the approval of standards, to the development and approval of standards.

Meanwhile, as the development of new technologies such as artificial intelligence (AI), Internet of Things (IoT), and data-mining are rapidly growing and standards and markets are strengthened in the fourth industrial revolution, public standard development is not able to keep up with the pace of market change. In 2018, the government wanted to strengthen the standard activities based on the Edu Tech standardization forum along with the public standard activities. In particular, as the importance of pre-emptive standards to prepare for confusion and excessive expenditure of new technologies on educational sites grows, the project focused on creating a

research and development platform for industry-academic cooperation to build a virtuous edu-tech ecosystem, establishing a system for pre-emptive standards based on R&D results, and strengthening the distribution system of standards to enhance the effectiveness of developed standards.

2. Promotion System[3] of Standardization

Standards can be divided into de-jure and de-facto standards. Public standards refer to those officially announced by the government, which in effect refers to those developed voluntarily in the private sector, i.e., in the market and generally accepted. Public and virtual standards can be distinguished locally as well, with international standards and domestic ones limited to domestic ones.

The EduTech Standardization Forum was launched by integrating the IMS Korea Standardization Forum and the Electronic Publishing Standardization Forum, which were operated separately until 2016, and has so far been transformed into a system in which standards and technical materials developed through the IMS Korea Standardization Forum and the e-Publishing Standardization Forum are carried over to perform management functions such as revision and abolition.

3. Status of Promotion and Performance

A. Standardization of Educational Information

In 2018, the government provided VR human factors guidelines considering the characteristics or environment of learners for effective and safe use of virtual reality (VR) technologies in education through virtual reality international standards development activities, and supported

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3) Modified and supplemented content of the Education Information White Paper 2017

the use of related standards and technologies, such as IMS Caliper and xAPI, which are the most important issues in the use of EduTech, to provide competitive edge among the private sector.

[Table 1-4-1] Development of Standards for Education in 2018

Classification		Standard Development
Public Standard	International Standard	– Virtual and mixed reality technology for educational use of human factors guidelines (users, developers) standards. (2 cases) – Standard for the Catalog Information Model linked the Virtual and Mixed reality Education Resources – Realistic Content Technology and Application Standard in Education (1 case)
	Korea Standard (KS)	– Learning Analysis Interoperability-Part 2: System Requirements – Learning Resource Metadata-Part 9: Data Elements for People / Part 11: Transfer from LOM to MLR
Standard in reality	Collective standard	– VR/MR Content Catalog Metadata Based on Curriculum and Achievement Criteria – Education VR/MR Content Human Factor Guidelines 1.0

B. EduTech R&D

In 2018, the government actively promoted related R&D by establishing an open lab-type environment for continuous new technology verification and creative R&D cultural innovation, creating a foundation for active and scientific methodologies for the future society.

In addition, it published various analysis data on trends of global technology in education and various trends such as Horizon Report, Innovative Pedagogy, and EduTech Trend Series for market analysis, and distributed them to industries, universities, and research institutes based on AI (Artificial Intelligence), Machine Learning, Virtual, Augmented and Mixed Reality (VR/AR/MR), Blockchain, Cloud, and Chat-bot Education. In addition, the core research subjects, including technology maturity, effectiveness, ripple effects, and linkage to standard development, were selected to carry out intensive research by selecting learning analysis and virtual reality technologies. In particular, in 2018, the government promoted the development of data collection analysis for intelligent learning analysis, and the release of virtual reality (VR) human factors guideline 1.0, which drew guidelines from the perspective of users' human factors and developers' UX designs that should be considered to promote the safe and effective utilization of virtual reality technologies at educational sites.

4. Prospect

For the information and communication industry, companies or institutions that have acquired ICT standards will have a huge impact on the complex social and economic networks associated with those standards and dominate the market (Korea Information and Communication Technology Association, 2018). As a result of this change in industrial structure, efforts to preoccupy standards based on R&D to secure standard competitiveness in the global market are expected to become more important, especially for the public sector to create and share a virtuous cycle of technology utilization standards for everyone in education. In addition, continuous efforts will be needed to establish a system of application and utilization of standards that can be co-prosperity between the public and the private sector through open standardization based on R&D, and to strengthen network exchanges at home and abroad. In addition, scientific verification R&D based on private, public, universities, and research institution cooperation for effective and ethical use of new technologies for educational innovation should be strengthened as well as active responses to emerging innovative technologies and Edu-Tech trends in the global market, such as diversification of contents and AI-based learning analysis using data analysis technologies.

Section 2. Education Copyright Support Center

1. Project Overview

In September 2017, the Ministry of Education designated the Korea Education and Research Information Service as the 'Education Copyright Support Center' to effectively support copyright issues at educational institutions. This reflects the educational institution's demand that a dedicated support agency is needed to systematically manage and resolve copyright disputes between teachers and students, expand the scope of copyright use of works for elementary and secondary schools, prepare standards for compensation for use of works for class support by educational support institutions, and raise copyright disputes between teachers and students. Due to differences in positions of some educational support institutions, it took time and pain to establish them, but the Education Copyright Support Center was operated late at the same time, allowing educational institutions to study common copyright issues and seek ways to find ways to do so.

However, recent cases of copyright disputes in educational institutions show that copyright problems will never be solved solely by improving the relevant laws and systems. This is a clear sign that the role and function of the Education Copyright Support Center should be accompanied by a good understanding of the current copyright grievances of educational institutions and timely support, rather than just studying macro legislation improvement. In this light, the roles and functions of the Education Copyright Support Center were re-examined in 2018 to select and implement major urgently needed projects first.

2. Main Status

The biggest issue in the educational institution's copyright dispute in 2018 is 'Font'. Since 2015, there has been a steady increase in the number of Font copyright disputes centered on

kindergartens and universities, and demand for copyright charges and settlement fees for the Font program for educational institutions has soared since a lawsuit filed against the education office and schools in March 2018 in which the court recognized the educational institution's unauthorized use of the font and responsibility for damages.

In 2015, a font company filed a lawsuit against the education office and two elementary schools in the region seeking damages for unauthorized use of the font. Private elementary schools reached an agreement of 5 million KRW before the first trial court ruling, while public elementary schools and the education office, which failed to comply, received 1 million KRW and 5 million KRW in damages, respectively.[4] The school and the education office found it difficult to understand the ruling that judged the school responsible for damages by citing incomplete font unauthorized use data presented by the plaintiffs, and the plaintiff Font Company also found it difficult to accept the difference between the original request for damages and the court's decision on compensation. In the end, both sides appealed to the high court and the Supreme Court, but both were rejected by the first trial. As a result, both sides were not satisfied with the ruling, but the school's responsibility for damages, even at a modest cost, was sure to serve as a very unfavorable precedent for schools in the same situation. Since then, the Font Company has shared cases of font damage to elementary and secondary schools in the Seoul metropolitan area and is forcing them to purchase damages or purchase fonts for unauthorized use of the fonts. Recently, two more education offices in the Seoul metropolitan area are under trial for filing lawsuits seeking damages for unauthorized use of their fonts. Recently, two more education offices in the Seoul metropolitan area are under trial for filing lawsuits seeking damages for unauthorized use of their fonts.

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4) Public elementary schools were awarded by the Ministry of Education for reparation under the National Reimbursement Act without holding the head of the school responsible for the cloning of a font by an unidentified staff member. As for the costs of lawsuits with schools, the plaintiffs were required to pay the entire costs of lawsuits against public elementary schools.

3. Main Outcomes

A. Font Copyright Cause and Response

The continuing dispute over the Font Copyright of educational institutions is interpreted for the following reasons: First, look for the first cause of PC user's lack of understanding about the font. Most PC users use the font, but they do not buy and use it. Schools are no different because the bundled font in the application software alone has enough work, such as writing documents. Thus, PC users have used the font only with an empirical understanding, without the need or opportunity to understand it correctly. As the Supreme Court's ruling (2001) confirmed, copyright understanding of the font is not easy to understand, and not many users know that only non-font files are protected. It is a problem to pass the buck only to the less understood users without efforts such as sufficient development to ensure proper use and understanding of the font and proactive measures to block unauthorized distribution sites.

Second, the cause can be found in that it is difficult to identify bundled and paid fonts on a PC. In schools that use multiple PC together, there may be additional installed fonts in addition to the built-in bundle fonts. There may also be school classes and outside lecturers or paid fonts that have been cloned without some recognition. However, it is very difficult and cumbersome for users to recognize such installed font as bundle, free, and free font and use it for their own purposes.

The third reason is the limitations of copyright legislation on changing the IT environment. As previously explained, in two copyright cases at Font Corporation, the court has taken the following position on the font. The design of the font is not protected, but copyright protection is provided for the font file implemented in a program to use the font on a PC. However, some law firms in charge of the Font Corporation's legal representative for copyright affairs are randomly collecting printed and distributed materials and PDFs from educational institutions and sending out large amounts of money or demand for the use of paid fonts.

In response, the Korea Education and Research Information Service produced guidelines for the use of the font based on the content of the font copyright counseling most frequently

inquired at schools in 2018 and completely revised and distributed the existing copyright textbooks (three kinds) to help them better understand the font and copyright.

B. Distribution a Program for Checking

In September 2017, the Korea Education and Research Information Service started developing a 'Font Check Program' that allows schools to check paid fonts through consultation with the Ministry of Education in order to urgently solve the problem of Font Copyright, which is the biggest issue of educational institutions, at the same time as it was designated as the Education Copyright Support Center by the Ministry of Education. It is a program that makes it easy to find additional installation font files that do not know who is installed in schools that use PC for public use.

However, even if the paid font files installed on the PC were deleted completely, it could not be reassuring as long as documents previously written with paid font were still available on the school homepage and others. This is because the history of paid font use can be included in the document regardless of whether or not the final document creator uses paid font. In order to do this, a program for replacing a paid font (HWP) with a bundle font was requested and produced by requesting Inc. Hangul and Computer.

Afterwards, the education institutions were required to share pending issues of the font dispute with the education office and to provide sufficient guidance and education to prevent further Font Copyright Disputes from occurring at the educational institutions. The inspection program also allowed all elementary and secondary schools to complete the inspection by 2018. In order to inquire and support the use of the font inspection program, the Korea Education and Research Information Service, the Korea Copyright Protection Agency, and Inc. Hangul Computer operated call counseling, respectively.

4. Future Plans

In the past, the trade for copyright settlement in no question first sued the investigative agency and demanded the settlement. The purpose of the measure is to induce users to demand the agreement of the rights holders with a burden on the exercise of public authority. Recently, however, such an arrangement has been taken in a different way than in the past. If past criminal charges were taken for the purpose of stopping copyright infringement, seeking damages or agreeing to do so, the court now prefers to sue for damages only for receiving settlement money without a legal battle over whether or not the cumbersome and burdensome copyright infringement was committed.

Even an educational institution should be held responsible for copyright infringement if the font file was copied and used without permission, but the act of agreeing to the settlement and the demand for a program sale cannot be considered proper. It is necessary to have a correct understanding fonts in the educational institutions and to deal with them wisely through fact checking. To that end, the Korea Education and Research Information Service plans customized copyright education for school education starting in 2019. The government aims to help prevent copyright disputes and raise awareness of copyright protection by focusing on the sharing of copyright issues and legal system education of educational institutions to teachers and education professionals.

Chapter 5.
ICT Literacy Level

1. Project Overview

International Computer Information and Literacy Study (ICILS below) has been initiated as the importance of computer and information development has been emphasized as one of the key capabilities of the future. The ICILS aims to measure, compare and analyze the computer and information aptitude of students from around the world on an international level for secondary school students as an international comparative study.

ICILS has been studying on five years cycle, and Korea has participated in the 13st annual ICILS 2013 study since 2012 and is currently carrying out the 2nd cycle of ICILS 2018. For ICILS 2018, the government developed a new evaluation system, evaluation frame and assessment tool with ICILS 2018 preparation in 2015 and 2016. In 2017, the ICILS 2018 preliminary inspection was conducted, and based on this, the ICILS 2018 main inspection was carried out in 2018. In 2019, ICILS 2018 main inspection results will be announced and analyzed.

2. Promotion Status

A. Revised ICILS 2018 Preliminary Inspection Evaluation Frame

The ICILS 2018 preliminary examination evaluation frame has been revised to two dimensions: 'Digital Information' and 'Computational Thinking'. In response to these changes, Computer and Information Literacy has been redefined, including computing thinking skills, to investigate, generate, communicate and solve problems using computers.

B. Configure ICILS 2018 Preliminary Inspection Assessment Tool

The inspection tool has been developed into an inspection module that can be conducted with a computer-based assessment. The ICILS 2018 Preliminary Inspection Module has been applied to the ICILS 2018 Preliminary Study as a course of module[5], which is the 'Band Competition', 'Breathing' and 'Field Learning' disclosed among the ICILS 2013 Inspection Modules last cycle, with the exception of 'After school exercise'. In addition, four new inspection modules have been developed, including 'Reducing trash', 'Board game clubs', 'A self-driving bus', and 'Farming with drones'.

The education context variable survey configuration consists of the ICILS 2018 preliminary examination questionnaire, which consists of student, teacher, ICT director, and school principal questionnaire, and the computer and information literacy education status and educational environment.

The preliminary examination of ICILS 2018 was conducted from June 8, 2017 to June 16, 2017, taking into account the schedules of the 32 schools selected. Thirty-two schools conducted preliminary inspections as planned, with 97.3 percent of the students participating in the inspection at the selected schools in Korea.

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5) Trend module means an inspection module with inspection questions commonly used between evaluation cycles for analysis of student computer and information trends.

3. Result of Promotion

Recently, Korea conducted information education in elementary and middle schools necessarily through the revised 2015 curriculum, but middle school students who are subject to the ICILS 2018 preliminary examination will be subject to the 2009 curriculum revision, under which 'information' is an optional subject. Each school subject to the ICILS 2018 pre-inspection depends on whether or not students complete the information subject. Therefore, in order to closely analyze the results of the ICILS 2018 preliminary and later ICILS 2018 main inspections, it is necessary to check the status of computer and information literacy education in each school. In response, the Korean research team further investigated whether the 2017 Information Curriculum was organized or not, the number of three-year information courses for freshmen (second year of 2017) in 2016, the number of teachers with information and computer teaching positions, and the operation of software education research schools or leading schools.

According to the results of the ICILS 2018 preliminary examination, eight schools (25%) were enrolled in the school curriculum in 2016 and five schools (15.6%) were enrolled in the curriculum in 2017. In addition, software education research and leading schools operated at three schools (5%) in 2016 and three schools (5%). There are 17 teachers in 12 schools (53 percent) who are qualified to teach information and computers. Of the 12 schools that have teachers with information and computer teaching qualifications, four have not organized information subjects, and teachers with information textbook certificates are teaching subjects other than information.

A comprehensive analysis of information education status showed that 19 out of 32 schools (59.4 percent) failed to provide computer and information service education opportunities to students through school education because they did not organize information subjects in their school curriculum and did not operate software research schools or leading schools. In other words, 380 students in 19 schools that conduct ICILS 2018 preliminary inspections did not receive computer and information literacy education in their regular curriculum from at least the first grade of middle school to the time of the second grade test.

4. Future Plans

Based on the results of the ICILS 2018 preliminary inspection and further analysis, future tasks are presented as follows. First, it is necessary to establish education infrastructure for computer and information consumption Second, teachers and administrators should be strengthened. To this end, the government should support training of school managers for computer and information-sourcing education, and strengthen support for leading schools and teachers' research groups. Third, computer and information literacy education should be expanded in the school curriculum. To this end, quality control is required for essential operation of computer and information service education for elementary and middle schools according to the 2015 education process. It should develop and distribute computer and information literacy education programs that are linked to various subjects. Fourth, computer and information literacy teaching should be improved. To this end, it is necessary to improve teaching education to foster computing thinking skills and establish an online ecosystem to spread computer and information consumption education.

Finally, a support system should be established for the stable implementation of ICILS. To this end, it is necessary to organize and operate a computer and information development education committee and support a stable implementation foundation for computer-based evaluation.

1. Project Overview

With ICT (Information Communication Technology) gradually spreading to all sectors of society and the structure of global competition strengthening, fostering talent with ICT literacy has become an internationally important issue. Korea also made software education compulsory from the revised 2015 curriculum. However, the ICT literacy of Korean students is declining, and education and information and technology education on the use of ICT at school sites are also continuously regressing. According to the ICILS 2013 survey, Korean students have low computer learning experience. The PISA 2015 survey also showed that the level of awareness of ICT utilization and attitudes among 15-year-old students in Korea alone is quite low. Therefore, policy initiatives should be strengthened to improve students' ICT literacy capabilities at the national level, which requires continuous measurement of ICT literacy levels and finding countermeasures based on the results.

The purpose of this study is to analyze the characteristics of learners as shown in the results of the ICT Literacy Level Measurement Study conducted by the Korea Institute of Science and Technology Information over the past 10 years (2007-2016) to derive major implications regarding ways to enhance learner's competency and improve inspection tools.

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6) This manuscript excerpts and summarizes some of the research report 'In-depth Analysis of ICT Literacy Levels for Elementary and Middle Students (Kim Jong-min et al)' by the Korea Research Institute for Science and Technology. Further details can be found in the study report.

2. Promotion Status (2007~2016)

Starting with the Development of Inspection Tools for Elementary School Students of the Korea Institute of Science and Technology Information in 2007, the Research on Development of Inspection Tools for Middle and High School Students in 2008 and the Development of Online-based Inspection Systems and Performance Test Tools in 2009. A nationwide ICT literacy level measurement study was conducted for elementary and middle school students every year since 2010, except for 2013.

Specifically, the government conducted an online inspection of ICT literacy in 2010, changed inspection tools based on capability factors, and developed questions and questions metadata (300 questions) for database deployment in 2011. In 2012, the government conducted online inspections by improving the system and establishing a permanent inspection system, and in 2013, it conducted a 'ICT Literacy Time Series Analysis' based on the results of a three-year study conducted from 2010 to 2012. From 2014 to 2016, research was conducted focusing on ways to supplement and modify test papers, conduct online inspections, and improve measurement of ICT literacy.

3. Main Analysis Results

The following summarizes the characteristics of ICT literacy scores among elementary and middle school students shown in the test data for 10 years (2007-2016) focusing on the technological statistics of the same variable.

A. Elementary School Students

First, if look at the average of ICT literacy scores for each elementary school year, the average for each 4-6 grade year was the lowest for 2016, and the average score for 2012 was the highest.

Second, analysis of content elements showed that 'Information Processing' was the highest

in 2010, 2014 and 2015, while 2011 and 2012 showed strong tendency in information processing as 'Computer and Network' was high.

Third, according to the analysis of trends by year of capability factors, 'Communication of Information' was the lowest in 2007 (1-2 years), 2009 (5-6 years), 2011 and 2012, showing the weak tendency in 'Communication of Information' and 'Analysis and Evaluation of Information'.

B. Middle School Students

First, if look at the yearly average of ICT literacy scores of middle school students, the average for each year first to third grade was the lowest in 2008, and the average score for 2010 was the highest.

Second, the 'Information Society and Ethics' were the highest in 2008, 2009, 2010, 2011, 2012, 2014 and 2015 as a result of the analysis of trends by content element year, and the 'Information Processing' was the lowest.

Third, according to the analysis of trends by year of capability factors, 'Use and Management of Information' in 2008, 2009, 2012 and 2016, 'Communication of Information' in 2010, 2014 and 2015 and 'Awareness of Problems' were the highest in 2011. Therefore, middle school students showed a strong tendency to 'Communicate Information' and 'Use and Manage Information'.

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Chapter 1.
The National Education Information System 'NEIS'

1. Project Overview

The National Education Information System (NEIS) is an educational administration information system established to efficiently carry out education administration tasks at the Ministry of Education, 17 municipal and provincial education offices (including industry associations) and some 10,000 elementary and secondary schools nationwide. The school's field and educational institutions contribute to enhancing the efficiency of education administration tasks and satisfying the people's right to know education information based on data generated and managed by NEIS.

2. Progress of Promotion

NEIS opened the general administrative area in November 2002 and the school administration area in March 2003 with the aim of enhancing efficiency in the overall educational administration. In March 2011, the next-generation NEIS was opened, and in 2017, the government implemented projects to improve the personnel and benefits system of school accounting staff, improve the functions of the National Service Standards (NCS), link the criminal experience management system of the National Police Agency, and establish a foundation for the establishment of an integrated disaster recovery system of the education

information system.

In 2018, the government is pushing ahead with the information service strategy plan project to prepare measures for the establishment of 4th generation NEIS in order to ensure the need to replace aging equipment and to accommodate changing education policies.

[Table 2-1-1] Progress of NEIS Construction Project

Period	Promotion Content
2000.9~2001.3	• Planning of ICT in Strategy for the Establishment of the Educational Administration Information System
2001.10~2002.11	• Development of 27 areas of work, including personnel, and opening 22 areas of general administration in November 2002
2003.3	• The opening of five school administration areas, including teachers/educators
2004.6	• Establishment of the College Entrance Data Delivery System
2004.8~2006.3	• Establishment of three separate areas such as school and academic affair (recommended by the ICT in Education Committee)
2006.3~2008.12	• Open public service (2006.) and school information notification (2008)
2011.3	• Completing the implementation of the next generation NEIS and applying it to the field
2012	• Young Talented School (August) and Overseas Korean Schools (October) expanded to school affair work
2013	• Online school violence survey and student emotional and behavioral characteristics test
2014	• Designation of NEIS's Major Information and Telecommunication Infrastructure
2015	• Certification of the Information Service Management System (ISMS) on the NEIS Operations Center
2016	• Expanding and Applying Web Access to NEIS's Teachers and Academic Fields • The Improvement of NEIS Function for the Application of the Free semester System • Improvement of NEIS Function for the Application of the Revised 2015 Curriculum
2017	• Improving the personnel and benefits system functions of the school's accounting staff • Enhancement of Functions for Linkage of National Serviceability Standards • Establishment of the Foundation for Integrated Disaster Recovery System for Educational Information System
2018	• Strengthening the management system of school records • Enhancing the User Education Environment • ICT Strategy Plan for 4th NEIS

3. Main Outcomes

A. Establishment and Improvement of the Integrated System for Education Benefits and Education Costs

In 2017, the government improved the NEIS-based program so that students could apply for education cost support at any time regardless of the application period and tried to expand

opportunities for benefit from children from low-income families by improving the link with the NEIS-based education benefit program.

In addition, the education benefit service was improved by reflecting real-time changes in students' transfer, admission, and academic records, and by upgrading statistical functions for settlement based on the status of the recipients and the results of the education benefit payment.

B. Improvement of NEIS System for Information Management of Absenteeism Students

In 2017, the scope of the management was expanded by adding the functions of managing absenteeism and underemployed middle school students through the improvement of the Suspension of Studies Students Support System, and the functions were improved so that they could be efficiently shared according to the operational conditions of each city or province by adding the 'Education Support Office' to the existing reporting system.

In 2018, the government will upgrade its the Suspension of Studies Students Support System by linking information on absentee with the Ministry of Health and Welfare's e-child happiness support in order to find children in need of welfare services.

C. Improvement of the Function of the Personnel and Benefits System of School Accounting Staff

In 2017, the common job codes of school accounting staff were standardized from 33 to 16 by improving the functions of the existing system of personnel and benefits for school accounting staff of 17 municipal and provincial education offices. In addition, the efficiency of human resources management and convenience of work was increased through the personnel and benefits system of school accounting staff at NEIS so that it would not be inconvenient to use the personnel and benefits system.

D. Online Survey and Examination Support for Students and Parents

In the 2017 survey on school violence, 4.2 million students (4.41 million students, 94.9 percent), 3.6 million students (3.82 million students, 94.2 percent), and 1.89 million students (1.91 million students, 99.2 percent) participated in the 2017 student sentiment and behavior test.

In the 2017 Teacher's Ability Development Assessment, 3.57 million students (4.33 million students, 82.4 percent), 1.86 million parents (5.7 million students, 32.6 percent), and 370,000 teachers (410,000 students, 90.0 percent) participated.

E. Information Sharing and Collaboration Through Connection of Information Systems

In 2017, the government linked teacher identification information to the Korean Council for University Education's standard public application system to enhance fairness in college admissions. In 2018, it is preparing to link the criminal history of education institutions workers to the National Police Agency's criminal record management system to protect

F. Establishment of the Foundation for the Integrated Disaster Recovery System for Information Sharing and Collaboration Education Information Systems through the Connectivity of the Information System

The Ministry of Education established a basic plan to establish a disaster recovery system in December 2016 and has been operating a team dedicated to establishing a disaster recovery system since February 2017, comprising the Ministry of Education, the municipal and provincial education offices and the Korea Education and Research Information Service. The team in charge of establishing the disaster recovery system is promoting the design of the disaster recovery center and disaster recovery system with the aim of opening the disaster recovery system in 2020. In addition, efforts are made to create a safer education information system by readjusting relevant laws and systems necessary for the integrated establishment and operation of the disaster recovery system and establishing a task continuity plan for securing continuity of educational and administrative tasks.

4. Future Plans

The NEIS, which was established in 2010, requires countermeasures to responding various pending issues, including the acceptance of changing educational policy support and the aging of infrastructure. The government implemented the information service strategic plan (ISP) project to prepare preemptive support measures for new education policies, improve work procedures, and secure a macro-investment guide to cope with rapid changes in information technology environment.

Chapter 2.

Local Education Administrative and Financial Integration System 'EduFine'

1. Project Overview

Since 1995, the need to introduce a business-type accounting method for local education finances has been raised by civic groups and scholars to enhance transparency and understandability of financial operations. In addition, double bookkeeping accounting system to calculate government financial statistics was made in accordance with the IMF's recommendation for the introduction of international level financial information at the time of the foreign exchange crisis in late 1997.

In February 2005, the Ministry of Education formed a digital local education finance team to establish an integrated information system for provincial education finance and started developing a local education administrative and financial integration system ('EduFine' below). The purpose of the EduFine is to improve transparency and efficiency in local education finances through innovation of the budget and accounting system (performance management, double accounting, integrated line and financial system establishment), and to reduce the work of faculty members by operating a system centered on users of the site.

2. Project Promotion Status

It conducted BSP, BPR, and ISP for the establishment of EduFine system in 2005, developed EduFine for 6 sectors, 16 systems and 55 units of work over two years from 2006, and opened services for 27 units in 2008. In 2013, it selected 'improvement of the EduFine system' as its national agenda and unified its spending items into a work management system.

In 2016, the government introduced the education and electronic financial system (e-education vault) through an agreement with the municipal and provincial education offices' vault banks to improve efficiency and transparency in fiscal execution, and the automatic payment system of education fees and credit cards to improve the convenience of parents' paying. In 2017, it linked the State Grants Integrated Management System (e-National Help) for transparent management of the execution of state subsidies by educational institutions, while pushing for the ISMP project to establish the scope of development and deployment strategy for the next-generation EduFine program. In 2018, the government completed the establishment of the State Grants Integrated Management System (e-National Help), and is pushing for the main project starting with credit card automatic payment for high schools.

3. Main Outcomes

In order to create educational conditions for teachers to devote themselves to their classes through mitigation of teachers' administrative work, 255 improvement opinions were drawn out of the opinions reached through school field visits (54 schools), and 17 cases with high urgency were reflected in the improvement of their functions. Eighty-four improvement opinions, which are difficult to improve in the short term, will be selectively reflected in the next-generation system.

In addition, the government established an automatic credit card payment system for convenience of parents' payment and efficiency of the receipt and has operated it on a trial at Gwangju and GyeongBuk Provincial Education Office, and operated it on whole high school

since September 2018.

In May 2018, the government completed the establishment of 17 education offices in the entire city and provincial education offices in order to improve transparency and efficiency in the expenditure of the educational special account vaults. In order to improve the performance of the school's Electronic Funds Transfer (EFT) service, the government created a clean financial environment at the education site by improving the resource extension and linkage structure of the EduFine general center. In March 2017, the government completed the enhancement of the function to link the EduFine system with the Ministry of Strategy and Finance's Government Grants Integrated Management System to prevent fraudulent and duplicated payments of state subsidies and disclose information to the public. In addition, stability and operational efficiency were dramatically improved by introducing and operating the international standard quality control system to provide high-quality EduFine services (maintaining 100% of the disability handling rate, 99.8% of the SR completion rate, 0.08% of the program defect rate, and 0.08% of the CMMI level3 certification).

Finally, the government launched an application development project in March 2018 to establish a next-generation local education implementation and financial integration system.

Chapter 3.

Local Education Finance Management Notification Portal System 'Local Education Finance Notice'

1. Project Overview

The purpose of Local Education Finance Notice is to ensure the people's right to know by transparently disclosing the situation of local education finance management where and how local education finance is used, and to enhance the financial soundness and efficiency of the people by strengthening the practical participation and communication of the people on the fiscal management.

The Ministry of Education established the local education finance information website after the integration of the local education finance information website (October 2014) - the temporary opening of the Local Education Finance Notice (December 2014) - the official opening (December 2015).

2. Status of Promotion

A. Promotion System

Since 2015, the Ministry of Education has successfully established the Local Education Finance Notice and established a local education finance notification system early by organizing

it as a financial expert at the municipal and provincial education offices and an information service expert at the Korea Education and Research Information Service. Currently, the Ministry of Education is in charge of overall projects, planning, and policy-making, while the Korea Education and Research Information Service and Information is in charge of overall development and operation after receiving projects from 17 municipal and provincial education offices.

B. Operation System of Local Education Finance Notification

The local education finance notification system consists of the municipal and provincial education offices' EduFine notification system and the Ministry of Education's public portal system, the Local Education Finance Notice.

The EduFine notification system is a public service system for preparing data for 'notification of local education finance status' pursuant to Article 60 of the 「Local Finance Act」 at the municipal and provincial education offices, and its main function is to prepare and manage basic data and notification data and to link it with the Ministry of Education's Local Education Finance Notice.

C. Content of Local Education Finance Notice

Local Education Finance Notice consists of integrated public notification, financial statistics, easy-to-know finance, school information, data room, participation and communication, and provides PC-based home page services, tablets and smartphone-based mobile web services.

3. Main Performance

Previously, the standards for preparing statistics for local education finance differed between the timing of the preparation and the preparers, making financial statistics less reliable. The same notification items, forms and criteria were presented by developing 'Preparation Manual

for Financial Public Announcement of City and Provincial Education Office' and were reflected in the amendment of the Act at each time of notification and notified to each city or provincial education office to ensure objectivity of the notification data.

In 2017, about 270,000 users used Local Education Finance Notice, exceeding the target of 260,000 users per year, and the number of annual access users will be close to 130,000 in the first half of 2018 and more than 290,000 through various promotional activities in the second half.

4. Future Plans

Although the Local Education Finance Notice has shown many positive results mentioned before despite the short operating period, there are still tasks that need to be resolved, such as measures to enhance public understanding based on the low level of public interest. It is planning to increase level of interest by reorganizing its homepage UI and providing new services through a six-month project to revamp the Local Education Finance Notice starting from July 2018.

The Ministry of Education and the Korea Education and Research Information Service and Information are carrying out various promotional activities, including running an online monitoring group for 'Local Education Finance Notice' directed by people interested in local education finances, and making efforts to expand the scope of public information by periodically surveying areas of public interest.

Chapter 4.
Operation of the Education Information Notification System

> **Section 1.** Operation of 'Kindergarten Notification' for Information Notification System for Kindergarten

1. Project Overview

'The Notification of Information System for Kindergarten' is an objective and transparent notification of main information in the entire kindergarten, and is designed to enhance the quality of infant education by guaranteeing parents' right to know and accurately identifying kindergarten conditions.

Since 2014, the system has been operated under the 'Integrated Notification of Information system for Nursery and Kindergartens', which allows information from existing kindergartens and nurseries to be checked at a glance in order to further expand parents' choices and minimize inconveniences. 'The Notification of Information System for Kindergarten' consists of the 'Kindergarten Public Information Registration System' that supports the Notification of Information for kindergartens input for the operation of the notification of information system for kindergarten and the 'Kindergarten Notification' that provides integrated notification of information.

2. Promotion Status

A. Progress of Promotion

The Notification of Information System for Kindergarten was established on November 13, 2009 through 'Plan for Advancement of Infant Education'. Notification of information for all kindergartens was mandatory through the revision and announcement of Article 5 paragraph 2 of the 「Special Act on Notification of Information by education-related institutions」 on December 31, 2011, and the specific scope, frequency and timing of Notification of Information of kindergartens were determined by the revision of Article 3 paragraph 2 of the 「Enforcement Decree of the Special Act on the Notification of Information by Education-related Institutions」 on April 20, 2012. In September 2012, the government began the Notification of Information System for Kindergarten in earnest by launching a public service for 'Kindergarten Notification'. In 2014, 'Mobile Kindergarten Notification' application was developed and services were started.

The current scope of Notification of Information for kindergartens was adjusted to 21 items and twice a year through the revision of the 「Enforcement Decree of the Special Act on the Notification of Information by Education-related Institutions」 in June 2015. As a result, 'Integrated Notification of Information for Nursery and Kindergarten' was started in December 2015.

The 'Financial Accounting Rules for Private Institutions' were revised in 2017, improving its function to allow private kindergartens to apply accounting account bookings to kindergarten Notification of Information systems starting in 2018.

B. Promotion System and Role

If look at the promotion system of the Notification of Information system for kindergarten, it consists of the Ministry of Education, the city and provincial education offices working council, the Korea Education and Research Information Service, the city and provincial education offices and the education support office, and kindergartens. The Ministry of Education carries out basic plans and system improvements related to the Notification of

Information system for kindergartens, collects policy opinions and conducts advisory activities at the working council of the municipal and provincial education offices, and plays the role of the Korea Education and Research Information Service as a general management institution for Notification of Information of kindergartens.

The Notification of Information system for kindergarten is largely divided into the 'Notification of Information Registration System' and 'Kindergarten Notification' that supports the public service of information notification. The notification of information registration system enters the information by accessing it through the Administrative Electronic Signature Certificate (EPKI) granted for each kindergarten at the time of regular notification in April and October. The education support office verifies the information of kindergartens under the support agency, while the municipal and provincial education offices verify the information of kindergartens under the education office. The Korea Education and Research Information Service, a general management agency, operates the school so that it can serve the nation through 'Kindergarten Notification' after collecting, managing and verifying information notification of kindergartens.

The kindergarten information notification system brings kindergarten information registered through NEIS, shares the information of kindergarten disclosed with the 'e-Kindergarten (infant school cost support system)', and provides the 'first-time school (kindergarten admission management system)' and internal connection services. In addition, it provides integrated information notification for nurseries and kindergartens in connection with the information notification portal of nurseries. In addition, it provides external link services with the Educational Information Statistics System (EDS) and the Government Public Data Portal for basic information on kindergartens.

The information notification for kindergartens is conducted in April and October for about 8,900 national, public and private kindergartens nationwide every year. The information notification for kindergartens consists of 21 detailed items in seven areas: basic status, infant and teacher, curriculum, cost and settlement, food and health management, environmental hygiene and safety management, corrective orders, and other educational conditions and operational status. An entity shall disclose information on 19 items in April and 11 items in October.

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3. Main Outcomes

Kindergarten information notification is mandatory for kindergartens operating in the year in the country, and all kindergartens normally participated in regular information notification in April and October 2017. Through the Kindergarten Notification, some 42,500 nurseries and 8,900 information for kindergartens are available at a glance.

The number of users of information notification for kindergartens has been on a steady rise and the number of users in 2017 increased about 38.6 percent compared to 2016, the report showed. Kindergarten information notification users have the highest number of users at the beginning of the admission season and semester each year, and the number of users of kindergarten notification applications has been steadily increasing.

4. Future Plans

The Kindergarten Information Notification System will assist kindergarten, education support office, city and provincial education office in entering, submitting, verifying accurate data through improvement and function improvement work that continuously reflects the needs and opinions of various stakeholders. In addition, in order to improve the service to the public from a user's perspective, the government will carry out the visualization of the information notification data and the improvement of the information notification and key notification indicators. In addition, in the long run, the government will carry out the reorganization of the Kindergarten Notification homepage and the upgrading of the Kindergarten Information notification System. In doing so, the government will ensure parents' right to know and choose kindergarten, enhance transparency and accountability in the operation of kindergartens, and support effective child education policies.

Section 2. Information Notification System for Elementary and Middle Schools 'School Notification'

1. Project Overview

The school information notification system was introduced and promoted with the aim of improving the people's participation in school education and the efficiency and transparency of education administration, and inducing data-based education policy and academic research as an essential system for satisfying the people's right to know school information and ensuring the school choice of students and school parents.

2. Promotion Status

A. Progress of Promotion

As the 「Enforcement Decree of the Special Act on Information Notification by Education-related Institutions」 was promulgated in November 2018, the legal foundation of the school information Notification system was fully prepared. After several revisions to the Enforcement Decree of the Special Act, 47 elementary and secondary school information in 15 categories as of 2018 has been disclosed on the school's website and through 'School Notification'.

B. Promotion System

The Ministry of Education will comprehensively manage and operate the school information notification system, including the establishment of a basic plan to operate the school information notification system and the improvement of the system, and prepare the forms and guidelines required for the notification. In addition, the Act may require individual schools to submit materials related to notification information and may issue corrective recommendations and

changes to education-related institutions.

The Korea Education and Research Information Service was designated as a general management institution in January 2008 and is in charge of matters concerning the establishment and operation of the school information system and the database, and supports the information notification services of education offices and schools, including the provision of various guidelines and user manuals, training of information notification personnel at the education office and schools, and operation of call centers.

C. Notification Institute

A total of 12,156 schools, which are subjected to the 2018 school information notification, will enter and submit information through the National Education Information System (NEIS), and the municipal and provincial education offices and general management institutions will provide the public service through the school announcement after verification. Among them, schools that do not use the National Education Information System (NEIS) disclose school information through the school's website, not through the School Notification.

D. Content and Scope of Notification

Regarding the current status of students, there are the number of students who are enrolled, transferred and suspended from school, the status of students who are enrolled newly, the status of graduates' careers and scholarships, and the improvement of students' physical strength. The current status of teachers will be disclosed, including the status of teachers in each position, the status of teachers in each category of qualifications, and the current status of teachers' performance and bonuses. Education activities include organizing and operating school rules and education plans, school management committees, club activities and the status of after-school operations. Education conditions include the status of school facilities and opening, school meals, school violence, student and school parents' counseling performance, school health and environmental hygiene, and school libraries. In addition, the results of the national scholastic achievement evaluation will be disclosed.

3. Performance of Promotion

A. Expansion of Public Big Data School Information 'School Notification'

Since March 2016, 29 types of School Notification data with high public interest were opened in the form of open format (CSV) by developing data for notification of School Notification. It is also contributing to the expansion of the private sector through data-linked services so that public information can be used by private companies and others. The number of users reached 13.64 million as of 2017 by improving the convenience of providing information and expanding the openness of data for public use.

B. National Field Support Group Configuration and Operating

A total of 83 field support teams were formed in 17 cities and provinces, focusing on experienced school information service providers nationwide, in order to expand the process of promoting effective notification service activities nationwide. Through the operation of the on-site support group, the government collects opinions of school sites in real time through advice from various fields such as providing customized services centered on users and information notification administration, systems, and guidelines.

C. Notification Information to Enhance Reliability and Efficiency

It expanded the link between educational statistics and data on NEIS, conducted thorough pre-testing and pilot operation of municipal and provincial education offices. Support was provided to enhance the work competency of the person in charge of information notification, such as production and distribution of input video manuals, training of upper and lower half of the year, cross-examination, and new production of work manuals of municipal and provincial education offices. In addition, the data management and storage system was established so that itemized supporting data of school information notification, which was previously managed with handwritten documents, could be immediately loaded into the system.

D. Public Satisfaction

According to a survey of students, parents, faculty, and researchers on satisfaction in the second half of 2017, the overall satisfaction level of School Notification rose 0.1 point year-on-year to 3.94 points, and the overall satisfaction level of School Notification UI improvement, visualization information provision and continuous expansion of public information was found to be satisfactory.

4. Future Plans

To enhance the accuracy of disclosed information, the municipal and provincial education offices need to strengthen their role in supporting and managing school information notification. Schools are required to enable collaboration and training support in schools through a field support group composed of public officials, the education office is required to establish and operate an inter-departmental cooperation system, check and monitor the relevant schools' disclosed information, and enhance the school managers' ventilation of interest and staff skills.

In addition, the general management institution should continuously find ways to reduce the burden of work on school sites and enhance their reliability, such as supplementing the input system of disclosed information, establishing an expanded verification system, and strengthening the automatic synthesis function of the information input into the NEIS. In addition, in terms of opening and sharing of public data, the government should seek policy and technical measures to enable consumers of disclosed information to actively utilize and utilize the information.

Section 3. The University Information Notification System 'University Notification'

1. Project Overview

Based on the 「Special Act on Information Notification of Education-related Institutions」 enacted in May 2007, the university information notification system is a public service that provides main information on the operation environment, education, and research conditions of 418 higher education institutions nationwide through University Notification (www.academyinfo.go.kr).

2. Promotion Status

The Ministry of Education, which is the main body in implementing the university information notification system, establishes a basic plan for the university information notification system, and the university information notification center, which is the general management agency, carries out monitoring of the status of university information notification, collecting, managing, and serving databases. The management institutions for each category will verify the information submitted by universities and link the verified information to the university information notification center of the Korean Council for University Education, a general management body.

The universities subject to the information notification are institutions of higher learning under Article 2 of the 「Higher Education Act」 and other universities established under the Act, which is divided into national, public, private and university, college and graduate schools, and there are a total of 418 universities in the 2018 subject to notification. Schools designated by the Presidential decree that information notification is difficult due to defense and security reasons, remote universities and in-company universities under the Lifelong Education Act will be excluded.

The university information notification defines the scope, number of notifications, and timing by higher education institutions according to the attached table of「Enforcement Decree of Special Act」, including the status of departments, tuition, employment rate, scholarships, and specialization status that can be referred to in selecting universities.

3. Main Outcomes

A. Information Notification to Streamline Management and Operation

In order to reflect the changing environment and the needs of the people, the government revised the notification items and guidelines to reflect the opinions of the Ministry of Education, higher education institutions and related agencies, and revised relevant laws and regulations, and held training sessions of staff in each area in March for reliable notification. To participate in the voluntary notification system of universities, 40 schools were selected to strengthen the cooperative system with universities and to conduct research on improving the notification system and reducing errors in information notification. In addition, a quarterly consultation meeting involving the Ministry of Education and the general and itemized management institutions was held to discuss ways to collect opinions on the related items and management guidelines for each agency and improve the notification system.

B. Quality Management of Notification information and Reliability Enhancement

In order to manage the quality of information notification which is a service to the public, internal verification (increase in previous years, type verification, content verification, etc.) was conducted during the notification to improve the accuracy of the notification information, and after the notification, reliability was increased through on-site inspection and consulting, external monitoring, and regular operation of the reporting center.

C. Enhance the Utilization of Notification Information and Strengthen the Promotion

In order to strengthen promotion activities for students and parents who are real demander, the government participated in the pre and regular college entrance information fair, ran the University Notification promotion center, distributed promotional materials, and guided them on how to search for the University Notification. It held a thesis contest for the public and college students, and actively promoted the university information notification system by holding a poster contest using notification information for high school students. In 2018, if universities are searched through an alliance (MOU) with domestic portals, notification information will be provided by linking the University's notification information.

4. Future Plans

In the future, it is necessary to enhance the reliability of notification information by strengthening the education of university information notification personnel, develop various promotional measures to enhance the awareness of University Notification, and provide customized services to group of University Notification (student and parents, researchers, university officials, policymakers, etc.).

Chapter 5.
Education Information Statistics System 'EduData System'

1. Project Overview

The EduData Service System, along with efficient management of data from educational institutions, contributes to the mitigation of teachers' statistical data preparation tasks. The data in elementary and secondary fields loaded into the EduData Service System include school information notification, age, EduFine, elementary and secondary education statistics, special education statistics, CSAT, and national academic performance results. Higher education also includes statistics on higher education, job statistics, lifelong statistics, higher education financial and student loans and tuition fees, and current data on university libraries.

2. Promotion Status

In February 2010, a 'Review Conference on the Establishment of Fact-based Education Policy Support Services' was held under the presidency of the First Vice Minister of Education (then the Ministry of Education, Science and Technology) in order to support objective education policy establishment and academic research based on statistics. On April 26 of the same year, the second education reform meeting was held under the presidency of President and the theme of 'Diffusing a Teacher's Culture dedicated to educational activities'. On June 21, the 'Information-Based Human Resources Policy Support Service (proposal) - Realize Zero

Burden of Unit School's Statistical Task' was established and promoted in earnest from 2011. On April 2, 2012, the EduData Service System, which allows one-stop access to educational information statistics, was opened by the Ministry of Education and 17 municipal and provincial education offices. The EduData Service System (EDSS) was also opened on 30 April 2012 to enable general researchers to use educational statistics data for academic research purposes.

3. Main Outcomes

The primary purpose of the EduData Service System is to mitigate the statistical administrative work of unit schools. Given its achievements, EDS has become a work system that reduces the administrative burden on school teachers by mitigating the production of statistical official documents, and further supports data-based policy-making policies. The rate of statistical data provision through EDS continues to increase, and EDS utilization training for city and provincial education offices and education officials is regularly conducted to reduce administrative tasks for unit school statistics through EDS utilization.

[Picture 2-5-1] Annual statistical data delivery rate via EDS (Unit: Case)

	2014	2015	2016	2017	2018
	3,409/8,800	3,411/8,555	3,886/9,224	3,722/8,488	2,789/6,062
	38.7%	39.9%	42.1%	43.9%	46.0%
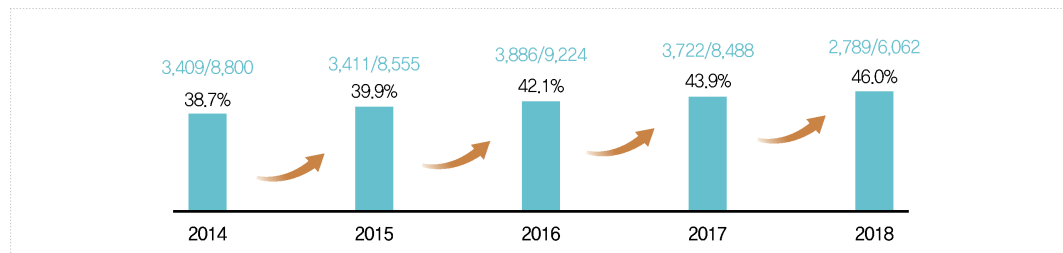
4. Future Plans

EDS is a meta-system that collects and links various source statistics, and reliability of source data is important to increase its utilization. In particular, measures need to be taken to enhance

reliability of data such as NEIDS and the work management system.

It is expected to be highly valuable not only in policy and academic use but also in the private sector as a large amount of educational information has been generated by the vast amount of educational information such as NEIS, EduFine, school information notification, KEDI education statistics, The EduData Service System (EDS), and education-related institutions. In addition, application of big data analysis technology and system establishment should be made to provide customized educational information to consumers. In addition, while the frequency of use of EDS continues to increase, the system should be promoted and the education for users should be expanded in order to improve the effectiveness of continuous work mitigation.

Chapter 6.
Municipal and Provincial Office of Education Management System

1. Project Overview

In 2003, the government selected 'Electronicization of the Entire Document Processing' as the 31st task of the e-government. This task is to electronicize the entire process of document processing from production to transfer and preservation and to establish a system for distributing documents between all administrative agencies, including public and private institutions. The Ministry of Education's establishment of an electronic school document system began in 2006 as one of its measures to boost teacher morale. The purpose of the project is to unify various approval functions of users through smooth exchange of documents between the Ministry of Education, the education office, the education office and schools, and to create a foundation for electronic processing of the entire process, such as production, approval, and distribution (Incoming/Outgoing) of documents. The aim is to alleviate the work of teachers and enhance the productivity, convenience and efficiency of document management of education administration.

2. Project Promotion Status

In April 2008, after the Ministry of Education introduced the Integrated On-Nara System and established the basic plan for the introduction of the school-unit electronic document

system in August, it formed the Electronic Document Establishment TF and the Local Education Function Classification System TF in October to prepare the standards for the classification of work management system functions and local education functions. In May 2009, the government established a basic plan for establishing a work management system for municipal and provincial education offices, completed the establishment and trial operation of the BPR/ISP system from July to October, 2010 and started the service nationwide on January 1, 2011.

It established an Internet Strategy Planning (ISP) in 2015 for the establishment of a next-generation work management system with the aim of opening the project in 2019 and implemented the Information System Master Plan (ISMP) project in 2016 to establish the scope of program development and implementation strategies. Since March 2018, it has been pushing for a project to develop applications for next-generation EduFine (integrating EduFine and work management systems).

3. Main Outcomes

In 2017, 8,016 out of 8,131 requests for correction of application software errors and improvement of user functions of the business management system were processed as a result of the project, and 8,016 cases were carried out for optimization of system performance of pilot education offices (Gyeonggi and Gangwon), and the government is doing its best for quality control by spreading them to other municipal and provincial education offices. To enhance user convenience and usability, eight tasks were improved, including designation of common unit tasks and unit task cards, preliminary distribution function to check the responsibilities of staff (documents and process departments) in advance, and submission of reception documents.

In order to activate the use of the job management system, the education for operators, including the transfer of records, was conducted four times in the first and second half of the year for a total of 82 employees and 9 types of user manuals were also implemented in the

current state, and the provincial education office's task council was supported eight times. In addition, it is pushing for the establishment of a master plan for the establishment of a next-generation integration system of local education administrative and financial, completing the status and case analysis, stakeholder consultation, improvement direction, establishment of a business plan and proposal request form in April 2017, and the establishment of the next-generation integration system of local education administrative and financial (integration of EduFine and work management system).

4. Future Plans

The government plans to implement maintenance so as not to cause difficulties for field users by properly handling error correction and improvement items of work management system application software, and to facilitate the release of production documents and original information by the municipal and provincial education offices (including schools), and transfer of production documents to the records management system. To secure reliability of the work management system and to efficiently manage documents, the government will continue to push for performance check and optimization, and improve functions focusing on user convenience. In addition, the government will push ahead with supporting work council and users centered on municipal and provincial education offices and provide education for enhancing the capacity of staff at municipal and provincial education offices.

The government plans to develop applied software for the establishment of the next-generation local education administrative and financial integration system (integration of EduFine and work management system) in accordance with the aging of the work management system, and to establish infrastructure for general centers and 17 municipal and provincial education offices from November 2018 to June 2019.

Chapter 7.
Preschool Tuition Support System 'e-Kindergarten'

1. Project Overview

In response to policies and environment for infant education, including free education for children aged 3 to 5 and the integration of credit cards for child care and education, the school has established and operated an 'e-Kindergarten' system for providing stable child education support services.

2. Promotion Status

e-Kindergarten will be in charge of policy making and implementation by the Ministry of Education, while city and provincial education offices will be in charge of policy implementation direction, consultation on major issues, and support and management of kindergartens. The Korean Education and Research Information Service is in charge of operating and managing the e-kindergarten system.

As 'Full Free Education for Infants Aged 3 to 5 Years Old' will be provided from the 2013, e-kindergarten is being reorganized and operated in phases. Starting in 2015, the integrated operation system for child happiness cards was prepared by implementing 'Integrated Project for Child Care and Childhood Expenditure Support Card'.

From August 1, 2017, the government has been providing equal support for infant education

for 'Foreign Children who Reside a Long-term in Korea' following the guarantee of equal infant education opportunities and changes to the social security system of the Ministry of Health and Welfare.

3. Main Outcomes

Transparent child education policies for free education of Nuri curriculum are being implemented through e-kindergarten, and administrative processes of kindergarten teachers and education offices have been simplified by informatization of the work of registering children, payment processing, and settlement of tuition fees. The amount of funding for preschool education is around 1.8288 trillion KRW for about 700,000 infants as of 2017.

4. Future Plans

Not only will the e-kindergarten's operation and security and personal information protection system be strengthened to establish a stable operating base, but through cooperation with the Ministry of Health and Welfare, the government will lay the foundation for integrated operation of welfare services to enhance the convenience of parents, including the integration of qualifications for child education and care support.

It plans to develop into an 'Infant Education Comprehensive Information Service' that can handle kindergarten admissions, information notification, on-site teachers' personnel and records management of infant life records, and kindergarten financial accounting in a single location.

Chapter 8.
Establishment of Integrated Information System for School Facilities

1. Project Overview

The national-based EduBill project for integrated school facilities was carried out as follows in order to promote the efficiency of the education office and the Ministry of Education's work on school facilities and policy-making through systematic management of school facilities' status information.

2. Promotion Status

First of all, before the implementation of the establishment project, the government performed business on establishment of school faculties integrated information system, business process reengineering and information strategy plan (BPR/ISP) for about eight months from August 2015 to March 2016 such as the development of business process reengineering (BPR) and Guidelines, the development of measures and guidelines for the standardization of data on school facilities management, the establishment of a mid-to long-term information strategy plan (ISP) for school facilities management, and the preparation of an integrated information system implementation plan and a request for proposal (RFP).

The first establishment project is 1.8 billion KRW as Ministry of Education's special grants for one year from April 2016 to March 2017, and is utilized as the education office's facility

management system within the scope of development and development of basic functions such as facility status and history management, education environment improvement project management, safety management, design book management and community functions. The second project has been carried out with major contents such as establishment of GIS-related functions and databases, development of facility operation management functions, linkage of existing system to primary function development, and establishment of backup system with budget of about 2.1 billion KRW for the last third establishment project since April 2018.

3. Main Outcomes

A. Development of Integrated School Facilities Information System

The Integrated School Facilities Information System is implemented by a total of three stages of construction projects, and the targeted for implementing functions in each field derived through the ISP were divided into three stages. In the second phase, the current status information, history management, approval functions were significantly reinforced in the second phase of the establishment project that was to be implemented by the end of March 2018. In the case of education environment improvement projects, the functions of 17 municipal and provincial education offices were improved so that they could carry out the entire process, ranging from applying for a project, to conducting a survey of the status, selecting priorities and confirming a project, using Edubill.

B. Establishment of Database

The school facility status data were organized so that students could enter the space information and facility status of a building that is sub-information only when they enter schools, land, buildings, and buildings with a hierarchy of facilities with a hierarchy.

The scope of the database establishment was largely based on the basic status of the school's basic development, land and building information, and even detailed information of each

building's space, such as its real name and actual area, were managed.

The GIS-related databases were provided with information on schools, buildings and facilities on their own, and data on topography, surface level, cadastral map, building information, and administrative area information were provided by the Ministry of Public Administration and Security and the Ministry of Land, Infrastructure and Transport, while maps and satellite photos were provided with data provided by the Open API.

C. Introduction of IT Infrastructure

The infrastructure deployed hardware and software for functional implementation developed during the second establishment project and equipment for backup of the first deployment system, while the hardware, including communication equipment and GIS, and various servers, storage, and software, security-related solutions, drawing management solutions, and linked solutions.

4. Future Plans

As the second establishment project of the school facilities integrated information system is completed in March 2018, the government will utilize the functions of the EduBill system developed by 17 municipal and provincial education offices and the Ministry of Education from April 2018 and implement the operation management project of the school facilities integrated information system in 2018 by utilizing the city and provincial funds. In addition, the government plans to continuously collect opinions from sites (e.g., various council, demand surveys, satisfaction surveys, etc.) for the third establishment project so that the project of optimized information system for user is established, and to establish a support system for facility management and data management (DB quality management, standards management) and IT infrastructure environment (server, S/W, security system).

It also plans to expand and enhance its functions by introducing latest technologies such as GIS systems and mobile solutions as it seeks to introduce more new technologies in national

policies. In particular, the government plans to maximize the utilization of the system and data by linking the internal systems of the Ministry of Education (NEIS, EDUFINE, educational statistics, etc.) and securing consistency and expanding data through the supply and demand of external data (Ministry of Land, Infrastructure and Transport, Korea Electric Power Corporation, etc.).

WHITE PAPER
ON ICT IN EDUCATION
KOREA 2018

Part 3
ICT in Higher Education

Chapter 1.
Establishment and Operation of ICT in University

1. Project Overview

The ICT in university is basically pursued autonomously by each university. However, projects that are difficult for individual universities to pursue are contributing to improving the competitiveness of universities through national support, and inducing voluntary efforts of ICT by universities.

In December 2002, 'e-Campus Vision 2007', a five-year plan, was established and the university e-learning support centers were established at 10 universities from 2003 to 2007. The government sought to expand e-learning of universities and enhance the quality of education by supporting the cost of contents development so that universities could jointly develop and utilize content.

In order to enhance transparency and efficiency of the national university's financial operations, the integrated administration and finance system, 'Project for Establishment of the National University Resource Management System', was launched in June 2015 so that various accounting can be handled in an organic manner with the National University Business Area (Fiscal, Personnel, Wages, etc.) and the integrated administration and finance system was fully opened in June 2017, starting with the Business Management System in January 2017. In addition, 10 education universities across the country have been jointly building a cloud-based integrated academic information system for three years from 2017. The total budget for the three-year injection will be 5.6 billion KRW, consisting of national coffers (90 percent) and university contributions (10 percent). In 2020, an integrated academic information system linked to the university's resources management system will be opened.

2. Main Project and Project Status

Education network is the largest computer network in Korea and has led the development of Korea's Internet communication industry. The education network began with a computer network connecting universities across the country, focusing on Seoul National University and nine main universities, and in 2001, the school network was dismantled and commercial network services were used. The Korea Education Network Council was established by switching to the commercial network system, and the operation support method was switched to the 'Government and University Service fee Sharing System' where the government pays a certain amount and the remaining costs are shared by universities according to bandwidth (communication capacity). Since 2006, multiple (two) communication business have been selected and contracted on a three-year basis to stabilize the network. Since 2009, the company has expanded the number of service providers to two to four, and as of 2018, it has participated and operated by three telecommunication businesses. As of December 2018, 393 institutions were using the educational net.

[Table 3-1-1] Status of consignment operation contracts for universities of educational network by year

(Unit: Hundred Million KRW, Gbps, Case)

Classification	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total project cost (hundred million KRW) (Government+University)	316	319	288	297	298	190	223	230	224
National Support Fund (hundred million KRW) (National Support Rate/%)	40 (12.7)	40 (12.5)	40 (13.9)	40 (13.5)	40 (13.4)	20 (10.5)	0	0	0
Contract Capacity (Gbps)	38.1	38.8	110.6	114.6	115.2	208.6	253.9	264	315.4
the number of colleges and universities to join (case)	374	374	368	366	366	358	358	356	357

Reference: Korea Education Network Management Headquarters, 2018.12

Under the leadership of the Ministry of Education, the Korea Education Network Management Headquarters (Seoul National University) is conducting tasks such as selecting

and negotiating telecommunication businesses, promoting and managing various businesses, and managing educational network subscription agencies.

Since 2016, national funding for the education network has been suspended, and 357 universities have signed a total of 315.37Gbps to use the Internet. This is analyzed to have a maximum budget savings of 320.2 billion KRW compared to commercial networks.

[Table 3-1-2] Comparison of Charges for Similar Telecommunication Services with Educational Network

(Unit: hundred million KRW/Annual rate)

Network Classification	Educational Network	KoNet commercial network (Application of exemption fee)
Telecommunication Charge	224	3,426

Reference: Korea Education Network Management Headquarters, 2018.12

A total of 102 studies were supported from 2002 to 2018, including policy for development of education network and ICT in university, measures for solving ICT, development of various basic data to support decision making appropriate to each university's actual conditions, and experiment of applying new technologies.

Research is conducted around topics that require practical application or are of high interest to each university, and the members' universities are invited, examined, and selectively supported for research. In order to improve the quality of research performance, the research performance is verified by an interim review meeting or presentation meeting, and the results are shared among universities through the Education Network website, report or conference presentation.

It also provides free IT new technology and re-education classes to help IT managers and practitioners respond quickly to changes in the information environment at universities. Since 2007, the government has been providing specialized education customized to high-quality working-level officials through consignment of specialized education institutes. Collective education and online classes were provided focusing on subjects such as IT planning, programming, cloud, database, mobile, network/security, and qualification. The number of students who completed education increased 5.7 times from 138 in 2003 to 790 in 2018, and the total number of students who completed the training totaled 7,628 (350 courses).

3. Future Plan

The Korea Education Network Council has been in charge of equal responsibility to public institutions as the main body for managing the national network for the past 30 years, and it has been playing a role as the center for ICT in university to solve common issues as the largest university consultative body in Korea involving 357 universities.

Amid the university financial crisis due to the rapid reduction of the school age population and calls for upgrading administrative and educational services due to the development of ICBM (IoT, Cloud, Big Data, and Mobile) technology, a shared platform (economic) among universities is emerging as an alternative, and ICT in university organization that will be strongly implemented is required. In response, the Korea Education Network Council intends to expand its role as ICT in university agency that will support the implementation of the Ministry of Education's ICT in university policy based on the joint Buying-Power and trust of existing universities. Government-level measures are required to drive the creation of a foundation for autonomous innovation of universities through consultation and coordination among universities, and to support them.

Chapter 2.
Status of Open University

> ## Section 1. Operation of Special Graduate School of Cyber University and Cyber University

1. Overview of Open University

Cyber University is an institution of higher education where a degree is awarded when a learner completes a certain degree by learning educational services provided by a professor in a cyber-space using information and communication technology, multimedia technology, and related software without restrictions on time and space.

2. Main Status of Cyber University

As of September 2018, a total of 21 cyber universities are operating. Nineteen of these schools, which are higher education institution in accordance with the 「Higher Education Act」, use the same name as cyber universities and its degree is achieved when certain credit is fulfilled, and two schools operate as 'Open University-style Lifelong Education Facilities' under the 「Long Life Education Act」. In addition, 18 out of 21 schools will be operated with a four-year bachelor's degree course, while the other three schools will be operated with a two-year metier's degree program. Since 2003, the Ministry of Education has been pursuing a

project to characterize cyber universities in order to create a foundation for pre-employment and liberal arts and to develop lifelong vocational skills for adults.

3. Status of Cyber University Policy

The project to characterize cyber universities in 2018 is being pushed to lay the groundwork for strengthening the capacity of remote universities as institutions of higher education in line with changes in the social paradigm environment, including a sharp drop in the school age population, an aging society and job changes following the fourth industrial revolution. The main contents of the plan include the readjustment of the characteristic system and the improvement of relevant laws and guidelines considering equity with other educational institutions, the implementation of the assessment of competencies of remote universities oriented toward securing educational competitiveness, the promotion of the specialization of cyber universities through short-term curriculum development projects, and the development of a future education base.

4. Future Plan

Cyber universities, as institutions of higher education, should continue their efforts to strengthen their role and strengthen their online educational competitiveness. In order to establish roles suitable for the lifelong learning era by regularly discovering and disseminating excellent teaching and learning cases, joint development based on mutual cooperation between universities and quality control system for raising the level of online higher education should be established. It will also have to establish differentiated online classes strategies to prepare for the era of the fourth industrial revolution.

> ## Section 2. Status of Operating Korea National Open University

1. Project Overview

The Korea National Open University is a university established in 1972, offering teaching services through various information and communication media, starting with lectures on broadcasting via radio and TV, and e-learning and mobile running using smart devices. There are 13 local universities across the country, three learning centers in Seoul and 32 learning centers in major cities and counties.

2. Status of University Operations

A. Education System

The Korea National Open University operates 23 departments in four colleges, including the College of Humanities and Science, the College of Social Sciences, the College of Natural Science and the College of Education and Science, in each academic area. The graduate program operates a total of 18 master's degrees in 18 departments and has been operating a business school since 2012.

Prime College is an educational environment for adult learners who can contribute to strengthening individual self-reliance and expanding social contribution. Prime College operates the second life design course for the 40s to 50s, the basic college course for those in office, and the advanced postgraduate course.

B. Status of Students

A total of 113,780 students enrolled in the undergraduate program as of April 2017.

Childhood education accounted for the highest proportion with 11,422 (9.4 percent), followed by life science with 9,751(8.0 percent), English literature with 9,706 (8.0 percent), and youth education with 9,648 (7.9 percent).

A total of 2,039 students attend graduate and business schools. According to the ratio by age group, people aged 40 to 49 accounted for the highest ratio of 888 (43.6 percent), followed by those aged 30 to 39 with 518 (25.4 percent) and those aged 50 to 59 with 430 (21.1 percent).

3. Status of Prime College Operation

A. Learning after Employment Course

The system of learning after employment, which is that to enroll universities later after graduate high school, raised the need to improve the existing learning after employment system due to a surge in the number of high school graduates and employed people. Accordingly, the Ministry of Education is using the Korea National Open University to promote 'Learning after employment'.

B. Hub University

Prime College develops and operates online classes for employees and prospective employees for free with the aim of enhancing their job skills and providing opportunities for career development and supporting the creation of an educational environment favorable to them.

The purpose of the Prime College's support course for the outer classes of education is to provide various customized courses for students with multicultural backgrounds such as marriage immigrants, naturalized citizens, and North Korean defectors to enhance their ability to stand on their own feet in Korean society and actively participate in society as multicultural citizens

A commissioned education course is a curriculum operated by a partner organization that consigns certain online content to the Prime College, and currently, Prime College has commissioned some subjects of its in-company college and basic courses for employee.

C. Lifelong Education Course

The lifelong education course at Prime College has established an educational environment that meets the characteristics and needs of adult learners, and has provided customized education services based on the life cycle since 2012. The courses are diverse in professional qualifications, cultural and artistic courses, and liberal arts courses.

D. OER Service

OER service provides free courses by accumulating the experience and skills of professionals of 40s and 50s into educational materials. The OER content developed so far has a total of 153 subjects and is also seeking to open and link content to YouTube, NaverCast, and NeulBaeUm of National Lifelong Learning Portal.

4. Status of Educational Content Production

All courses at the Korea National Open University are provided using information and communication media. Lectures are developed and provided by selecting one medium from TV, audio or e-learning (multimedia, web) depending on the character of the subject. Out of 4,934 content produced, 3,765 e-learning classes (76.0%) and 1,178 TV lectures (24.0%).

As of April 2017, 620 basic textbooks and 505 workbooks are being used. Lecture textbooks only apply to undergraduate courses, and graduate programs do not publish them separately. Digital textbooks currently offer a total of 390 kinds of undergraduate textbooks.

5. Challenge and Prospect

The Korea National Open University needs a new strategy to faithfully implement its given basic national responsibilities and provide quality education services needed for a new society.

First, it is necessary to consider introducing a new learner-oriented education system. In the

advent of the information society and the new fourth industrial revolution society, social members should be able to acquire the necessary capabilities easily.

Second, providing various education programs to meet social and consumer needs is necessary. It is necessary to continue to provide various education programs, taking into account the aspects of human resources training required by the incoming new society and the aspects that can provide what the demander demands.

Third, it is necessary for the international community to contribute to the public good outside of the country. It is necessary to continue to cooperate with developing countries in the field of education as well as expand the awareness of Korean education in the international community by providing e-learning models suitable for the educational environment of developing countries through continued cooperation with the international community.

Section 3. Support Project for e-Learning in ASEAN Universities

1. Project Overview

The ASEAN Cyber University e-learning Support Project (ACU Project) was initiated by the Korean government at the Special Summit of the Korea-ASEAN in 2009 when the ASEAN Secretary-General proposed the establishment of ASEAN Cyber University to spread Korea's ICT in education and cyber university management experience to ASEAN countries and to expand educational and human resources exchanges between Korea and ASEAN.

[Picture 3-2-1] Modified mid and long-term roadmap for ACU projects
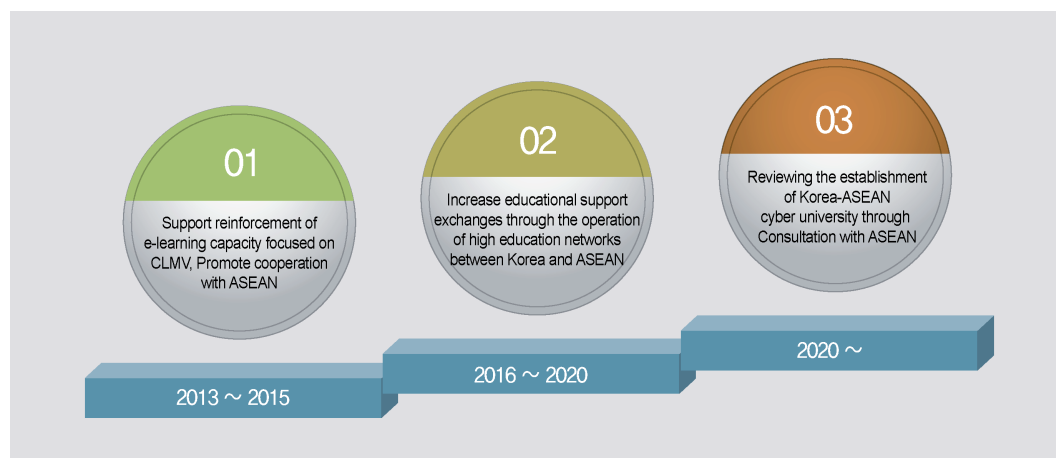
※ Reference: Ministry of Education, Changing the Project Plan for the Establishment of ASEAN Cyber University (Proposal), 2013.7

Under the changed plan, the first cycle (2013-2015) of the project was to support strengthening e-learning capabilities with the focus of CLMV countries, and to promote educational and human resources exchanges between Korea and ASEAN. In the second cycle of the project (2016-2020), the government is establishing and operating the ACU-OER platform with the aim of expanding educational and human resources exchanges through the

operation of the network of higher education between Korea and ASEAN. Based on this, the government plans to expand the use of existing infrastructure and contents by expanding ASEAN participating countries and universities. If it is deemed necessary to establish an ASEAN Cyber University based on the results of the 1 to 2 cycles of the project, it will consider establishing an ASEAN Cyber University through consultations with ASEAN.

2. Promotion Status

A. Vision and Strategy

4C strategy (Customization, Connection, Contents, and Collaboration) was established based on the experience of the first cycle project in order to achieve the vision of Korea-ASEAN development and shared growth of higher education. First, e-learning expert training programs, e-learning content production and e-learning curriculum consulting are provided according to the Customization strategy. Second, it expands co-utilized contents through linkages of contents of university's various open lectures according to the Connection strategy. Third, the government will strengthen the infrastructure for co-utilized content through the operation of open content sharing platforms such as ACU-OER according to the open Contents platform strategy. Fourth, in accordance with the Collaboration strategy, cooperation between the government of the Republic of Korea and ASEAN and between universities is strengthened to improve the efficiency of the project implementation. Through these strategies, the government plans to achieve goals such as strengthening the e-learning capabilities of the four ASEAN countries (CLMV), utilizing and operating the Korea-ASEAN joint content, establishing and operating an ASEAN co-utilized system, expanding the Korea-ASEAN network and strengthening cooperation in exchanges.

B. Promotion System

The promotion system of the ACU project consists of the Ministry of Education of

member countries, the steering committee with policy makers from member universities, the working-level committee with working-level officials, and CLMVT (Cambodia, Laos, Myanmar, Vietnam, Thailand) member universities, participating universities from ASEAN countries, AUN, domestic cooperation universities and KERIS, which is in charge of business planning and operation.

In 2016 the second cycle project, the government selected domestic cooperation universities through public recruitment and promoted 1:1 matching for each of the four ASEAN countries (CLMV). Cambodia cooperates with Soongsil Cyber University/Konyang Cyber University Consortium, Laos cooperates with KRWkwang Digital University/KRWkwang University Consortium, Myanmar cooperates with Busan Digital University/Dongseo University Consortium, and Vietnam cooperates with Youngjin Cyber University/Yeongjin College Consortium. An advisory committee consisting of e-learning experts of higher education has been formed and operated. Starting in the second half of 2018, the ASEAN Advisory Committee will be formed and operated by 10 ASEAN member countries, comprising officials in charge of higher education at the Ministry of Education to establish ACU.

C. Main Content by Project Area

1) Reinforce e-Learning Capabilities of the Four ASEAN countries (CLMV)

The government supported reinforcement of the four ASEAN countries' (CLMV) e-learning capabilities by holding training sessions to foster e-learning experts, providing vouchers for e-learning related courses, supporting local e-learning seminars and education for spreading e-learning, and supporting finding good cases using e-learning.

2) Korea-ASEAN Joint Content Utilization and Operations Expansion

The ACU Project Secretariat supports CLMV member universities to develop e-learning content, supports e-learning curriculum operation for developed content, and supports e-learning quality management system to vitalize the use of collaborative content between Korea and ASEAN.

The ACU Project Secretariat supported the operation of e-learning courses with credits and non-credits to promote the use and encourage participation of CLMV member universities and ASEAN countries, and developed and distributed operation manuals for professors.

3) ACU System Operations

The ACU e-learning system consists of three parts: the Portal Homepage, the Learning Content Management System (LCMS), and the Learning Management System (LMS). ACU LMS is working to improve user accessibility by supporting downloadable mobile applications on Android and iOS, and to provide quality services by creating a cloud environment utilizing CDN services for smooth service delivery to ASEAN countries.

In 2016, the Open Education Resources (ACU-OER) platform was established to expand the pooling of higher education resources in the ASEAN region and to enhance the level of higher education in ASEAN universities, and pilot services were launched. The ACU-OER platform was first equipped with e-learning content produced by CLMV member universities, ACU co-utilized content, and meta-data of KOCW's English content. As of January 2018, ACU-OER provides about 692 kinds of English-language content.

4) Form and operate the Korea-ASEAN network

A study was launched to review the feasibility of establishing an ASEAN Cyber University and conducted an investigation and analysis to identify the status of ASEAN higher education e-learning. Following the existing members of the ACU project, Cambodia, Laos, Myanmar, Vietnam and Thailand, the Philippines and Malaysia, Brunei and Indonesia newly joined the project in 2017. Nine of the 10 ASEAN members are involved in the ACU project.

The ACU Project Secretariat is pushing projects such as operations committees and working-level committees, joint Korea-ASEAN research and international conferences to promote exchanges and cooperation between Korea and the ASEAN region. By holding these continued meetings, the government were able to ensure the efficiency of business implementation, build consensus on the need to expand exchanges of higher education between Korea and ASEAN, and strengthen the network of higher education between Korea and ASEAN.

Part3
ICT in Higher Education

3. Main Outcomes

The ACU project provided a system for member universities of CLMV countries to develop and operate e-learning content on their own by providing support for strengthening e-learning capabilities of the four developing countries (Cambodia, Laos, Myanmar and Vietnam). Moreover, the project's biggest achievement is that it has contributed to narrowing the e-learning gap by improving e-learning capacity levels, which were somewhat lacking compared to other ASEAN countries.

Cambodia's member university (ITC, NIPTICT) agreed to cooperate a course for credit exchange and joint degree with Soongsil/Gunyang Cyber University. Myanmar's member university (UT/UIT) agreed with Busan Digital University to exchange credits and develop public content for this purpose. In the case of Vietnam, the government signed an MOU with Samsung Electronics among its Vietnamese subsidiaries to implement secondary vendor and customized contract department at Youngjin Cyber University, Korean cooperation university.

Starting in 2016, joint universities in Korea were matched one-on-one with CLMV member universities to provide feedback on the results of each stage throughout the entire e-learning content production process. Through this process, local universities have established a foundation for creating and utilizing quality content with their own technology. As a result of these efforts, the growth of professors and learners using e-learning is expected to accelerate in the future, with a 22 percent increase year-on-year.

The president and professor of CLMV University also have a positive view of e-learning usefulness and availability. The ACU project continues to promote e-learning-based cooperation projects and joint research with international organizations in ASEAN, including participating countries and the ASEAN University Union, to help maintain the diplomatic trust between Korea and ASEAN by practicing their commitment to help reduce the educational gap in ASEAN.

4. Future Plans

It is at a critical time when ASEAN member countries must develop a model for establishing ASEAN Cyber University agreed on based on analysis of project implementation performance in the first to second cycles. The establishment of the ASEAN Cyber University is a very cautious approach as it is only possible to meet various environmental requirements, such as sociocultural, economic and institutional aspects, that learners of ASEAN countries can learn effectively through e-learning. To that end, the ACU Secretariat began research in 2017 on 'Diagnostic Study of Higher Education e-learning Levels by ASEAN Countries' and in 2018 for 'Establishment of ASEAN Cyber University Model and Strategies'. It plans to draw up the ASEAN Advisory Committee (composed of education officials from 10 ASEAN member countries) and the ASEAN Cyber University model by 2019, confirm participation of 10 ASEAN member countries, and announce relevant details through high-level discussions in education sector of the ASEAN+3 by 2020.

Chapter 3.
Korea Open Courses Ware (KOCW) Service of University

1. Project Overview

As we enter the era of the fourth industrial revolution, various forms of learning content and teaching methods are continuously discussed to meet the demand for future education. The release of educational materials called Open Education Resource (OER), an online free lecture service led by leading overseas universities such as MIT, is spreading in quantity, and the classification system and quality form of lectures are also changing. The quantitative spread and qualitative change of OER are positively affecting the improvement of teacher's teaching learning and learners' various learning abilities in terms of higher education as well as re-education and knowledge sharing in terms of lifelong education, and the effect on the actuality of higher education is expected to gradually increase.

Meanwhile, the OER movement began to take shape in Korea in December 2007 when the Korea Education and Research Information Service launched a pilot service for the joint use of open lectures at universities called Korea Open Courses Ware (KOCW), and is now entering a turning point for qualitative development in various forms as well as the collection and expansion of simple university teaching materials.

2. Promotion Status

KOCW (http://www.kocw.net) is a service designed to jointly use video clips and materials of lectures voluntarily released by universities and related institutions for free anytime, anywhere. In December 2007, it implemented a website for learning and began providing full-fledged support for teaching education at universities. In addition to university lectures, KOCW operates a variety of themed lecture services to meet the demand for learning, including English, liberal seminars, job education and certificate preparation, and in particular, it contributes to the enhancement of competitiveness of higher education with services that expand learning rights and lifelong education opportunities for adult learners preparing for a second life as well as college students, and help them choose and improve careers for high school students.

3. Main Outcomes

As of the end of July 2018, KOCW has provided video clips of 32,000 lectures and 390,000 lecture materials provided by 225 universities and institutions in Korea and abroad, and since June 2010, it has developed and serviced applications using mobile.

Meanwhile, with the support of teacher's teaching and the development of lecture clip (segmentation) function for the accessibility and convenience of lecture contents by users, the students set up specific lecture sections that they wanted, and started a service that could be stored and used. In addition, Naver is providing real-time link service of lecture meta information so that searching of KOCW lectures can take place easily, and is preparing for mobile app reform that is steadily increasing in use in the second half of this year.

Through the KOCW, the Korean Education and Research Information Service is spearheading efforts to provide opportunities for higher education and lifelong education to learners with economic, time and regional difficulties, and to support the revitalization of Flipped Learning for innovative teaching and learning methods at universities.

Part 3
ICT in Higher Education

4. Future Direction

With the establishment of a knowledge-based society in the 21st century, the importance of lifelong education has grown further with the rapid aging of members of society and the increasing interest in life after retirement. In line with the trend, major countries around the world are pushing for the introduction of new lifelong education policies and education models, while renowned universities are also moving to strengthen lifelong education. As such, it is the Open Educational Resources (OER) that has been highlighted in the process of shifting the paradigm from traditional school-oriented education to lifelong education, and the KOCW, which is in its 11th year this year, is steadily striving to serve as a 'Hopeful Bridge of Higher Education' that provides opportunities to anyone who needs education at any time.

Chapter 4.
The Korean University Resource United System (KORUS)

1. Project Overview

The Korean University Resource United System, KORUS, is an integrated administrative and fiscal system of national universities that was adopted in September 2010 as a 'Plan to Advance National Universities' and a national policy project in 2013 with the need to prepare institutional devices to enhance efficiency and transparency of their financial operations through organic linkage and unified management of complex and diverse accounting.

The Korean University Resource United System is a system used by 100,000 teachers, staff and researchers at 39 national universities, and has been contributing to the lack of interconnection due to the establishment and operation of individual information systems at universities, waste of human and physical resources, and narrowing the gap in information service levels among universities, and standardizing education, administrative work and enhancing efficiency.

[Picture 3-4-1] Progress of Promotion of The Korean University Resource United System

| Start (2015. 5. 29) | 3 months for analysis (2015. 6~8) | 3 months for design (2015. 9~11) | 7 months for development (2015. 12~2016. 6) | 7 months for test (2015. 12~2016. 6) |

| Pilot operation (2016. 9~12) | 1st opening(2017. 1. 1) 2nd opening(2017. 3. 1) | Stabilization (2017. 1 ~ 4) | Opening (2017. 5) |
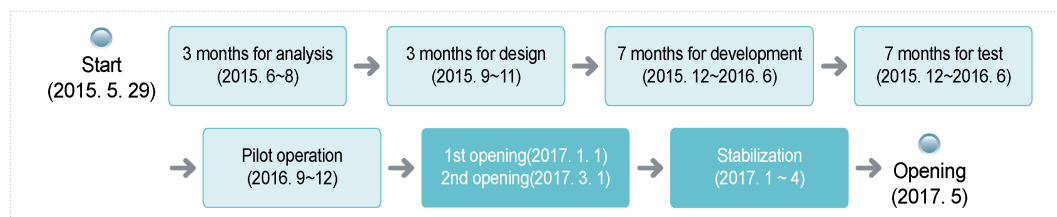
※ Reference: Ministry of Education, Basic Plan for KORUS Operation, 2018.2

2. Promotion Status

The Ministry of Education is in charge of the promotion system for the establishment and operation of the Korean University Resource United System, while 39 national universities are in charge of the overall master role in the university, including consultation, coordination on matters related to project promotion, support for task analysis, design and verification, standardization of work, and management of university data.

[Picture 3-4-2] System of KORUS
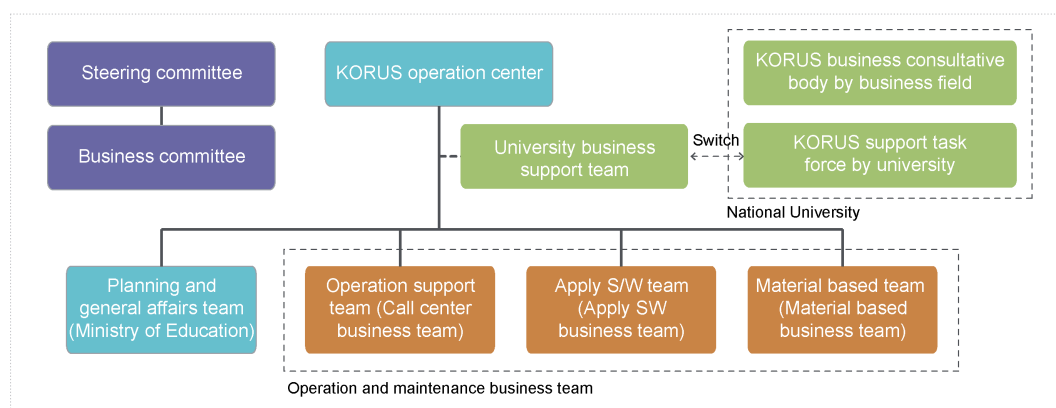
※ Reference: Ministry of Education, Basic Plan for KORUS Operation, 2018.2

3. Main Outcomes

A. Improve University Work Efficiency and Bridge the Information Gap

The second service was opened for portal, business management, personnel (basic), payroll, facilities, and power generation fund sectors in January 2017, and for financial accounting, personnel (performance), industrial studies and foreign institutional links in March after establishing the system and trial from May 2015 to December 2016.

In particular, the Korean University Resource United System helped to increase the efficiency of national universities' work and reduce the gap in information with central departments,

local governments, and education offices (elementary and secondary schools) by completely supporting the recent social issues of ActiveX removal and HTML5 technology, which is next generation new standard, while satisfying BRM (function classification system), records management standards, and bookkeeping by double entry.

B. User Support System Operation

1) Operation of a Telephone Consultation Center

It has established an Internet-based telephone counseling center for systematic support, including inquiries and counseling for systems and services of 100,000 national universities and external users, and actively responds to requests for support through 17 to 19 counselors. The telephone consultation service is worth 750 million KRW a year and has been contracted for many years since 2018.

2) Application Maintenance and Enhancements

After the establishment of the information system, the government focused on enhancing user convenience, maximizing service satisfaction and system utilization, and enhancing stability, including preventive inspection and error of the operational material base (hardware, system software, security, etc.). In 2017, the government tried to stabilize the system by focusing on correcting application errors, improving functions, and optimizing them due to many program errors and user inconvenience in the early stages of its operation. In 2018, the government attempted to improve functions by changing user requirements and legal systems rather than by improving system errors.

3) Establishment of Communication and Cooperative System and Strengthening User Convenience

The KORUS operation center focuses on operating a user support system (SR) with the aim of establishing a cooperative system with national universities, educating users, operating a business consultative body, and visiting university sites. In particular, 452 students from 39 national universities were trained in 2017 to improve their core and related skills. The operation

of 19 business consultative bodies and 18 universities participated by university staff were visited to collect user opinions and reflect them on the improvement of the system.

C. Securing Information Service Stability and Strengthening Information Protection

1) Securing Material-based Maintenance Stability

The system and services were quickly stabilized by changing the configuration settings, taking corrective actions, and optimizing them through maintenance service projects for one year (June 2017 - July 2018) after its opening in 2017. Based on 519 types of hardware and 37 types of commercial software, the government strengthened the operation manual and stabilization of the system, optimization of the system, and operation manuals, including 299 cases of infrastructure failure prevention, 67 cases of supporting related institutions such as universities, and four simulated drills for emergency response against disasters and failures.

2) Strengthening Information Protection

Data independence by university was guaranteed by managing information on the administration and finance of each university through a physically independent database. By applying 10 levels of information protection system from user PCs to servers, the security system was established for each area, including personal information, users, networks and systems, and technical, administrative and physical measures were taken to link the encryption system, access control, real-time monitoring, and the ECSC (Educational Cyber Safety Center) to prevent security breaches. In February and April 2018, the security system was strengthened through two security checks with the department's information protection team.

[Picture 3-4-3] Information Protect and System of KORUS
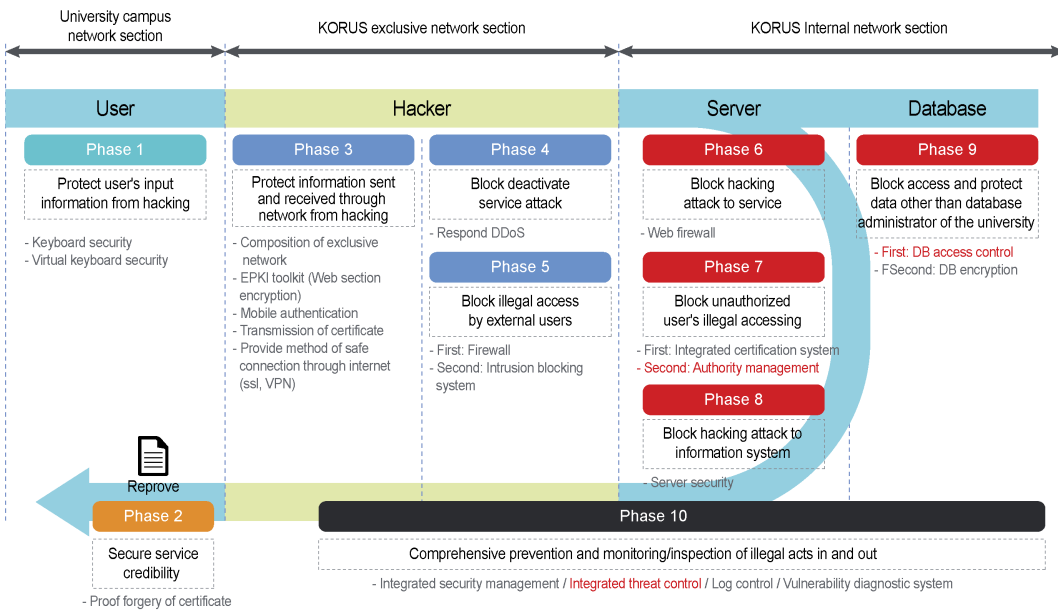
※ Reference: Ministry of Education, Report on Status of KORUS Operation, 2018.8

4. Future Plans

In the future, the KORUS operations center will focus on securing stability of the Korean University Resource United System, strengthening security, educating users, forming its own team for each national university, utilizing representative instructors, strengthening promotion activities, and improving the level of maintenance projects, with the aim of improving the satisfaction of teachers, maximizing work efficiency, and enhancing financial soundness and transparency. In addition, it will expedite the settlement of chorus by actively collecting opinions from university sites and achieving continuous improvement in their functions.

Chapter 5.

The Study in Korea Comprehensive System

1. Project Overview

The Study in Korea Comprehensive system (www.studyinkorea.go.kr) is a Korean study information system operated by the National Institute for International Education, an organization affiliated with the Ministry of Education, and provides a one-stop online service for the entire course of studying abroad, from entry and employment to departure, in order to improve access for foreign students to study in Korea. The project was established in 2011 and the pilot project was implemented in 2012 to reach the present date. This enabled the government to manage unified international students and created an environment where anyone could easily prepare to study in Korea.

2. Promotion Status

The system for the operation of the Study in Korea Comprehensive system will be operated with the Education Development Cooperation Team of the Ministry of Education and the National Institute for International Education's team, and with cooperation from the Ministry of Justice and the university.

The operation contents of the Study in Korea Comprehensive system can be divided into supporting study work, operating the homepage, operating and maintaining the system, operating the community of students studying abroad, and cooperating and linking operations

with other institutions.

Support for studying abroad will support various tasks required for overseas students to enter Korean universities, including online admission application services where success or failure can be confirmed, processing GKS-related work, managing information on students, and supporting academic exhibitions. The website provides various study information for foreign students who want to study in Korea. In particular, it provides information such as providing visa information related to the employment of foreign students in conjunction with the Ministry of Justice and the KOTRA, and announcing the recruitment of foreign students by Korean companies.

3. Main Outcomes

The number of members increased from 173,173 in 2012 to 349,132 in 2017 and more than six times from 474,463 in 2012 to 2.95 million in 2017 through the introduction of Korea through the Study in Korea Comprehensive system, study abroad, scholarship guidance, and online admission applications.

[Table 3-5-1] Performance of The Study in Korea Comprehensive System

Ranking	Indicator	2012	2013	2014	2015	2016	2017
1	Number of applicants for online	(Apply) 3 Schools, 21 People	14 Schools, 650 People	16 Schools, 789 People	40 Schools, 1,376 People	44 Schools, 1,537 People	43 Schools, 1,976 People
2	GKS Handling	553 Case	3,361 Case	2,047 Case	2,407 Case	3,474 Case	2,171 Case
3	The Number of Members	173,174 People	214,095 People	251,131 People	283,599 People	320,263 People	349,132 People
4	Annual access count	474,463 People	1,861,801 People	2,004,054 People	1,732,471 People	2,876,157 People	2,950,153 People
5	Attendees to the Cyber Study Fair	Unopened			116 Countries, 5,468 People	(The first half of year) 151 Countries 7,208 People (The Second half of year) 149 Countries 7,246 People	(The first half of year) 154 Countries 17,443 People (The Second half of year) 145 Countries 7,143 People

4. Future Plans

The following tasks are planned to be implemented in order to strengthen the promotion of study in Korea to global through online and to promote the operation of the Study in Korea Comprehensive system, which is operated to raise awareness of study in Korea through the provision of admission information to domestic universities.

First, it will expand the scope of support for multilingual in the Study in Korea Comprehensive system. Indonesia's interest is very high, given the interest of many countries around the world through the Cyber Korea Study Fair. Therefore, in addition to the 11 languages provided by the Korean Overseas Study System, Indonesian will be provided.

Second, it will establish and operate a credit card payment system to activate online admission applications. As universities want to use online admission services, they are reluctant to pay admission fees through account transfers, so the credit card payment system will be introduced to support students and schools who apply for study abroad.

Third, it is a change in the number of operations and operation methods of the Cyber Study in Korea Fair. It will change its current operation twice a year to three later to promote study in Korea and support video chatting to facilitate counseling.

Part 4
ICT in Academic Research

Chapter 1.
Status of ICT in Academic Research

1. Importance of ICT in Academic Research

Following the development of information and communication technology, online information services have emerged through computerization of university libraries and the establishment of original database. It is expanding its base by providing various services such as computerization of collection lists, digitalization of collection materials, online collection of digital texts and personalized services.

2. Promotion Status

Starting with the 9th IBRD education Vice-Ministerial Funding Project carried out between 1993 and 1997, the 'Comprehensive Plan for ICT in Libraries' between 2001 and 2004 promoted the digitalization of the list of collection materials in university libraries and the establishment of the original database. In September 2015, the 「University Library Promotion Act」 was enacted to improve the system for the promotion of university libraries.

The university library's role is to collect and provide data suitable for demand as the data of the university library has a wide variety of types and forms, such as books and Web databases.

The digitalization ratio of traditional book media in books and academic magazines is increasing greatly, and a variety of multimedia data is also appearing.

3. Main Outcomes and Future Plans

The Korea Education and Research Information Service is opening the university licensing system to researchers at all universities in order to identify the current status of academic resources scattered in each institution and promote information on academic research.

It also plans to promote Foreign Academic Support Centers by strengthening the cooperative system with specialized institutions in each subject area, and continue to expand projects to reduce the relative digital divide of universities and enhance national competitiveness by improving the quality of college licenses and overseas database services.

> ## Section 2. Foundation for ICT in Academic Research in Korea

1. The Background and Progress of the ICT in Academic Research in Korea

The establishment of academic research information distribution system in Korea began in earnest with the establishment of the Korea Institute of Science and Technology Information in 1962. In 2001, 'Korea Institute of Science and Technology Information' was launched, combining the Korea Institute of National Industry and Technology Information and Korea Research and Development Information Center.

Investment for ICT in university libraries was carried out in earnest, starting with the 9th IBRD vice-ministerial funding project carried out between 1993 and 1997. The Korea Education and Research Information Service, which is responsible for the distribution of academic information focusing on university libraries, is leading the development of academic research ICT in Korea with the goal of establishing and operating an educational information network to investigate, collect, produce and effectively distribute information needed for education and academic research, raising the quality level of education and academic research and contributing to the development of national education.

2. The Role of Major Institutions related ICT in Academic Research in Korea

A. The National Library of Korea

The National Library of Korea is establishing a mutual cooperation system with libraries at home and abroad and foreign government and international organizations. It also operates an

international standard data number system to give standardized unique numbers to various publications produced in Korea, and to streamline the distribution of publications and literature information. It operates the website archiving (OASIS) and the database establishment and the Korea Library Information System-Network (KOLIS-NET).

B. The Korea Institute of National Industry and Technology Information

The Korea Institute of National Industry and Technology Information is a specialized research institute in the field of national science and technology information and is establishing a system for systematic collection, management and joint utilization of domestic and foreign information. It operates NDSL (a service platform that provides high quality information to researchers) and NTIS (National science & Technology Information Service).

Chapter 2.
Sharing and Distribution of Academic Information

1. Project Overview

RISS (Research Information Sharing Service), an academic research information service launched in May 1998, is a national service open to researchers, professors and the general public, and aims to enhance national research competitiveness by quickly and accurately providing resources for academic research information on higher education, including domestic and foreign degrees and academic papers and book materials, and e-learning lectures. As of February 2018, it has established itself as a leading service channel in the academic field, with 4.17 million cumulative members and an average of 13.29 million searches per month in the previous year. In particular, in 2017 a stable evaluation base was established through the establishment and execution of a plan for promoting assessment at each stage of the university library based on the University Library Promotion Act, and an evaluation system was established to minimize the work of university libraries through data links with existing academic information statistics service (Rinfo).

2. Promotion Status

RISS provides information on the list and collection of domestic and foreign materials held by its member institutions through its comprehensive list distribution channel (unicat.riss.kr) which includes 100 percent of the nation's four-year universities and 776 institutions. As of February 2018, RISS users can use 11.19 million domestic and foreign data lists, and 57.05 million collection information can be searched to find out which universities have the data they want, and through this, they can copy and loan data that is not provided with digital texts among those held by individual universities. It also provides services for digital texts produced by universities and academic organizations, including degree papers, academic papers and research reports. As of the same year, RISS users can use 1.44 million master and doctoral dissertations in Korea and 180,000 doctoral dissertations in foreign countries for free according to the author's consent. In addition, digital text services for some 5.12 million domestic academic papers are also available, including academic papers established through agreements with academic organizations and academic papers by domestic academic organizations built by the private sector. In this case, 1.09 million articles, such as open access papers or papers built by the Korean Education and Research Information Service, are available for free, while 4.03 million cases built by the private sector are available for free depending on whether the institutions affiliated with theses are subscribed to them.

In the case of overseas academic papers, the government allows users to obtain the original text of the material they want through Inter Library Loan based on the information of the collection of overseas academic papers by edition mark of universities across the country that it builds every year. In addition, for academic resources that are not available in Korea or that cannot be obtained because they are not owned by a member organization of mutual loan service, the Electronic Document Delivery Service (EDDS) is provided to enable the use of data texts through overseas purchasing agencies. In particular, in the case of overseas academic papers, the government is operating the Foreign Research Information Center (FRIC) with the Ministry of Education in 10 subject areas (cultural science, natural science, electronic and information communication, agriculture and livestock, education, social and artistic skills, etc.)

to jointly utilize overseas academic information and information and reduce budget. As of February 2018, users will be able to use the original text-copy service free of charge for some 35,000 foreign academic papers and 19.39 million papers held by the Foreign Research Information Center through RISS. Integrated search services for key overseas electronic information are also provided through RISS. It is introducing general-purpose overseas academic and electronic information used by many academic researchers through a college licensing method and opening it to academic researchers affiliated with universities across the country. Users can use foreign electronic information subscribed by their agencies for free 24 hours, and even if they do not subscribe to it, they can use expensive overseas electronic information for free from 4 p.m. to 9 a.m. on the following day through RISS.

The mutual loan service continuously expands the scope of support for researchers so that 605 institutions can receive data not obtained from the university library in Korea through the mutual loan agency channel WILL (Web Inter Library Loan). Through Inter Library Loan linked to Japan's NII (National Institute of Information), it have been made possible by local and Japanese university libraries sharing data and by launching mutual loan service with CALIS (China Academic Library & Information System) of China, the database search and original document copy services of 700 Chinese university library collections are available. In order to secure data in Europe, it has also provided a copy service through the National Library of France (BNF) and the National Library of Spain (BNE) since 2014 and is also providing the Electronic Data Delivery Service (EDDS), which provides overseas academic resources that are not owned in Korea at low prices, through various channels such as OCLC, Right Find, Germany's SUBITO and others.

3. Main Outcomes

Research Information Sharing Services (RISS) removes the essential login function to enhance service accessibility and use for the users, thereby increasing the service use every year through improvement of the service, including the use of data search and viewing original text

without logging in. In 2017, the government also expanded academic research and information services for those who are alienated from information through RISS-Book links.

The Union Catalog service supports library work at individual universities, with 100 percent of four-year colleges subscribed to, and 776 institutions are participating as of February 2018. It currently has 11.19 million surge data and 57.05 million collection data.

As of February 2018, there were 605 institutions participating in the Inter Library Loan service, with a majority of the nation's university libraries participating, including the four-year and two-year university and special library. In addition, the government operates a distribution network for home and abroad academic information to ensure access to abroad academic resources, provides a foundation for securing more than 90 percent of the world's published materials through the abroad paper purchase agency service for data not existed in Korea, and provided more than 150,000 applications and 129,000 data as of the end of 2017.

4. Future Plans

In order to flexibly respond to new demands from individual researchers and agency members and changes of environment in academic research information, RISS listens to users' opinions and operates specialized committees through various channels. The government will go a step further to implement demand-oriented services and strive to create new added value of academic resources by promoting the sharing and utilization of academic resources.

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Section 2. **Establishment and Operation of Digital Academic Information Distribution System**

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1. Project Overview

The digital academic information distribution system (dCollection) refers to a series of processes designed to collect and distribute academic information produced by individual institutions, especially universities, and to provide integrated services. The Korea Education and Research Information Service has established a digital academic information distribution system since 2003 to distribute it to universities nationwide, and as of 2018, 241 institutions have used the digital academic information distribution system. Through this digital academic information distribution system, academic papers from universities across the country are being collected online, and academic papers and research reports are also being collected based on Open Access (OA).

2. Promotion Status

A. Status of Distribution and Operation System

The dCollection System was first developed by the Korean Education and Research Information Service as part of the 'National Academic Research Database Construction Project' of the ICT Promotional Fund of the Ministry of Information and Communication in 2003 and its functions were strengthened in 2004 and 2005. As of December 2017, 241 universities use the dCollection system, which is equivalent to almost all universities producing graduates with master or higher degrees in Korea.

B. Status of System Establishment

The dCollection system was developed on a direct delivery basis in 2003 and hosted in 2007 and has been used for more than 10 years, raising the need for IT technology and environment, and strengthening the security of the system. In particular, the government introduced the electronic government recommended framework for strengthening the stability and security of the system, and supported efficient collection and management of dissertations written with various multimedia resources, such as existing documents, images and videos. Starting with upgrading the hosting system in 2016, the government plans to complete the development and application of the direct delivery system by 2018.

3. Main Outcomes

Digital original text online service of academic research results has become a very important service for researchers who want to quickly obtain the original text. Through the dCollection System, 1.42 million dissertations were collected and 5.05 million academic papers were collected in December 2017 and the original texts were provided through RISS. About 60,000 dissertations are collected each year through the dCollection, and the collected dissertations and academic papers are linked with RISS, making them freely available to anyone.

It has formed and operated a 'Committee for the Sharing of the Academic Information Original Text' to share its role and cooperate with universities, which are the main production and holding institutions of academic information resources, and to make continuous policy decisions. The selection of the committee is made up of two years through the assessment of the contribution of the sharing of the original academic information distribution business, and 20 new universities of the management committee are newly formed and active as of 2018.

4. Future Plans

Article 7 and 13 of the 「University Library Promotion Act」 provided that university libraries have a legal basis for the collection, digitalization and operation of various knowledge resources produced by universities, and for the joint use of digital data built up between universities. If all types of academic research products produced in universities based on the dCollection system are digitalized and can be serviced free of charge through RISS to academic researchers across the country, not only will it contribute to improving the country's research competitiveness, but also the status of the university library in charge of its role will be able to leap.

Part 5
ICT in Lifelong Education

Chapter 1.
National Lifelong Learning Portal 'Neul-BaeUm'

1. Project Overview

Under 'Smart Lifelong Learning Comprehensive Delivery System Construction' established by the government in 2014, National Lifelong Learning Portal Neul-BaeUm (www.lifelongedu.go.kr) was opened to create a smart lifelong learning environment that can be learned anytime, anywhere.

Since then, it has completed a lifelong education promotion system that leads to the nation-city, province-city, district-township by linking lifelong learning information scattered at public institutions and other institutions nationwide with quality public education data to serve as a national lifelong learning delivery system so that the entire nation can learn without restrictions on time and space

2. Promotion Status

A. Promotion System

The Ministry of Education will direct the project to establish a lifelong learning support system online, while the National Institute for the Lifelong Education will establish and operate a system and service for the National Lifelong Learning portal. The main service

contents are to collect and distribute information on and off-line lifelong education information of the information provider, and to provide customized information for individual learning diagnoses by linking the learning history of each user to the lifelong learning account system.

B. Status of Operation Service

The Neul-BaeUm service consists largely of the lifelong education information 'Confirmation and Sharing'. Lifelong education information 'Confirmation' is a function of collecting and communicating information to users through agreement with the lifelong education information provider. Lifelong education information 'Sharing' is a function to spread lifelong education by disclosing video courses and various lifelong education information for anyone to use.

With the integrated search function for information under 'Confirmation' and 'Sharing', users can set up and search the desired learning type, purpose, learning area and learning classification, and use the results to search for customized information by individual.

3. Main Outcomes

A. Link and Provision of Lifelong Education Information

As of February 2018, the Neul-BaeUm secured diversity in lifelong education information by linking and providing 280,000 online lifelong education information and 410,000 offline lifelong education information.

In particular, the provision of more than 2,000 lifelong education information related to foreign languages satisfies the requirements of lifelong foreign language education for the Neul-BaeUm learner.

B. Information Quality Control to Lifelong Education.

To enhance the reliability of linked information, the government promoted six visit monitoring sessions and 11 written monitoring sessions for 17 municipal and provincial lifelong education

promotion institutes. In addition, about 280,000 information previously linked to provide the latest online lifelong education information was updated. This is an effort to quickly reflect training content that reflects timeliness and user's needs to enhance service use.

C. Improved User Convenience through the System Improvement.

The government developed 'Learning Center in My Town' function that provides information based on location of users, and provides lifelong education courses and institutional information for users by providing them with customized lifelong information.

In addition, remote services were introduced to enhance service accessibility to the information vulnerable, enhance communication between users and managers, and diversify public service channels, resulting in real-time civil complaints response effects.

4. Future Direction

The National Lifelong Learning Portal Neul-BaeUm will expand the area of lifelong education information to diversify information from the existing lifelong learning portal into the lifelong education information portal which diversify information and the subjects of service use.

First, lifelong education information for the handicapped will be linked and content developed to provide customized lifelong education for the handicapped. Second, it will link and provide lifelong education academic and statistical information to help develop lifelong education-related disciplines and technologies. Third, the 'National Lifelong Education Statistics' service provided by the Korean Educational Development Institute will be linked to provide objective and empirical information based on statistics. It will support the promotion of academic research in the field of lifelong education and the establishment of education policies by utilizing the linked lifelong education statistics information.

Chapter 2.
Municipal and Provincial Lifelong Education Information Network

1. Project Overview

The 'DaMoA Lifelong Education Information Network' project was aimed at supporting local residents to more easily participate in lifelong learning by operating a city or provincial system so that they could search for human and physical education resources scattered in education facilities, programs and instructors at one time, anywhere and at any time. Since 2011, the Ministry of Education has selected three to four cities and provinces as auxiliary businesses through public contests, and provided 75 million KRW in national subsidies to local governments for the establishment of a lifelong education information network. The project involved a lifelong education information network in 15 cities and provinces, excluding Seoul and Gyeonggi Province, which established their own information networks from 2011 to 2016.

[Table 5-2-1] Status of Establishing Municipal and Provincail Lifelong Education Information Network

Establishment Year	2011	2012	2013	2014	2015
City and Province	Busan, ChungNam	Jeju, Ulsan, Daejeon	Incheon, ChungBuk, Daegu, GyeongBuk	GyeongNam, JeonNam, Gangwon	Gwangju, JeonBuk, Sejong

Afterwards, the government provided 10 million KRW to 15 cities and provinces[1] in order to upgrade the information system and strengthen the information collection and management

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1) Seoul and Gyeonggi Province, which built their own information systems, did not apply.

network of local educational institutions established in 2016. The Seoul government, which established its own information network for cities and provinces, opened the 'Seoul Lifelong Learning Portal' in 2011, and Gyeonggi Province has been operating the G-SEEK since 2017 by reorganizing its 'Gyeonggi Lifelong Learning Education Place HomeLearn', which focuses on online lectures. The Lifelong Education Information Network established through the project applied standards for data collection from the system design and development stage, taking into account the link with the National Lifelong Learning Portal.

2. Promotion Status

Information services provided through the lifelong education information network will be divided into four areas: local educational institutions, programs, instructors and learning clubs. Depending on the region, the government is additionally operating functions such as online courses, study counseling and design, supporting learning community activities, and linking online related services in the region.

A. Agency and Course Information

Lifelong education information networks in 17 cities and provinces commonly contain information on local educational institutions and instructors. Information of educational institutions are provided by search functions and statistical information based on classification criteria, such as administrative areas and operation types, and provided by a comprehensive view of location information through maps. GyeongNam Province has 4,056 information cases of educational institutions with the highest amount of information.

Course information, like education institution information, are provided by search functions and statistical information based on standardized classification criteria, such as administrative areas, learning periods, subjects to be learned, tuition fees and educational content. Busan, which has the highest number of course information, carries 36,521 cases.

B. Trainer and Learning Club Information

The city and provincial lifelong education information network provides information on instructors and learning clubs that are registered and active with local governments and local educational institutions, in addition to information on education institutions and courses collected as national lifelong learning portals depending on the region. Of the 17 cities and provinces, 13 cities and provinces[2], which provide information on instructors, provide teaching information based on the relevant statutes, and Jeju posts the most teaching information in 482 of them.

The city and provincial lifelong education information network, which provides information on learning clubs, offers a total of 11[3] education club information services in Busan, Incheon, and ChungNam.

Among them, Busan, Incheon and South Chungcheong Province post information on more than 600 study clubs.

C. Other Features, such as Online Courses

In addition to providing information such as education institutions, courses, instructors, and learning clubs, the government will additionally operate various functions depending on the needs of residents in each region. In particular, Daegu Lifelong Education Information Network provides 724 types of learning videos for each lifelong education field, and supports convenient access to residents by linking them with Daegu Citizen Cyber Education Center, TV Worknet, K-MOOC, KOCW and the National Lifelong Learning Portal. The Incheon Lifelong Education Information Network also features 31 humanities academy, 51 creative academy and a total of 82 video courses.

In addition to the DaMoa Lifelong Education Information Network, Daejeon operates a

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2) The 13 city and provincial lifelong education information networks that provide instructor information services are Busan, Incheon, Gwangju, Ulsan, Sejong, Gangwon, ChungNam, ChungBuk, JeonNam, GyeongBuk, GyeongNam and Jeju, while the Ulsan and JeonBuk lifetime education information networks have functions but have not been posted.

3) Learning club information services are available in a total of 11 cities and provinces in Busan, Incheon, Gwangju, Sejong, Gangwon, ChungBuk, ChungNam, JeonNam, GyeongBuk, GyeongNam and Jeju.

separate 'Daejeon Citizens' University' and 'Daejeon Delivery Class' system in connection with online classes services. The service will be provided through the Daejeon Citizen University's website in connection with membership registration, recruitment requirements, application for classes and refunds for offline courses at Daejeon Citizens' University, which is run mainly by the Daejeon National Institute for Lifelong Education and Songchon Campus.

The Sejong Lifelong Education Information Network provides a unified application service for education courses operated by the city or the city-run Institute for Lifelong Education, while the ChungNam Lifelong Education Information Network provides information on 37 learning spaces in the region in connection with 'Learning Road', a shared learning space service. In addition, Sejong, JeonBuk, and JeonNam provide information on lifelong learning centers in the township and neighborhood as separate menus.

D. Other Cities and Provinces

Seoul and Gyeonggi establish and operate their own lifelong education information network system without national funding, reflecting the direction, goals and main tasks of the city government.

In addition to providing online learning, educational institutions and course information and communities, Seoul Lifelong Learning Portal offers 'Seoul Free Citizens' University', which was launched under the representative brand of Seoul's lifelong learning policy, as a separate menu. Currently, the portal offers 748 online lectures in each field, with 8,037 educational institutions and 1,269 course information.

Gyeonggi opened 'Gyeonggi Province Knowledge Campus G-SEEK' in 2017, which focuses on learning, trends & topics and my platform as its main functions. Customized courses by each life cycle are offered in 14 areas, including foreign languages, certificates, employment, start-ups, retirement design and living information. In particular, a knowledge sharing platform service called 'My Platform' allows any resident to open and operate courses tailored to their knowledge and talent.

The municipal and provincial lifelong education information network started in 2011 and

was established in 17 cities and provinces in 2016. The municipal and provincial information networks are meaningful in that it provides online-based local lifelong education services as a system that forms the basis for lifelong education and information services.

Before the establishment of the lifelong education information network in the city and provincial areas, some local governments provided education information in the area, but it was difficult to check the websites, or even to have no homepage, as the level of information service between regions was wide and scattered. Therefore, information on local education institutions and programs could be found in one place through the establishment of a lifelong education information network, and information on the programs could be verified even if it was not a resident of the local residents, and they could participate in lifelong education. In other words, it is an achievement in that it is possible to develop a standardized system of information on education institutions and courses through the establishment of a network of municipal and provincial information, and to make a database of information on lifelong education in the region based on it.

3. Future Direction

The city and provincial lifelong education information network is meaningful in that it standardizes the information collection system from the supplier's perspective and has a database of scattered lifelong education information, but the task remains to enhance the availability of local residents in terms of the consumer. The direct input by the competence city, county, district, and local educational institutions is also a limitation. It is also necessary to check limitations on providing only educational information without learning design, consultation and consulting, knowledge sharing, and competency diagnosis for learners when various OER (Open Educational Resources) content is distributed via YouTube.

However, despite the aforementioned limitations, it is now necessary to consider that the annual educational institutions and course information inputted can be a very useful analysis in terms of local lifelong education. In order for the city and provincial information networks to

serve as a more effective function for future lifelong education, the government should derive the direction of development appropriate to the region based on the accumulated lifelong education information, systems, and administrative networks by analyzing the characteristics of the region, the status of educational institutions, and the needs of local residents. In addition, considering the characteristics of life-oriented and community-oriented lifelong education in Korea, the government needs to seek to create new functions that can support the local communities of students and customized learning design of residents, in addition to the cyber education centers operated by local governments and the current uniform way of providing information.

Chapter 3.

The National Learning History Management System

1. Project Overview

The National Learning History Management System was opened in 2010 to promote the 「Lifelong Learning Account System」 project under Article 23 of the 「Lifelong Education Act, which supports learners to accumulate and manage various learning experiences in their online learning accounts comprehensively. The lifelong learning account system is designed to allow the accumulation and management of the diverse learning experiences of the people in the learning account and use the results in conjunction with their academic background or qualifications, with the main purpose of expanding the participation of the people in lifelong learning and fostering ability-oriented talent.

2. Promotion Status

The National Learning History Management System is accessed through the Lifelong Learning Account System homepage (www.all.go.kr) and for registration of a learning history, it is necessary to open a learning account through membership of the website. Learning account numbers are given to learners who open a learning account, and their registered learning history is accumulated in the learning account. The accumulated learning history is issued in the form of a lifelong learning history certificate, which enables the use of learning outcomes.

3. Main Outcomes

In 2018, the number of new study account openings is 1,254 (2018.2). In 2010, when the National Learning History Management System was first opened, the number of people who opened a learning account was 977, but as of February 2018, the number of people who opened a cumulative learning account increased by about 66 times to 67,848.

As of February 2018, the number of newly registered learning experiences stood at 8,658. The number of registration of learning history refers to the number of cases in which a student account holder has registered his or her academic background, qualifications, experience, lifelong learning, and other activities (voluntary service, awards, paper, foreign language, reading, etc.) in the national learning history management system. At the time of the opening of the national learning history management system in 2010, 3,615 cases were registered, but as of February 2018, the number of cumulative learning history registration increased by about 62 times to 223,719 cases. Since 2014, about 40,000 study history registrations have been carried out every year, and the trend has been on a constant rise since 2015.

4. Future Plans

Future tasks for expanding and enhancing the participation of learners in the national learning history management system are as follows. First of all, the Ministry of Education and Employment and Labor is to reorganize the national learning history management system in accordance with the NCS (National Competency Standards) and KQF (Korean Qualifications Framework). Next, the government plans to provide customized counseling and learning design services using accumulated data in the learning history management system. Based on various learning experiences registered by learners, they will need to support individual learning design consultations and provide learning support services to encourage continued self-development and learning participation by providing customized information, such as a list of recommended education programs.

Chapter 4.
Customized Lifelong Education Information Service

Section 1. Korean Massive Open Online Course (K-MOOC)

1. Project Overview

The Ministry of Education launched the K-MOOC (Korean Massive Open Online Course) project in October 2015 to 'Open Excellent Courses of Universities to the General Public through the Internet' in order to actively respond to the international spread of the MOOC (Massively Open Online Course) and changes in the paradigm of higher education.

In 2018, K-MOOC's operation project aims to expand practical educational opportunities, improve job trade volume of adults and workers who responded to the fourth industrial revolution, and promote innovation of teaching-learning methods at university sites in order to realize higher education that everyone enjoys under the vision of 'Revitalizing Lifelong Learning centered on K-MOOC'.

2. Promotion Status

The K-MOOC is planned to first organize leading universities around the nation's best universities to acquire a luxury brand image when it was launched in October 2015, and then

expand the number of participating institutions on an annual basis. It was also promoted to provide contents in areas with high utilization and general purpose and high demand based on the autonomy of universities, while gradually reviewing additional services after establishing the infrastructure through government support.

In 2018, it is expanded and operated to include courses at leading K-MOOC universities, classes designating classes and fields, courses linked to financial support projects at other universities, self-participation courses such as public institutions and other courses linked to overseas. Meanwhile, in order to promote gradual globalization after the stable settlement of domestic services, the company initially develops and operates courses of domestic universities, but gradually provides superior contents of major foreign universities directly on the K-MOOC platform through agreements with overseas MOOC operating institutions (France FUN MOOC etc.), or jointly develop and provide contents with overseas universities (Thai, etc.).

A. Improve User-Friendly Learning Services

The regular course operation provided by the K-MOOC platform has been expanded to include learners in regular courses by increasing the number of mandatory annual operations of participating institutions from one or more times to more than one. For learners wishing to self-study, 'Audit' was introduced to open access and classes at all times in addition to the application period. However, it is not allowed to issue a separate certificate of completion, manage learning, and approve credits in audit.

To improve learner satisfaction, a class evaluation was introduced and the results of the assessment were provided to the teachers, and a reflux system was prepared to reflect the improvement of the course, providing the learner with excellent course information. In addition, a course-specific data analysis system called 'K-MOOC Insights' provides a visual approach to learners' behavior, enabling professors with insufficient statistical knowledge to develop data-based course management strategies.

B. Enhance the Utilization of K-MOOC Courses

In order to provide learners with active and continuous learning incentives and to expand the use of K-MOOC courses' completion results, a number of universities are using K-MOOC courses as credits or flipped learning courses. To that end, non-participating universities in developing and operating K-MOOC courses are also pushing to expand their use to recognize K-MOOC courses as credits. Currently, 101 courses at 33 universities have one to three credits, while K-MOOC courses at other universities offer credits at 11 schools. In addition, the National Election Commission has expanded its use in training employees in the public sector by recognizing them for 15 hours per course and utilizing education and training at the Ministry of Education.

It is also linking its accounts with K-MOOC platforms or providing a company-only page service so that organizations such as public organizations and businesses can use it in conjunction with K-MOOC.

3. Main Outcomes

A. A Change in the Selection Method of K-MOOC Course

In 2018, the company runs 89 institutions and 423 courses from MOOC Promotion University, a class that designates bundles and fields, courses linked to financial support projects from other universities, autonomous participation courses such as public institutions and overseas links. In particular, it selects a total of 23 courses, including 11 classes in vocational education, 6 classes in basic of majors and Korean studies, and 6 classes in autonomous areas, to prepare for the development and operation of courses. In addition, the class has selected 5 classes and 23 courses, focusing on areas related to the fourth industrial revolution, and is developing courses in robotics, big data and artificial intelligence.

B. Increase K-MOOC Learner Use and Satisfaction

As of August 2018, K-MOOC had about 6.58 million visits to its website, about 6.5 million applications for classes and 300,000 registered members to meet the diverse learning needs of learners. In addition, with the number of K-MOOC course development universities and courses gradually increasing and the use of courses such as credits and other places of use, the rate of course completion has been steadily increasing.

Meanwhile, the results of the satisfaction survey conducted in March 2018 on applicants for K-MOOC courses in 2017 showed that 84.5 percent of all respondents said that the courses were helpful in achieving their original goals, similar to 84.4 percent in the previous year. In addition, 87.4% of the questions concerning the overall satisfaction with K-MOOC courses were answered positively and the positive response rate was similar compared to the previous year. In particular, 2.9 percent of the respondents said "very yes," according to the report.

4. Future Tasks

Future tasks of the K-MOOC operation project should be to flexibly respond to the demand for job capabilities at related industrial sites, such as the fourth industrial revolution, and to expand and develop courses in the field of effective bundle lectures and vocational education that enable systematic learning of specialized fields. In addition, it is necessary to develop K-MOOC courses and develop ways to monetize them for the establishment of services and step-by-step self-reliance that operating institutions can continue to grow on their own.

> ## Section 2. National Support Center for Parents (Parents On-Nuri)

1. Project Overview

About 11 million parents live in Korea. Parents usually mean adults with children attending elementary, middle and high schools, but if they include families with preschoolers or college students, all adults in Korea who are older than a certain age are now parents or in the past.

However, interest in parents who are the three main players in education, along with students and schools, was not relatively high. In fact, parents are the ones who enjoy the right to education as a civil right, and especially those who have children who reach the age of mandatory education will be obliged to have their children receive the education prescribed by law. Along with the nation, parents have both fundamental responsibility and authority regarding education. In other words, from the point of view of school-age students, the two main actors of education are parents and the nation, and in the form of public education, parents are key educational actors along with the nation, even if their parents entrusted education to the nation or local governments - in fact, in the form of school education - with all the educational influence of their families.

The online classes system for parents is being operated with the aim of providing reliable educational information online in order to strengthen the ability of parents to educate their children, a key player in the nation's education. Since the National Institute for Lifelong Education was selected as the operator of the National Support Center for Parents in October 2010, the official website of the National Support Center for Parents, 'Parents On-Nuri (www.parents.go.kr)' was established in March 2011, and has been running the parents' online curriculum since March 2013. Since July 2015, the two services have been unified, integrated and operated under the current 'Parents On-Nuri (www.parents.go.kr)' and mobile application services have also been provided. In 2018, new services for parents such as e-book service on

education materials for existing children, dream letter for providing information on career education by school level, career-recipe (podcasts) and dream juniors were added.

This provides more accurate education information to parents through Parents On-Nuri and helps them understand the changes in society and the educational environment and establish their own education plans. In addition, the government has developed and provided additional online classes courses, textbooks and programs every year to help parents enhance their ability to educate their children, as well as to ease anxiety about their children's education.

2. Promotion Status

Since March 2011, the National Support Center for Parents has been developing and operating 'Parents On-Nuri' to play an e-hub role in providing information on their children's education, online parents' education, parent counseling, and parents' educational skills for their children. The following are the main information services provided on the Parents On-Nuri website.

First, the Parents On-Nuri website provides parents with the latest information on their children's education needs. In addition to information on children's education, video education information materials such as new education policy briefings and special lectures by the Ministry of Education are available and the latest news from each field is posted to support parents' awareness of and interest in education policies.

Second, it provides a total of 34 types of online content, including prospective parents (kindergarten~high school students), education for parents, self-directed learning, career and education, personality education (family education), reading education and economic education.

Third, it operates a representative counseling number so that parents can check information on their parents' school participation and counseling services (education, career, school life) at its National Support Center for Parents and provides a link service that can be moved to the website if necessary. In addition, it is strengthening communication with parents by using social networking sites such as Twitter, Facebook, and blogs to enhance access to education information and to promote distribution and expansion.

3. Main Outcomes

In March 2011, the National Support Center for Parents opened the 'National Support Center for Parents Homepage' to provide online various and authorized materials that help guide children and participate in schools. The homepage has a cumulative 80,132 members and a total of 1,168,042 visitors as of December 2018 with the aim of securing educational convenience for parents, expanding educational opportunities and diversifying parental education.

In October 2012, the government provided a communication space for parents to produce and share information directly, rather than unilateral delivery of information by policy institutions, by launching 'Parents On-Nuri Webzine' and blog 'Together Education, Parents On-Nuri' and SNS services, reflecting the educational needs of parents for providing information for their children's education once an each quarter. In 2013, the government began to provide systematic content data for parents by providing customized online curricula for each life cycle, and it has also provided mobile services since 2015. By managing the previously developed educational materials as a learning history in the online system, it is possible to provide integrated and systematic education services to parents. In 2018, the login process was simplified so that any parent can access the desired educational contents at the time and place of their choice, and parents with limited access to offline education such as office workers, multicultural and low-income families could also access high-quality content.

4. Future Plans

The following plans are developed and implemented in order to continuously provide high-quality parent education services.

First of all, it plans to provide more high quality education contents for parents. The National Support Center for Parents will officially prepare channels to collect demands to systematically discover and identify demand from parents and school sites, and continuously

secure quality content through expert monitoring.

Secondly, it plans to strengthen cooperation among institutions related to parents' education. Promoting education policies for parents starts with a cooperative network with the municipal and provincial education offices and the local support center for parents. In the future, the National Support Center for Parents will push for the establishment of a cooperative system through mutual cooperation at the working level, as well as the regularization of the operation of a consultative body, which will be joined by related ministries and local parents' support centers.

Finally, it plans to establish a system to deliver information services to parents. In the future, Parents On-Nuri will have to fully secure customized programs for parents' life cycle (by transition period) through cooperation with related ministries and agencies, and play a role as a platform for interconnecting and using individual content based on unique characteristics of related agencies.

Section 3. Digital Archive of Multicultural Education

1. Project Overview

The multicultural population in our society is increasing gradually. According to the present investigation of foreign residents in local government released from the Ministry of Public Administration and Security in 2018, it increased by more than three times over 10 years, and the total population is 3.6 percent rate for foreign residents. In addition, the number of children from multicultural families has increased about eight-fold to some 212,300. Furthermore, according to the U.N. Report on the future, if the trend of low birth rate and aging is maintained, the proportion of multicultural families in Korean society will account for about 21 percent of the total population by 2050.

The Ministry of Education stresses the importance of multicultural education at the educational scene so that multicultural students can grow into human resources in our society by fully exercising their capabilities without being left out and by enhancing the sensitivity of all students.

The National Center for Multicultural Education of the National Institute for Lifelong Education is a trust organization for major policy projects for multicultural education, and operates information service projects focusing on developing materials and contents for multicultural education, promoting multicultural education and network, operating a portal for multicultural education, and building and operating digital archives for multicultural education in line with the Ministry of Education's policy direction.

2. Promotion Status

A. Information Service of the National Center for Multicultural Education

The National Center for Multicultural Education provides major contents related to multicultural education through its homepage (www.nime.or.kr) including introduction and promotion of policy projects related to multicultural education, information on policy schools for multicultural education and statistics on multicultural education. In 2017, it provided video clips of the Korean education system and entrance information in six languages to elementary school students from multicultural families in cooperation with the Korea National Open University. In addition, in 2018, the same contents are produced for middle school students' parents and translated and published in five languages and are being serviced. It also provides various types of information services related to multicultural education.

B. Establishment and Operation of Digital Archive for Multicultural Education

The National Center for Multicultural Education is establishing and operating a 'Multicultural Education Digital Archive'. 'Multicultural Education Digital Archive' is a specialized data search system that allows users to find the data they want more easily through integrated data search functions and input of search terms such as subject, object, task and region. It also features statistical status and meta-analysis of archive users' usage trends.

According to the data that was viewed a lot as of November 2018, 609 cases of the '2018 Multicultural Kindergarten Business Brief', 565 cases of the '2017 Multicultural Centered School Business Brief', and 534 cases of the 'Korean Language Education Course (2017 revision)'. The National Center for Multicultural Education plans to actively utilize these functions in analyzing the needs for developing multicultural education materials in the future.

3. Main Outcomes

Since 2005, when its homepage is established and operated, the National Center for Multicultural Education has been providing various information on multicultural education for the convenience of users. In particular, the use of the archive system facilitated the collection of statistics, including the status of data retention and collection, types of subjects, and status of multi-lingual support data.

In order to promote 'Digital Archives of Multicultural Education Data', various materials related to multicultural education that are currently being developed and used by relevant institutions are collected, classified by subject and content, and chunked. It also provides data search functions so that users can use it when searching for data by summarizing the topic search terms and key contents of each data. In addition, it is currently implementing automatic completion function and tag (#) search function in search tap in order to strengthen its search function in 2018. In addition, the government has collected materials for multicultural education developed by the municipal and provincial education offices and multicultural education policy schools (multicultural kindergartens, prep schools, multicultural centered schools, and multicultural education research schools) and applied them to digital archives of multicultural education. As of November 2018, accumulated data on digital archives for multicultural education totaled 2,393, while the 2018 data pageview is tallied at 1.39 million, 2,860 cases as of November.

4. Future Plans

The National Center for Multicultural Education is preparing to operate the revamped multicultural education portal in 2019 to build and operate more advanced information services. The direction of the reshuffle and the new features to be added are as follows:

First, as a hub institution for multicultural education, the government aims to continuously strengthen the portal function of multicultural education. To that end, the portal will have a

new space for teachers to work on, allowing them to directly share and exchange views on materials used in multicultural education sites, rather than providing data in a single direction from the center.

Second, the government want to strengthen the information service function of the portal. In order to introduce the latest information and enhance the convenience of field users, the page table, which currently comprises a multicultural education portal, is reconstructed into a policy introduction space, parent space, teacher space and notification page, thereby providing more specific information to each appropriate target and providing links to relevant data and information.

Finally, to strengthen the search function and to provide convenience for new visitors, a related search word function or tag (#) search function will be installed. In addition, the government plans to establish periodic links with related agencies and continuously update and manage existing data to develop them.

Part 6
ICT in Career and Vocation Education

Chapter 1.
ICT in Career and Vocation (CareerNet)

1. Project Overview

The Korea Research Institute for Vocational Education and Training developed and provided career and vocation information network, 'Career Net', in 1999 to support the people's career design. Career Net is an information network that provides career information needed in career design for elementary, middle and high school students, teenagers, teachers and parents.

Currently, Career Net serves as a key educational informant to support career education during school curriculum such as 'Carrer and Vocation', 'Technology and Home', and 'Creative experience Activities' at elementary and secondary schools.

2. Promotion Status

A. Integrated Member System Establishment

Other national-level information networks to support career education include 'Career Experience Path of Dreams', 'Remote Video Career Mentoring' and 'Youth Entrepreneurship Experience Program YEEP'. These sites have a separate membership system or not.

Through the integrated membership system establishment project completed in the first half of 2018, an integrated membership system was established in which various career education-related sites could be used with a single member's information.

B. Mobile Application Redevelopment

Seven types of applications related in career education were integrated and organized into three types of applications. The three applications that were finally compiled and reconstructed are the 'Career Net Application', which includes the main functions of Career Net, 'MomSsok Career', which is the career information service for parents, and the 'Career Net eBook', which provides e-books on career paths and jobs.

C. Transition to a Cloud-Based System

Career Net is implementing a 'Cloud Transform Plan' to transform its physical servers into virtual servers in three phases. As a first step, the government transformed the Web server and WAS segments into a cloud-based one in 2016. In 2017, the media server division was switched in the second stage. What currently remains as a physical server is the database sector and is a three-stage's task.

D. Reorganization of Career Psychological Inspection System

Among the various services provided by Career Net, career psychological testing is not only utilized by many users, but also has a large amount of data that needs to be processed electronically. Accordingly, psychological test services with relatively more processing loads than typical webpages were reorganized to operate in an independent system.

E. Provides the latest career information

In order to provide information on career related in the fourth industrial revolution, a separate menu called 'Information on Career of the Fourth Industrial Revolution' was newly established. 'Information on Career of the Fourth Industrial Revolution' collects and provides relevant career information by major keywords, including artificial intelligence, robots, big data, the Internet of Things and virtual reality.

3. Main Performance

A. Status of User

For all of 2017, 508,903 new subscribers to Career Net. More than 8 million people visited and 266 page views. The cumulative number of members has decreased significantly since 2014 due to the implementation of the policy of restarting personal information on 2-year-cycle and is currently 1,591,438.

The number of online career counseling on Career Net was 33,093 as of 2017. There were 15,069 cases of cyber counseling, 11,920 cases of peer counseling, and 6,104 cases of counseling on the Career Solution menu. The mobile application service provided by Career Net is a consolidation effort in 2017, with three categories: Career Net, Career Net ebook and MonSsok Career, and the cumulative number of downloads since its development is 77,753 cases. The Career Net application, which provides online psychological testing, cyber career counseling, job information and academic information on mobile devices, was downloaded 75,371, while 1,750 favorite courses for parents and 632 eBooks that provide career education-related content as electronic books were used.

[Picture 6-1-1] CareerNet, Downloads of Mobile Applications

Cumulative Downloads

CareerNet Application
75,371

eBook CareerNet eBook
632

MomSsok Career
1,750

Total 77,753
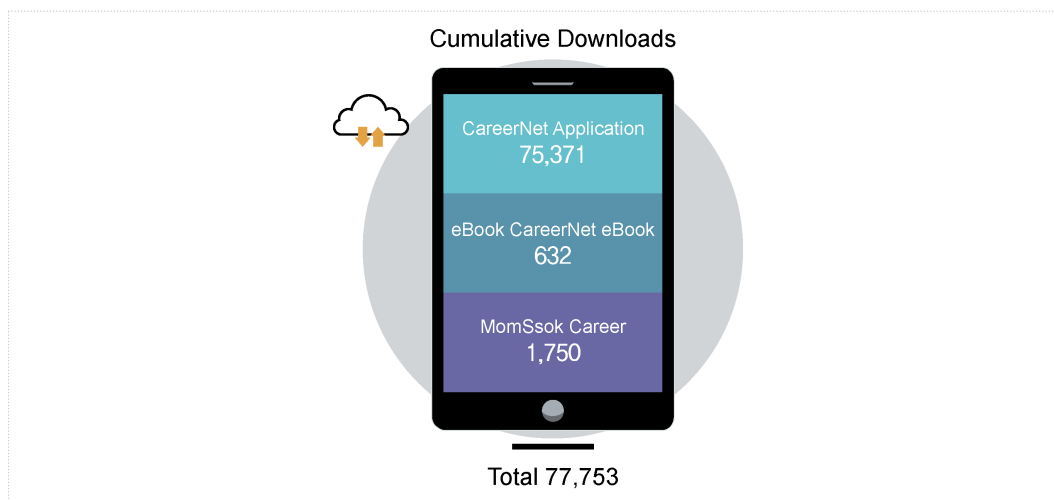
* Service Reorganization Day: 28, February, 2018
* Cumulative download count results from January to the end of June 2018

B. User Satisfaction and Demand

Career Net has been carrying out user satisfaction in the second half of every year. Users' satisfaction with the overall Career Net service has been consistently higher than 4.0 since 2012. For 2017, the overall satisfaction level of the career net was 4.23 points, 4.15 points for design and screen composition, 4.13 points for use method and 4.20 points for content.

C. Sharing Career Information

Career Net has been sharing information with public and private organizations through open APIs since 2012. There were 211 agencies (193 private institutions and 18 public institutions) that applied for APIs to share information on the Career Net (2017). In addition, 3.88,102 cases of department information on the Career Net and 2.888,672 cases of school information were used by external institutions when looking at the details of requests for information through open APIs.

4. Future Plans

A. Expanding the Status as a National Career Education Information Network

My Career, which shows career experience of Career Net such as psychological testing and online counseling, plans to develop into a system that not only shows Career Net, but also remote video mentoring, Career Experience Path of Dreams and major activities of youth entrepreneurship program YEEP.

B. Completing the Cloud Transition of the CareerNet Database

Currently, Career Net operates a hybrid cloud system that links the IDC (Internet Data Center) area with the cloud area. Of the three-stage transforming project, it has been completed to stage 2 and the database server needs to be switched.

C. Updated and Shared Psychological Inspection Tools

Psychological examination tools of six types of CareerNet were developed in early 2000, and some inspection tools were not updated. As the academic ability and values of adolescents change, so do the standards of career psychological testing tools. It is necessary to provide adolescents with suitable and reliable career choices through regular updates. Because there are many external demands for psychological testing tools, the government plans to develop open API functions by the end of 2018.

D. Expansion of Career Education Content for Elementary School Students

For elementary school students, who make up a major user base for Career Net, new subscriptions have been low recently. The biggest reason is that fewer programs are available to elementary school students. It is necessary to develop and distribute new programs that can help elementary school students in career education.

Chapter 2.
ICT in Human Resources Development Support (NHRD.net)

1. Project Overview

In order to find key policy agendas regarding education training and human resources development related to labor market, qualifications and career, and secure the basis for policy making, the Korea Research Institute for Vocational Education and Training has established and operated the 'NHRD.Net (National Human Resources Development Net)' since 2001.

2. Promotion Status

NHRD.net provides the latest information on national human resources development quickly, while providing various statistical information related to the human resources development in Korea through 'Indicators for Human Resources Development of Korea' menu. In particular, 'Human Resource Development Trend' includes The HRD Review and KRIVET Issue Brief, which are the own publications of the Korea Research Institute for Vocational Education and Training, to contribute to making it easier for the general public to access trends, statistics and policies related to human resources development. Through the 'Human Resources Policy Projects' and 'Global Human Resources Projects' menu, the government also shares and promotes information on various projects and forums (Best HRD, Future Human Resources Forum, HRD Policy Forum, Social Policy Research Forum, and

Global Human Resources Forum) currently underway in connection with national human resources development.

Meanwhile, it provides mailing services to differentiate itself from other information services and enhance the quality of its services to the public. Further from simply providing the latest trends related to human resource development, the government has prepared and provided its own issue paper, which is an empirical analysis of issues of high importance from a policy perspective.

In order to enhance the accessibility of website and enhance the reliability and satisfaction of users, NHRD.net completed the reorganization of the website by promoting the web accessibility enhancement project, acquired the web accessibility quality mark of the National Information Society Agency for the first time in August 2012, and has since been updated in full compliance with the strengthened web accessibility guidelines.

3. Main Outcomes

Looking at the main operational results of NHRD.net in 2017, NHRD.net first uploaded 1,622 data for 2017 and provided mailing services to 1,921 members on the latest trends in human resource development. As a result, 140,000 visitors logged onto the NHRD.net site each month and said users were satisfied with the content provided by more than 70 percent of users.

4. Future Direction

NHRD.net is the only comprehensive information infrastructure in Korea related to future national human resources development policies, and it is necessary to enhance differentiation with related websites to properly reflect changes in human resources policies of various government departments, while also promoting strategic cooperation to compensate for

weaknesses of NHRD.net. In addition, continuous supplementation and reorganization of the sites is also required to appropriately reflect changes in the human resources-related policy environment of various government departments to realize the new government's national tasks, such as job economy and lifelong job education innovation.

Chapter 3.
ICT in Career Qualification Information

1. Project Overview

As the career qualification registration system was introduced in 2008, the Korea Research Institute for Vocational Education and Training has been establishing and operating the 'Career Qualification Information Service (www.pqi.or.kr)' system since 2009 to provide information on registered career qualifications to the public and manage and operate the registration system.

Career qualification Information Service was developed to ensure the public's right to know about the career qualification system, to protect consumer rights and interests arising from the process of acquiring a career qualification, and to conveniently and efficiently support career qualification registration services. career qualification Information Service provides various qualification-related contents and contents related to career qualification system for spreading consumer awareness of career qualification, eliminates asymmetry in qualification information between qualified information consumers and suppliers by enabling information inquiry of registered career qualification, and contributes to the reduction of cases of non-registered career qualification, operation of non-registered persons, and various false and exaggerated advertisement.

2. Promotion Status

A. Content of Provided Information

The information provided by the career qualification Information Service consists of the 'Information on Registered Career Qualification' section for searching the career qualification information and the 'Registration Management' section for registering the career qualification information. Starting in 2014, new information was created to check national qualification information as well as information on career qualification, and additional public service was added to the menu for reissue of career qualification certificates and cancellation of registration, and to the areas where career qualification was prohibited by the relevant ministries. As system function improvement has recently been made, various information such as the number of test, receptionists, number of applicants, number of acquirers, and acceptance rate entered by a career qualification manager, as well as basic information such as job content and grade of individual qualifications, have been available to identify the annual certification schedule.

B. Status of Career Qualification Registration and Authorization

As of March 2018 (2018.3.31), a total of 29,211 career qualifications were registered through the private qualified information service. Although only 655 subjects were registered in 2008, the number has increased significantly since 2011 and has been on a steady rise.

Meanwhile, among registered career qualifications, the number of accredited career qualifications is 99 as of March 2018, indicating that the number of registered career qualifications has not changed much compared to the increasing trend of registered career qualifications.

3. Main Outcomes

A. Status of Membership

A total of 11,021 organizations have subscribed to career qualification information services. By joining the member, it will be able to apply for registration of career qualifications and provide basic information on those qualifications. Meanwhile, ordinary people can be provided with information on career qualifications without having to sign up for membership separately, and can inquire about their qualifications or receive newsletters.

B. Status of Content Retention

As of March 2018, content provided through career qualification information services includes career qualification information, qualification-related news and announcements, related laws, forms and documents, data and publications, prohibited areas and announcements of deregistration. According to the content, 29,211 career qualification information, 253 qualification news and announcements, 23 related laws, 38 forms and documents, 103 qualification-related materials and publications, 34 notices in prohibited fields and 63 notices are deregistration.

C. Status of Online Complaints and Q&A

In March 2018, a total of 6,129 cases were posted, based on the online complaints and Q&A status of members of career qualification information services. Specific details of online complaints and Q&A include complaints and reports on false and exaggerated advertisements and damages, opinions and suggestions on the career qualification system, application procedures of registration and certification, and questions and answers concerning the use of career qualification information services.

D. Main Information Services Added

Career qualification Information System in 2017 was improved for improve efficiency. The

relevant departments' logging in function was added to reflect the needs of the relevant departments which conduct the career qualification registration review. In addition, joint issuing agencies that are applying for joint issuance of career qualification can check the status of applications for registration and information on joint issuance qualifications after registration.

4. Future Promotion Plan

Currently, about 29,000 career qualifications are registered, and career qualifications are expanding to new areas related to the Fourth Industrial Revolution. Given the trend of changes in the number of new registrations and revocation each year, registration is expected to continue to increase.

Despite changes in the environment, such as the increase in the amount of information and the increase in demand for information due to the quantitative increase of the career qualification, the career qualification information service system remains in the system framework in 2011 and is lagging behind that of other public institution operating systems. Therefore, an urgent improvement of the career qualification information service system is required in order to respond effectively to the quantitative increase of career qualification and government's policy related career qualification.

In 2017, the government promoted the establishment of the career qualification Information Service (PQI) and Information Service Strategy Plan (ISP) of system in mid and long term, and plans to conduct discussions on the improvement of the system based on the results of the analysis of the overall status, such as the analysis of the career qualification system, registration and certification processes, and the analysis of outdated hardware and software and functions, and the analysis of the needs of stakeholder related to the career qualification system. The system will need to be reorganized through the implementation of the mid- and long-term Information Service Strategy Plan (ISP) to provide active access to changes in the environment surrounding the career qualification system.

Chapter 4.
The National Competency Standards
(NCS Learning Module Service)

1. Project Overview

The National Competency Standards (NCS) are the national system of knowledge, technology and attitudes required to perform duties at industrial sites. The National Competency Standards (NCS below) was named through the National Policy Coordination Conference in 2010, and has been selected and promoted as a national task for establishing a capability-oriented society in 2013.

The purpose of the NCS implementation is to resolve discrepancies between education & training and qualification and industrial sites by reorganizing education & training and qualification on the NCS basis. Education and training students and qualification acquirers who want to get a job will be able to design a clearer personal career by referring to the NCS. In addition, companies can expect social cost savings, such as reduced costs of retraining new employees.

2. Details on Promotion of NCS and Learning Module services

The Ministry of Employment and Labor and the Human Resources Development Service of Korea provide NCS and learning modules through the online portal site (www.ncs.go.kr). NCS and learning module integrated portal sites (NCS sites below) are responding to the needs of

consumers by continuously improving their functions. As a representative, NCS site is currently being built and operated through 'Open Integrated Portal Site in 2014', 'Advanced Project of NCS Homepage in 2017' and 'Project of Improving Platform for Data Utilization in NCS in 2018'. The main contents of each project are as follows:

3. Status of NCS Site Service

'NCS Customized Search' is a screen that comes into contact with a pop-up when accessing NCS site. As analyzing the utilization patterns of NCS users, it provides a recommendation menu for user characteristics. NCS Customized Search provides a service group that is frequently utilized when a group of users is selected that meets the purpose of visiting the NCS homepage, and a shortcut button is provided when a service group is selected.

The NCS site provides services and search services to help user understand the NCS and learning modules basically. The main menu of the NCS site consists of five categories: [NCS Integration], [Blind Adoption], [Business Utilization], [Education and Training Course Design], and [NCS Media Center].

4. Main Outcomes

As a result of its efforts to raise awareness of the unfamiliar NCS to the public, the NCS site's awareness is gradually improving from 40 percent in 2016 to 46 percent in 2017. The number of visitors to NCS sites rose 102 percent on-year to about 2.16 million in 2017, with about 4.16 million downloads.

[Table 6-4-1] Status of NCS Site Visits   (Unit: Person, Case, %)

Classification	2015	2016	2017	Increase and decrease rate (%) (Compared last year)
Number of new members (person)	123,541	115,526	71,238	61
Number of visitors (persons)	1,559,672	2,118,777	2,165,981	102
Number of downloads (cases)	3,271,266	4,367,630	4,160,898	95

5. Future Plans

To meet the needs of visitors to NCS site, the government is continuously striving to improve its functions by providing services by customer type, developing functions to improve customer accessibility, and providing optimized menus that reflect customer characteristics through analysis of big data. In particular, the NCS site plans to conduct performance analysis every year to monitor smart performance management system developed and operated until recently, link with internal and external NCS-related information, and customer-oriented services through big data analysis, and operate sites that can contribute to the spread of blind recruitment.

Part 7
Bridge the Information Gap

Chapter 1.
Bridging the Educational Gap for Information-Alienated Groups

1. Project Overview

In the Fourth Industrial Revolution and the Intelligence Information Society, knowledge and information will produce the most added value. This will result in a widening gap in knowledge and information, resulting in an economic and educational unequal environment, if no one is provided with easy access to knowledge and information. Therefore, efforts should be made to reduce the gap between those who are alienated information who are difficult to access knowledge and information.

Accordingly, the Ministry of Education is pushing for 'Project to Support ICT in Education for Elementary, Middle and High Schools Students', where PC and Internet fee are supported for families of low-income students in elementary, middle and high schools, and provides various educational contents such as EBS content and cyber learning content to provide equal educational opportunities.

2. Promotion Status

The Ministry of Education provides quality Internet communication services by signing an Internet communication fee agreement with Internet service providers every three years to support important Internet communication expenses among projects supporting elementary,

middle and high school students' ICT in education. It provides Internet communication services based on agreements with KT, LG U+, SK Broadband and SK Telecom, which had been signed until December 2020.

The budget for projects to support ICT in education of elementary, middle and high school students was set up as the ICT Promotion Fund (Fund: Local Expenses-5:5) from 2000 to 2003, the ICT Promotion Fund (Fund: Local Expenses-5:5) and special grants (Special: Local Expenses-7:3) in 2004, and special grants (Special: Local Expenses-3:7) from 2005 to 2006. From 2007, the budget was transferred to the municipal and provincial education offices, and the project was carried out by securing all local expenses other than 1.7 billion KRW (3.9 percent of the 2007 budget), and since 2008, all municipal and provincial education offices have secured local expenses, drawing up budgets and plans for each city and provincial education office, and selecting applicants.

When parents and student's guardians of the outer class on information submit an application to a school, including those who are provided with basic living security and working poor class, the support ICT in education of elementary, middle and high school students provides PC and Internet communication expenses through a review by the Student Welfare Review Committee. However, by integrating with other support projects (school meal expenses, tuition fees, and free after-school classes) through the One-Click Application System, evidence documents have been simplified and students' identities can be guaranteed because there is no offline application process.

3. Main Outcomes

A. Expanding Support by Signing Agreements Between Internet Service Providers

The Ministry of Education signed an agreement with KT (former Korea Telecom) in 2000 to provide Internet services to students who are eligible for support ICT in education of elementary, middle and high school students through online access to educational contents

with more information service benefits, and provided modem communication fees for 15,000 KRW.

As the high-speed Internet service was later distributed due to the development of the Internet communication network, the service fee for high-speed Internet communication service was reduced by 30 percent to 21,450 KRW per person a month from June 2002 and 19,800 KRW from March 2006 so that high quality Internet communication service is available.

[Table 7-1-1] Trends of Internet Communication Cost Agreement   (Unit: KRW/Month)

Agreement Year	Agreement Cost (1Person)	Increase and Decrease	Communication Provider	Settlement with Agency
2000	33,000	-	KT	Ministry of Education
2002	21,450	11,550 KRW Decrease	KT	Ministry of Education and Human Resources Development
2006	19,800	1,650KRW Decrease	KT	Ministry of Education and Human Resources Development
2009	18,700	1,100KRW Decrease	KT, LG, SK	Ministry of Education, Science and Technology
2012	17,600	1,100KRW Decrease	KT, LGU + , SKT, SKB	Ministry of Education, Science and Technology
2015	17,600	-	KT, LGU + , SKT, SKB	Ministry of Education
2018	17,600	-	KT, LGU + , SKT, SKB	Ministry of Education

B. Performance of Project Promotion

The Ministry of Education provided PC to 50,000 students in 2000 by a four-year lease division purchase through a contract with a PC manufacturer in order to support large numbers of PCs for students who are eligible for support ICT in education of elementary, middle and high school students. Since 2007, PC support projects have been transferred to the municipal and provincial education offices, and many students have received support benefits every year to date. The budget spent on PC support from 2000 to 2015 totaled 249 billion KRW, with an average of 18.5 billion KRW being spent annually from 2000 to 2006 and an average of 11.3 billion KRW being spent from 2007 to 2017, when PC support projects were transferred to the municipal and provincial education offices.

The number of students supported Internet telecommunications costs is 50,000 in 2000 and

165,000 in 2016, and the government provided an average of 38.5 billion KRW per year from 2007 to 2017 from 2007 to 2017, from an average of 13.4 billion KRW a year from 2.5 billion KRW in 2000 to 2006 and 28.2 billion KRW in 2007 to 39.1 billion KRW in 2016.

4. Future Direction

The following are the directions to be pursued in the future through inspection of the achievements and problems of the projects to support ICT in education of elementary, middle and high school students.

First, the Ministry of Education signed an agreement with Internet service providers (KT, LG U+, SKB, SKT, etc.) to provide high-speed Internet service at a discounted price. It is necessary to push ahead through consultations with operators to provide discounts on Internet communication fees in the future as well as various educational programs and content suitable for student education.

Second, while it is important to provide communication infrastructure, such as providing PC and Internet communication expenses to students who are the outer class in information, education on provision and utilization of learning-related content is needed to address the educational gap by utilizing the communication infrastructure.

Third, it is necessary to provide a support system that continuously provides education on map management and sound Internet use and related Internet services for students to use the Internet in a sound manner.

Fourth, the government needs to maintain a close cooperation system among officials of the education and information service programs through consultation meetings and workshops for the smooth implementation of the projects by each member of the Ministry of Education, municipal and provincial education offices, schools and Internet service providers.

Chapter 2.
ICT in Special Education for Students

1. Project Overview

The National Institute of Special Education is systematically promoting 10 major projects in six areas, starting with the 'Building the Education and Welfare Information Center for Handicapped Students' project in 1998, including the operation of a site to support teaching and learning for handicapped, support to address the digital divide of handicapped students, strengthening the information service capabilities of handicapped students, supporting education for handicapped students and operating a remote education training system.

[Table 7-2-1] Project Overview of ICT in Education for Handicapped Students at the National Special Education Center in 2018

Classification	Detailed Project
Operate the teaching and learning support site for handicapped students	• Operation of EduAble.net • Operation of Field Support Group
Support to bridge the information gap between handicapped students	• Development of an auxiliary engineering device for education for handicapped students • A Study on ICT in Special Education and Auxiliary Engineering
Strengthening the information service capabilities of handicapped students	• Operate the National handicapped Students e-Festivals • Development of Software Education Support Program for handicapped Students
Promoting content for future education and environment education	• Development of Contents to Support Teaching for handicapped Students to Guarantee Learning Rights • A Study on the Contents of Support for Teaching Learning for handicapped Students with Disabilities to Guarantee Learning Rights
Education support for handicapped students	• Produce and distribute alternative learning materials for disabled students
Operation of Remote Training System	• Operation of online remote training system for teacher training, etc.

2. Promotion Status

A. Operation of EduAble.net

Launched in 2005, EduAble (www.eduable.net) has served as a national education information portal to support educational material at special educational sites. EduAble is the only handicapped student teaching and learning support site in Korea that specializes in developing and supporting educational materials for handicapped students, leading the information service of the special education classroom environment and supporting the sharing of excellent educational materials of each local educational institution.

[Table 7-2-2] Main Service of EduAble

Main Menu	Main Delivery Service
Class support data	• Digital Books, Multimedia Books, Textbook Supplementary Materials, Field Support Group Recommendations, Clip-type Training Videos
Alternative Learning Data	• Textbooks, study reference books, EBS broadcasting textbooks
Career, Higher, Life	• Career education, higher education, lifelong education, free semester system
Special Education Engineering	• Auxiliary engineering, software education, future classroom
Sympathetic	• Education materials, contests, human rights education, awareness of disability, etc.

B. Development of an Auxiliary Engineering Device for Eucation for Handicapped Students

The project for the development and research of auxiliary engineering devices for education for handicapped students is aimed at expanding opportunities for handicapped students' participation in learning and minimizing learning deficits in school age through the development and distribution of educational auxiliary engineering devices that can be used in special education sites. At the same time, it is also pushing for special education engineering analysis, such as auxiliary engineering for handicapped students, and information on foreign auxiliary engineering.

In 2017, one type of function and graph indicator for blind students was developed and the status of ICT in special education and auxiliary engineering was investigated. In 2018, it is

developing switches and switch controllers for handicapped students, and is studying ways to establish a support system to activate ancillary engineering support services for education.

C. Strengthening the Competency of Handicapped Students Nationwide

The National E-Festival for handicapped Students is an annual competition held from 2003 to improve the ICT skills of handicapped students and to foster a sound leisure culture. Handicapped and ordinary students, teachers, parents, special education experts and related figures will attend the event, consisting of a national special school (class) student information contest, an e-sports competition for handicapped students across the country, a special education information service conference and cultural events. In addition, the National Institute of Special Education has been developing software education programs for blind students since 2018.

D. Development of Contents to Support Teaching and Learning for Handicapped Students to Protect Learning Rights

The Project for the Development of the Contents to Support Teaching and Learning for handicapped Students is a project to develop multimedia contents to guarantee the teaching and learning rights of handicapped students in a digital learning environment in accordance with the Ministry of Education's policy to prepare for the future education environment.

From 2014 to 2016, 'Digital Book' consisting of smart learning production tools and viewers and contents based on 2011 curriculum was developed and distributed, and from 2017 based on the 2015 curriculum, the government is focusing on developing digital content that can be used without restrictions due to disability characteristics through the application of Universal Design for Learning (UDL).

E. Other Projects

The project to produce and distribute educational materials such as textbooks and reference books for handicapped students in the form of print or electronic files by transforming them into accessible forms for handicapped students. Alternative materials are produced and

distributed in braille, voice and expansion.

In addition, through the operation of the remote training system, the government also provides remote education training to enhance special teachers' expertise, understand general teachers' integrated education, and foster special education assistant staff and parents' ability to support handicapped students.

3. Main Outcomes

As a national institution for special education, the National Institute of Special Education is striving to improve education conditions for handicapped students, bridge the digital gap of handicapped students and strengthen the information capabilities of handicapped students through various information service support projects. In order to measure performance, 'Number of Access to Websites that Support Teaching and Learning' is used as an indicator. The number of connections reached 742,694 in 2017, and the number is expected to increase every year, with some 80 to 900,000 in 2018.

[Picture 7-2-1] Number of access to the teaching and learning support site users (As of 2017)

2017 number of access times
742,694

4. Future Direction

Under the Ministry of Education's 'Five-Year Plan for the Development of Special Education (2018-2022)' for the ICT in Special Education for handicapped students, the

government intends to propose the following measures to ensure the legitimate educational convenience of those subject to special education.

First, it should support the establishment of ICT infrastructure in preparation for the future education environment. For handicapped students, the digital environment opens up the possibility of participation. Therefore, the establishment of ICT infrastructure should precede where handicapped students are being educated. If legitimate educational convenience is provided through the ICT infrastructure, interaction with ordinary students will naturally become active, and participation of handicapped students will be expanded to form the basis for successful social integration.

Second, if the establishment of ICT infrastructure was preceded, the development of contents considering the characteristics of the disability should be promoted. In some cases, if content is presented as an approach that is not appropriate to them, the content may not be available. Therefore, content development for handicapped students should be studied in depth rather than content development by ordinary students, and content should be provided to suit the characteristics of handicapped students.

Third, such efforts for handicapped students are not the only role of the National Institute of Special Education. If content that takes into account ICT infrastructure and disability characteristics is shared throughout education, the digital divide among handicapped students in various fields of education will be reduced and handicapped students will be guaranteed.

Part 8
Construction of Sound Information Culture and Information Security

Chapter 1.
Healthy Cyber Culture Formation Activity

1. Project Overview

As usage of Internet and smartphones has become more common, experiences of inflicting and damaging cyberbullying by class are gradually increasing in accordance with changes of lifestyle and generation, and serious adverse effects such as excessive dependence on smartphones, spreading false information, and reckless notification of personal information are occurring due to the expansion of use of smartphones. Accordingly, there is a growing need for education and publicity to foster Internet ethics and prevent cyber-bullying.

2. Main Status

In 2017, the Korea Communications Commission and the National Information Society Agency operated 'Customized and experienced Internet ethics education' suited requirement and demand of the field for each kindergarten, elementary, middle and high school students, and provided education related to the education leader's 'Offline Teacher Training' such as 'On-line Ethics Education' for parents, 'On-line Curriculum' for general teachers, and scholarships for teachers. The number of education graduates also increased to 166,600 (an 11 percent increase from 2016).

According to a survey of 1,400 teenagers who received Internet ethics education in 2017, the level of improvement in Internet ethics awareness was found to have increased by 9.8 points (about 12.5 percent) after training, and the highest improvement in responsibility for Internet use, especially at 11.6 points.

In addition, the government operated a 'Beautiful Internet World' declaration ceremony and weekly (September.4 to 16, 2 weeks) under the slogan 'The Beautiful Internet World We Make Together' in 2017 and performed 147,688 participants in the period (an increase of about 10 percent from 134,233 in 2016). In order to bridge the gap in Internet ethics education by region, the Internet Ethics Experience Center is operated in Busan (National Busan Science Museum), Gwangju (National Gwangju Science Museum), and Bundang (JubWorld) year-round, and 443,471 people visited the area annually.

In addition, a national participation campaign to create a 'Beautiful Internet World' called 'Internet Dream Kid Song and Music Creation Festival' was held to help people understand and communicate Internet ethics in a friendly and easy manner through music and to find and spread excellent contents that people can sympathize with through 'Internet Ethics Culture Creation Contest' and 'Teaching-Learning Guide Contest'.

3. Future Plans

In order to spread a sound Internet use culture, the government plans to expand customized and experienced education programs to create an environment in which the beneficiaries of education can empathize with and practice Internet ethics. In particular, it is necessary to expand the base of education targets by securing more Internet ethics content and campaigns in response to the growing cyberbullying among adults, and by promoting education and promotion to beneficiaries such as the Korea Youth Fair and the Korea Education Fair.

In addition, the government plans to strengthen education of mentors in the educational interface, including teenagers, parents, teachers and youth mentors, to induce changes in the home and school environment, and to help all public become healthy Internet users through programs that can be applied in life.

Section 2. Information and Communication Ethics Education for Elementary and Middle Schools

1. Project Overview

Information and communication ethics education is an educational activity aimed at fostering basic skills such as the right information search and utilization, desirable communication, and global citizenship for the members and fostering the right values and patterns of behavior for youth living in a knowledge and information society, also is an education to resolve adverse function of ICT occurred recently.

[Table 8-1-1] Ministry of Education, Progress of Promotion of Information and Communication Ethics Education

Year	Progress of Promotion
2001	• Produce and distribute information and communication ethics guidebooks for elementary, middle and high schools
2002	• A Study on the Counterfeit of Information Service through School Education
2003	• Creating and distributing teachers' guidebooks
2004	• Developing and providing content as part of a project to strengthen information protection education for elementary, middle and high schools
2005	• Revision of 'Guidelines for Information and Communication Technology Education' for elementary and Secondary Schools – Provide information and communication ethics education for more than 7 hours among regular subjects – Information and Communication Ethics Training Using the Curriculum's Time
2006	• Establishing 'Directions for Training for Teachers' for Strengthening Information and Communication Ethics Education' – New Teacher: 2+ hours of job training – Class 1 Teacher: 15 Hour Mandatory Job Training
2007	• The results of information and communication ethics activities of municipal and provincial education offices are reflected in the 'Comprehensive Assessment of Regional Education Innovation' – Operation of the curriculum, training performance of teachers, and self-diagnosis performance of Internet Division
2008	• Autonomous operation of municipal and provincial education offices after the self-regulation measures of schools
2009	• Information and communication ethics-related contents are expanded into the revised education process (enforced in 2009) – 7th Curriculum: 15 Curriculum – Revisionary Curriculum: 24 Curriculum
2010	• Establishing and operating a consultative body for municipal and provincial officials of information and communication ethics – Participation in the Ministry of Education, the municipal and provincial education offices, and the Korea Education and Research Information Service – Sharing city and provincial activities, discussing joint countermeasures, etc.

Year	Progress of Promotion
2011	• Promotion of a joint project between the city and the provincial government of information and communication ethics − Developing online content: 65 types − Providing job training for counselors across the country: 722 people
2012	• Reinforcement of Information Communication Ethics Education − Training for leading teachers in information and communication ethics (for city and provincial recommended teachers) − Operating youth camp for mentoring (for city and provincial recommended students)
2013	• Strengthening Information Communication Ethics Education Based on the Curriculum − Discovering and spreading excellent cases of information and communication ethics education based on education courses − Research on the status of information and communication ethics education and measures to prevent and activate reverse functions
2014	• Reinforcement of Information Communication Ethics Education − Produce and disseminate guidelines for implementing information and communication ethics − Development and distribution of reverse function diagnosis tools based on ICT use
2015	• Reinforcement of Information Communication Ethics Education − Promote voluntary preventive activities at school sites to foster a sound information and communication ethics culture − On and offline job training to strengthen the competence of education staff, teachers and professional counseling personnel, including strengthening information and communication ethics education and preventing cyber violence at school sites. − Developing and distributing content for information and communication ethics education (24 types of educational content, 2 types of promotional materials) (will be developed for 24 types of educational content considering information ethics content elements by school level, and 2 types of promotional materials for parents and students)
2016	• Reinforcement of Information Communication Ethics Education − Information and communication ethics education and operation of 150 leading schools to prevent cyberbullying − Train leading teachers and operate teachers' club to promote information and communication ethics education − Selection and operation of Wee Center (34 centers) to counter cyberbullying (34 centers)
2017	• Reinforcement of Information Communication Ethics Education − Information and communication ethics education and operation of 150 leading schools to prevent cyberbullying − Train leading teachers and operate teachers' club to promote information and communication ethics education − Selection and operation of the Cyber Violence Response Center, 46 centers) − Develop and distribute online content for the education of their parents (8 types)

2. Promotion Status

The Ministry of Education established the 'Plan for the Prevention of Cyber Violence and the Detailed Promotion of Information and Communication Ethics Education' in 2017 and conducted various anti-cyber violence education and information and communication ethics education in major areas, including strengthening of the cyber adverse function prevention education for students, strengthening the cyber response capability for teachers and parents, raising awareness and strengthening the cooperative system of teachers and parents.

If look at the major tasks in more detail, it included developing and distributing teaching materials for information and communication ethics education, selecting and operating a leading school for cyber violence prevention and Wee Center to response cyber violence, selecting and operating an information and communication ethics teachers' training center, selecting and operating an information and communication ethics teachers' research group, teaching-learning guideline contest for internet ethics, strengthening media usage education for parents, and conducting weekly information and communication ethics education and contests and events related to information and communication ethics.

3. Main Outcomes

The Ministry of Education is trying to prevent various cyber bullying. In particular, cyber violence is supplemented with problem handling manuals so that it can be investigated and dealt with strictly as physical violence, and the training of school violence prevention committee members and parents of unit schools is being strengthened. In addition, the government is operating a leading school for cyberbullying prevention that focuses on cyberbullying prevention activities such as campaigns against cyberbullying, development and application of class data against cyberbullying, and activities to spread information and communication ethics awareness by cooperating with related ministries, and strengthens experienced prevention education and education related to information and communication ethics, including webtoon and UCC production.

[Table 8-1-2] Main Performance of Promotion of Information and Communication Ethics Education in 2017

Development and Distribution of data	• 250 kinds of information and communication ethics teaching materials to prevent cyberbullying • Eight types of online content for parents' education
Support for the reinforcement of teachers' competency	• 17 Association for the Prevention of Cyber Violence and the Research of Information and Communication Ethics Education Teachers – 102 types of development materials – Operate teacher delivery training (150 people × 17 = 2,550)
Exploring and distributing operational cases	• The Selection of 20 Leading Schools to Prevent Cyber Violence

Cyber Violence Response Center, Operation of the Wee Center	• Selection and operation of 46 Wee Centers – Promote workshop and training for capacity building of staff at the Wee Center in the stronghold – Sharing the operation results report of the hub Wee Center
Establishing and operating a consultative body of related ministries and agencies	• Establishment of related government departments and agencies' consultative body regarding excessive immersion of information and communication ethics, game, Internet, and smartphone – Implementation of the Promotion Plan Council four times in total • Edunet Information and Communication Ethics Service(www.edunet.net) – Operation of integrated services for related ministries and agencies' education cases and data (total 400 or so cases)
PR and campaign	• Smart ICT Content Contest (KT Hope Sharing Foundation) • Sponsorship of UCC Contest (Clean Content Movement Headquarters) for Personality Clean Content Public Service Campaign • 2017 Professor of Internet Dream and Operation of Collaboration for Learning Guide Competition

4. Future Plans

Despite efforts by various sectors of society, the level of lack of cyber ethics among teenagers is increasing, and the low age phenomenon of cyber violence in particular is an urgent task to be solved. To this end, information and communication ethics education should be continuously conducted in a specific and systematic manner during childhood and adolescent, and related programs should be reorganized to provide education in a phased and systematic manner, taking into account the growth, development and academic achievements of teenagers.

Through information and communication ethics education, students need to reflect on human meaning as a moral entity and move in a way that allows them to view and judge problems in the information society from an ethical perspective. To this end, education opportunities for various experiences and reflection are needed through daily educational activities linked to the education process, and related infrastructures are linked with the government, the private sector and various media organizations.

Chapter 2.
Privacy and Information Security

Personal Information Protection Policy for Educational Institutions

1. Project Overview

The Ministry of Education strives to create a 'Safe and Reliable Environment for the use of Personal Information Protection by Strengthening the Awareness of Privacy and Capacity of educational (administrative) institutions' in accordance with the enactment of the 「Personal Information Protection Act」 (2011. 9.30).

It provides standard privacy management measures to encourage autonomous personal information protection activities such as producing and distributing standard lists of personal information files and handbook for personal information processing guides to educational and administrative agencies, while supporting policies for safe management of some 110,000 personal information files held and managed by 17 municipal and provincial education offices, their affiliates, universities and public organizations.

In addition, the Center for Information Protection and the nationwide education are continuously promoted to enhance awareness of personal information protection.

2. Promotion Status and Main Outcomes

A. Improvement of Privacy Policy and System

The Ministry of Education proposed the standard for work process of protection privacy such as reorganizing 17 forms and 161 applications related to the collection of personal information that are being handled by educational (administrative) agencies. The government strives to promote awareness of privacy by conducting a level diagnosis of the level of personal information protection management, reflecting the results on the institutional assessment and the public notice of universities, and by planning and operating round-the-clock training for those responsible for personal information protection, personnel, and new personnel. In addition, the government has strengthened the system of supporting personal information protection education and on-site consulting by continuously nurturing leading personnel for personal information protection, while strengthening the system for directly listening to the voices of field personnel and reflecting them in policies through the operation of the consultation body for personal information protection of each agency. The government also strives to establish a culture of self-contained personal information protection by preparing communication channels and work support systems for those in charge of business through the privacy portal.

B. Education and Promotion of Personal Information Protection

Since 2012, the Ministry of Education has designated and operated on- and off-line education centers in order to expand educational opportunities for those in charge of personal information protection at educational (administrative) institutions and address time and space constraints. In order to support the continuously changing work environment for personal information protection, the company provides personal information protection tour training for new personnel, personal information protection officers (CPOs), and personal information protection personnel every year, and makes various efforts to train instructors specializing in

personal information protection and leading personnel for supporting personal information protection tasks.

C. Operation of Personal Information Exposure Inspection System

In order to prevent personal information leakage and exposure accidents on websites operated by educational (administrative) agencies, the Ministry of Education established a personal information exposure inspection system (8 types) and conducted preventive inspections on more than 21,000 websites in 2017. In addition, in the case of an agency that has exposed a large amount of personal information (more than 1,000 cases) as a result of preventive inspection, unnecessary personal information was destroyed through on-site consultation and security and correction measures were taken for violation elements of the 「Personal Information Protection Act」.

For the safe operation of the homepage, the Ministry of Education provides a guide for responding to web server security weaknesses, a manual for personal information protection law, and educational materials through its personal information protection portal and education cyber safety support system. In addition, SSL[1] 22,467 and APIs[2] were distributed as of December 2017 by actively promoting the distribution of security servers for the safe distribution of personal information.

D. Personal Information Protection Inspection and on-site Consulting

The Ministry of Education has designated the Korea Education and Research Information Service as a specialized institution to enhance the level of personal information management in educational (administrative) institutions, and has set up an on-site inspection team using experts from various levels trained as leading agents to check the status of personal information protection of educational (administrative) institutions and conduct consultations

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1) SSL: Secure Socket Layer. Encrypting and communicating information for secure communication over the Internet.
2) API: Application Programming Internet. API refers to an interface that allows control of the functions provided by the operating system or programming language for use in applications.

on safe management measures. Accordingly, after conducting a level assessment of 454 institutions, including universities and industry-affiliated institutions, 20 institutions were selected for on-site consulting, and 17 municipal and provincial education offices will be inspected and on-site consulting in the second half.

3. Future Plans

The Ministry of Education plans to strengthen support for education (administrative) institutions to collect, manage and operate personal information efficiently by strictly restricting the collection of personal information unnecessarily by preparing a minimum standard for collecting personal information under the 「Personal Information Protection Act」.

To this end, the government is developing a system to distribute the personal information exposure inspection system to large education offices so that they can check the websites belonging to the organizations at least once a year.

Section 2. Establishment and Operation of Cyber Safety Center in Ministry of Education

1. Project Overview

The Ministry of Education has established and operated the 'Ministry of Education, Cyber Security Center' in February 2008 to prevent the spread of cyberattacks (hacking, DDoS attacks, etc.) from spreading attacks in real time and minimize the spread of damage and secondary accidents in the event of infringement.

2. Promotion System

The Ministry of Education is in charge of information protection affairs, including the establishment of information protection policies and improvement of the system, based on related statutes such as the 「Act on Local Autonomy」, 「Elementary and Secondary Education Act」, and the 「Regulatory and Higher Education Act」. In February 2016, the Korea Education and Research Information Service was designated as the organization dedicated to the operation of the Cyber Safety Center of the Ministry of Education through the revision of the 'Rules for Operation of Cyber Safety Centers of the Ministry of Education'.

The municipal and provincial education offices were required to operate their own security system centers to protect information of education support offices and schools (elementary, middle and high schools), take primary security and initial measures against cyberattacks, and promptly report any incidents of violation found to the Cyber Safety Centers of the Ministry of Education to prevent the spread of encroachment accidents. The agencies, universities and public institutions under the Ministry of Education are provided with a system to respond to security regulations and intrusions at the Cyber Security Center of the Ministry of Education.

3. Main Promotion Project

A. Cyber-infringement Countermeasures Sheriff's System Implementation

In February 2008, the Ministry of Education established a cyber safety center of the Ministry of Education to protect key information resources of 447 educational institutions, including municipal and provincial education offices and universities, from advanced cyber breaches such as 'Lansomware', 'DDoS (Distributed Denial of Service)', and attacks on 'Advanced Persistent Threats (APT)', and to minimize damage to the information network and its main information system.

B. Promote Emergency Response and Recovery in the Event of an Accident

The Cyber Security Center of the Ministry of Education conducts rapid analysis and restoration of accident causes in case of cyber attack violation accident to educational institutions, and operates 'Information Protection Inspection and Support Group' to prevent the spread of damage. In particular, a joint response system in cooperation with the relevant agencies (NCSC) will be operated in the event of serious breaches in major systems of educational institutions (NEIS, EduFine, Academic and Administrative Information System, etc.).

C. Promotion of Security Weakness Check on Homepage

Cyber Safety Centers of the Ministry of Education is operating a 'Homepage Security Vulnerability Self-checking System' to prevent any cyber infringement on major homepages held by educational institutions. The vulnerability diagnosis items are managed in four sections (system management vulnerabilities, program security vulnerabilities, user authentication vulnerabilities, bulletin vulnerabilities) and 16 detailed items, and inspection patterns were improved and applied when new vulnerabilities occurred.

D. Conducting a Simulation to Cope with the Cyber Crisis

The Cyber Security Center of the Ministry of Education examines the information system of educational institutions by conducting simulated cyber crisis response drills in the first half of every year (May), the second half of every year (October), and the Ulchi exercise (August) as if they were an actual cyber terror attack. In 2017, a total of 24 institutions were selected for mock hacking and DDoS attack training in the upper and second half of 2017, and in August, a total of 79 institutions, including municipal and provincial education offices, universities, and their agencies, conducted on-the-job training, hacking mail, and simulated invasions in connection with the Ulchi exercise.

E. Strengthening the Protection of Major Information and Communication Infrastructure

The Ministry of Education has designated and protected a total of 24 major information and communication infrastructures in the education sector. The institutions are the 17 municipal and provincial education offices that run the Education and Public Administration Information System (NEIS), a system that has large student information, the Korea Education and Research Information Service, and six national university hospitals (Seoul National University Hospital (BonKRW, Bundang), Busan National University Hospital, Chonnam National University Hospital, Chongbuk National University Hospital and Chungnam National University Hospital) that have sensitive information about individuals' health.

F. Sharing Cyber Safety Information and Strengthening Cooperation

The Cyber Security Center of the Ministry of Education has established an 'Educational Cyber threat Information Sharing System' to promote the sharing of information related to the latest information security to those in charge of the security system of 447 educational institutions. Through these efforts, the government, the military and the private sector provide cyber trends and cyber threat trends provided by related agencies (NCSC) every month, and the agency sends

'News Clipping' to watch news related to information protection at a glance through e-mail from the agency's staff.

4. Future Plans

The year 2018 is an important year to prepare for a second leap forward with the 10th anniversary of the opening of the Cyber Security Center at the Ministry of Education. It will operate a collection and analysis processing system that can more accurately and proactively respond to cyber breaches by establishing a comprehensive system of security systems for educational institutions, and plans to push for the automation of analysis applying new technologies such as deep learning and artificial intelligence, and the expansion of a comprehensive security system.
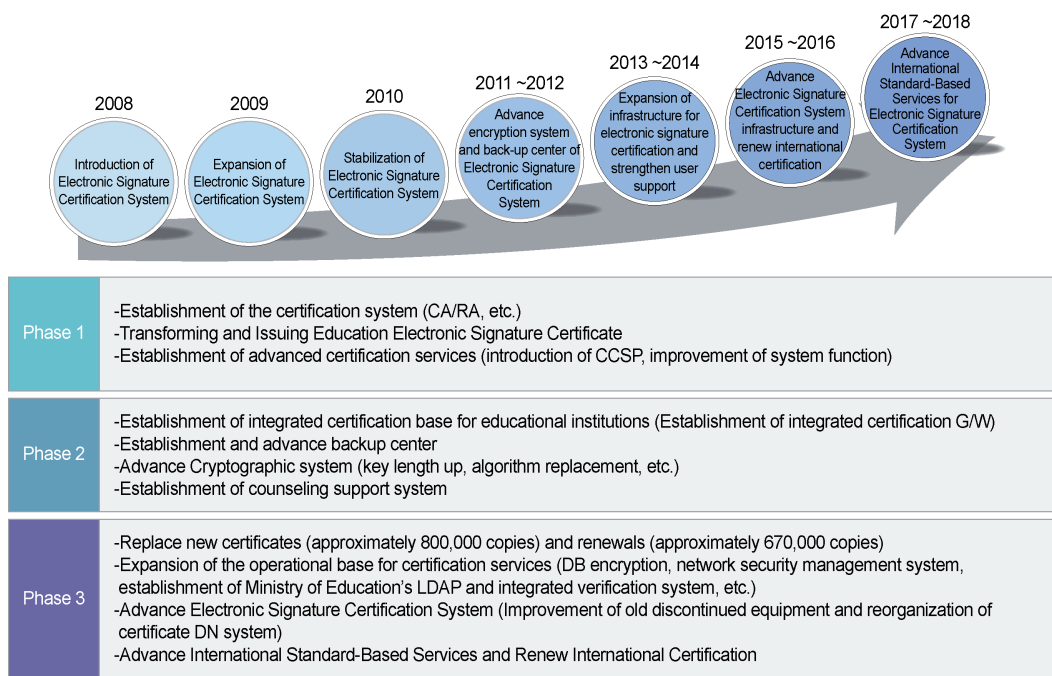
In addition, the government plans to strengthen its analysis and prevention-oriented tasks by increasing the number of experts in analyzing new cyber threats and responding to on-site responses, analyzing incidents of on-site infringement by educational institutions, checking the operation system for information protection, and checking information system vulnerabilities.

Section 3. Establishment and Operation of Electronic Signature Certification Center

1. Project Overview

The revision of the 「Electronic Government Act」 in January 2007 required the Ministry of Education to establish its own GPKI certification system by requiring the use of GPKI certificates in the distribution of administrative electronic documents and providing the basis for private school faculty members to issue certificates, and by abolishing the Korea Advanced Institute of Industrial Economics and Trade's Electronic Signature Certification Center in May 2008 following the Ministry of Information and Communication's plan to reorganize the NPPI certification system.

[Picture 8−2−1] Establishment and Operation of Administrative Electronic Signature Certification Center of the Ministry of Education

Phase 1	-Establishment of the certification system (CA/RA, etc.) -Transforming and Issuing Education Electronic Signature Certificate -Establishment of advanced certification services (introduction of CCSP, improvement of system function)
Phase 2	-Establishment of integrated certification base for educational institutions (Establishment of integrated certification G/W) -Establishment and advance backup center -Advance Cryptographic system (key length up, algorithm replacement, etc.) -Establishment of counseling support system
Phase 3	-Replace new certificates (approximately 800,000 copies) and renewals (approximately 670,000 copies) -Expansion of the operational base for certification services (DB encryption, network security management system, establishment of Ministry of Education's LDAP and integrated verification system, etc.) -Advance Electronic Signature Certification System (Improvement of old discontinued equipment and reorganization of certificate DN system) -Advance International Standard-Based Services and Renew International Certification

※Referencce: Korea Education and Research Information Service, 2018.2

The Ministry of Education established the Information Service Strategy Plan (ISP) in May 2007 to set up a model for the establishment of the GPKI certification center for educational institutions, and established the Ministry of Education's Administrative Electronic Signature Certification Center in April 2008.

2. Detailed Promotion Task

A. Establishment and Operation of Administrative Electronic Signature Certification Center of the Ministry of Education

The Ministry of Education's Electronic Signature Certification Center aims to establish and operate the 'Unified Certification Gateway System' for the administration of the Ministry of Education and Electronic Signature Certification System for the issuance and verification of electronic signature certificates and for the management of certificate user information and connection of information with the national administrative information system.

A more enhanced verification system for user certificates was prepared by deploying systems such as KGS, CA, RA, DS, OCSP, etc., which are essential to issuing and managing certificates, introducing mailing services to provide additional services, developing diagnostic tools for deploying a secure server, and developing certificate processing programs. In addition, the ministry operates a system to monitor the status of issuance and use of certificates by more than 12,000 educational institutions in real time, including the analysis of the operation status of the administrative electronic signature certification center of the Ministry of Education and the establishment of its own situation room for situation control.

B. Establishment and Operation of RA/LRA for Municipal and Provincial Education Offices, Universities, and Public Institutions

The municipal and provincial education offices have designated registered agencies (RAs), education support offices, universities and public institutions as remote registration agencies (LRAs) and operate the certificate issuance and management system for each educational institution.

[Table 8-2-1] Status of Ministry of Education RA/LRA

Classification	Ministry of Education	Municipal and Provincial Education Office	Education Support Office	University	Public Institute
Number of Agency	1	17	169	465	11

※Referencce: Korea Education and Research Information Service, 2018.2

C. Establishment and Operation of Backup Center for Administrative Electronic Signature Certification System of the Ministry of Education

With the aim of establishing a real-time disaster recovery system for stable operation of electronic signature certification services and restoration of system failures, the Ministry of Education's Center for Electronic Signature Certification has established regulations for disaster recovery for the operation of electronic signature certification systems in the event of a disaster, and established a backup system for disaster recovery in remote areas.

In 2018, a disaster recovery center was relocated with the aim of creating a new physical environment due to the relocation of the existing disaster recovery center rental server room (public institutions under other ministries) and lack of rental space.

D. SSL Certificate Distribution

Since 2008, before the Personal Information Protection Act went into effect, the Ministry of Education has been reducing the budget by providing free SSL certificates to secure personal information safety on the Web sites of educational institutions. In addition, the Center for Electronic Signature Certification diagnoses whether to establish SSL certificates on the website of educational institutions to enhance security. Accordingly, the government is striving to prevent damage to information leakage and gain public confidence by distributing information services on the websites of educational institutions via the information and communication network.

[Table 8-2-2] Status of SSL Certification Distribution (Unit: case)

Classification	Ministry of Education	Education Office	University	Public Institute	University Hospital	Total
Number of Distribution	29	1,627	1,468	104	5	3,233

※Referencce: Korea Education and Research Information Service, 2018.2

E. Certificate Processing Program (standard security API) Distribution

A certificate processing program must be applied to use the PKI certificate issued by the Ministry of Education's Administrative Electronic Signature Certification Center for certificate-based login, security channel configuration, identification and file encryption in the education institution's application system. To this end, the Electronic Signature Certification Center is distributing certificate processing programs to enhance security in the establishment of information systems of educational institutions.

[Table 8-2-3] Status of Certificate processing program (Unit: case)

Classification	Ministry of Education	Education Office	University	Public Institute	University Hospital	Total
Number of Distribution	17	255	230	36	0	538

※Referencce: Korea Education and Research Information Service, 2018.2

F. Advanced Authentication System

The Ministry of Education's Electronic Signature Certification Center conducts compliance with international standards and enhancement of functions of the certification system for the provision of safe and reliable education information services and e-government services. In 2017, POSCO made efforts to improve its ability to respond to information security threats from authentication services and increase user convenience by reorganizing the DN system, strengthening the functions of certificate registration and management, and strengthening the counseling support system.

G. Organization and Personnel

The Ministry of Education established a department in charge of electronic signature certification centers within the ministry and formed a team in stages to play a role. The organization personnel of the Electronic Signature Certification Center are as shown in the table below, and RA/LRA tasks have been developed to secure personnel from municipal and provincial education offices, universities and public institutions on their own or utilize existing personnel.

[Table 8-2-4] Personnel required for electronic signature certification center by year　　(Unit: Person)

Classification	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Regular	2	3	3	3	2	2	3	3	3	2	2
Contract	0	1	2	2	2	2	2	2	1	1	0
Consignment	6	9	9	12	12	12	12	12	14	14	16
Total	8	13	14	17	16	16	17	17	18	17	18

※Referencce: Korea Education and Research Information Service, 2018.2

H. Readjustment of the Legal System

The Ministry of Education's Electronic Signature Certification Center stipulates the types of certification services, methods and procedures, conditions of use, and other necessary matters by establishing the Ministry of Education's Guidelines for Certification of Administrative Electronic Signatures and Certification. In 2018, the government revised the regulations for certification work, including the currentization of the names of organizations under the government reorganization, supplementing identification procedures to strengthen the management of certificates, and clarifying details on the criteria for certification work and certificate management by specifying items under RFC3647.

I. Advanced International Standard-based Certification Services and Renew International Certification

The Ministry of Education's Electronic Signature Certification Center obtained international certification for certification services from an international authorized agency (WebTrust.org),

and was verified for its security and reliability. The Center for Administrative Electronic Signature Certification at the Ministry of Education is pushing to upgrade its certification service to strengthen its functions for issuing and managing certificates for certificates of certificates and SSL that comply with international standards, and to implement operation and management of the electronic signature certification system based on international standards through renewal of international certificates. Based on acquired international certification, the government is pushing to improve the web compatibility of the Ministry of Education's administrative electronic signature certificate under the mobile environment and various Web browsers.

3. Future Promotion Direction

In the future, the Ministry of Education's Electronic Signature Certification Center will strive to provide safer and more reliable certification services, such as abrogating the public certification system in the private sector and diversifying the means of certification for educational institutions in accordance with the environment of expanding the spread of user mobile handsets.

Section 4. Diagnosis of Level of Information Protection in the Ministry of Education

1. Project Overview

In order to provide various education information services, the technology environment related to information services such as IT infrastructure, database, web services, and cloud is expanding and social interest in information security and personal information threats is also on the rise. In response, the education institute has conducted a check on the level of information protection for educational institutions since 2009 so that the threat factors can be eliminated in advance and long-term and continuous improvement tasks can be carried out through autonomous self-diagnosis.

The level of information protection is measured and evaluated by educational institutions themselves, and promoted with the aim of voluntarily improving information security and personal information protection, and implementing a safe cyber environment.

2. Promotion Status

A. Establishment of a System for Diagnosing Information Protection Level

The Ministry of Education prepared a system of level diagnosis considering the administrative and institutional characteristics of information protection by analyzing domestic and international regulations and evaluation systems to prepare a system of level diagnosis of information protection.

B. Progress of Promotion Level Diagnosis

A total of four indicator research projects were carried out in 2009 starting with five items,

14 categories, and 66 inspection indicators. A system for managing level diagnosis of information protection was developed in 2013 and a foundation was prepared through the system improvement projects in 2015 and 2017.

C. Detailed Checklist and Indicator Configuration

The average score of personal information protection level diagnosis also decreased slightly in some items as the personal information protection level check indicator in 16 was subdivided every year.

3. Main Outcomes

A. Conduction of the Level of Information Protection Diagnosis

In the past three years, the number of organizations participating in the level of information protection diagnosis has increased from 386 in 2015 to 439 in 2018 and the overall educational institution has maintained a normal level of security with an average of 77.5 points based on the 2017 evaluation criteria.

B. Promote Information Security Level Diagnosis

The average score of information security diagnoses has been on the rise every year, especially in the area of cyber crisis management over the past three years.

C. Promotion of Checking the Level of Personal Information Protection Diagnosis

The average score of a personal information protection diagnosis has been rising slightly every year. The most volatile area over the past three years was 'Performing the Personal Information Impact Assessment', which saw a slight decrease in the score in 2016 and a sharp increase in the score in 2017.

D. Explanation of Information Protection Level Diagnosis and On-site Inspection

Through an annual briefing session on the index of information protection level diagnosis, the government strive to improve the level of information protection of educational institutions and improve their difficulties through smooth exchange of opinions with the staff of educational institutions and on-site inspection of the experts on security of educational institutions.

4. Future Plans

Through its recent project to develop indicators for quality diagnosis of educational institutions in 2018, the government is pushing to reflect newly changed laws and guidelines and evaluate levels customized for educational institutions considering type and size.

Establishment of the Integrated Disaster Recovery System for the Educational Information System

1. Project Overview

The goal of the establishment of the disaster recovery system is to pre-establish the 'Unified Disaster Recovery System of the Education Information System' in preparation for disasters so that the educational administrative work can be performed reliably and continuously.

The magnitude 5.8 quake, which occurred in Daegu and adjacent Gyeongju, where the NEIS Central Command Center is located on September 12, 2016, was recorded as the largest-ever earthquake on the Korean Peninsula since Korea began observing an instrument earthquake in 1978. Separately, a fire broke out in November 2015 at the Seoul Metropolitan Office of Education in a building where the education information system was installed, and a consensus was formed on the feasibility and urgency of establishing a disaster recovery system for the education information system. In addition, on September 28, 2016, Sohn Hye-Won and others, member of the National Assembly, expressed concerns about the establishment of a disaster recovery system for the education information system and asked for the early implementation of the project under the responsibility of the Ministry of Education, the Ministry of Education, in consultation with the Ministry of Strategy and Finance, secured related project funds and carried out the project in earnest from 2017.

The project for establishing integrated disaster recovery system for education information system focused on developing basic plans and budget for the establishment of disaster recovery system from 2017 to mid-2018, designing of disaster recovery center, design of disaster recovery system (ISP) and developing standards for business continuity planning (BCP). From the second half of 2018, the government plans to build a site for a disaster recovery center, build infrastructure such as buildings, power and telecommunications,

implement a project to establish a disaster recovery system, and complete a physical disaster recovery system. Separately, the government also implemented projects to improve relevant laws and systems to establish and secure the legality of the integrated disaster recovery system. If look at the budget required to establish an integrated disaster recovery system, the government will invest a total of 44.1 billion KRW, including 19.2 billion KRW as state coffers for building physical infrastructure such as the center's construction and 24.9 billion KRW as local expenses (special subsidies) for establishing the first stage of disaster recovery system (storage and backup networks).

2. Promotion Status

A. Selection of the Site for the Disaster Recovery Center

Considering the functional characteristics of the disaster recovery centers, the Ministry of Education decided Sejong City as the site for the disaster recovery centers, considering the geographical location, accessibility and the status of earthquakes in municipal and provincial education offices nationwide. Located in the center of the Korean Peninsula, Sejong City has the advantage of being easily accessible from the Seoul metropolitan area, Chungcheong, Jeolla and Gyeongsang provinces and having a low chance of disaster such as earthquakes and tsunamis. In addition, Sejong City has the advantage of being able to efficiently respond to disasters, such as the formation and operation of a joint government task force.

B. Design of Disaster Recovery Center

Building design considering the characteristics of the integrated disaster recovery centers operated by the Education Ministry (Central General Center) and 17 municipal and provincial education offices was carried out with the following basic policy.

First, the government will establish an integrated disaster recovery center for the education information system designated as the country's main information and communication

infrastructure so that the disaster recovery center can meet the requirements in accordance with the relevant criteria, as it is expected to be designated as the country's main information and communication infrastructure in the future.

Second, the design of earthquake damage reduction is reflected in lighting lights, ceilings, and doors so that the disaster recovery system can be operated reliably and efficiently even in the event of a disaster or disaster, so that the impact of disasters or disasters in the region is minimized.

Third, it is expected that the use of the disaster recovery center will continue to expand, enabling the expansion of infrastructure and buildings.

Fourth, as a specialized data center, it will carry out energy-saving architectural design such as bar, eco-friendly, energy efficiency and intelligent buildings, which will have large-scale power requirements such as anti-temperature humidifiers, servers and storage.

Fifth, to cope with the lack of expertise of personnel in charge of designing and constructing disaster recovery centers, architectural design and construction work will be promoted through the procurement agency's 'facility customized service'.

C. Design of Disaster Recovery System

1) Design Direction of Disaster Recovery System

The design direction of the system for the establishment of the integrated disaster recovery system of the education information system was established and implemented as follows. First, in terms of service size, the system implementation environment for service conversion in the event of a disaster is designed by exploring existing resource utilization measures, etc. Next, in terms of storage configuration, data replication has led to agency-specific storage deployments considering heterogeneous storage operating environments in the future. Finally, the replication network for the operation of DRS will be determined by checking the security review of the public network, including VPN, dedicated lines, and KISTI.

2) Technical Review on Disaster Recovery System

A technical review was made on how data is transmitted and how data is replicated in order to establish a disaster recovery system. Since the disaster recovery system should be less limited in distance without affecting the main center (more than 300 km distance between the disaster recovery center and Jeju education office), it was analyzed that the system should be introduced asynchronously, but the RPO could be ensured by setting up an appropriate transmission cycle.

It was decided that the data replication method should be designed as a virtualization-based data replication method that supports heterogeneous storage in preparation for future system changes, such as the 4th generation NEIS and EduFine.

3) Results of a Review on the Recovery Level of Disaster Recovery System

In the form of the disaster recovery system, the level of recovery of the disaster recovery system was initially set to be implemented at the tier 3 level, considering the introduction of the fourth generation age for the aforementioned reasons, reflecting the ISP results carried out in 2013. The type of disaster recovery system implementation was defined as Hot Site (Data Mirroring Site).

4) A Study on the Network for Disaster Recovery

The integrated disaster recovery system of the education information system is aimed at preventing data loss by establishing the data back-up system of the 17 municipal and provincial education offices and the education administration general center, and swiftly recovering the data through the disaster recovery center in the event of a disaster at a particular municipal or provincial education office. In addition, there is a requirement that work for rapid service conversion should be minimized in the event of a disaster declaration by the municipal and provincial education offices and the education and administrative centers. Based on these conditions, it was decided that the disaster recovery network would be established with an Internet line after comparing the disaster recovery line configuration method.

3. Main Outcomes

Main Outcomes of the 1ˢᵗ year (2017) of the establishment of the integrated disaster recovery system of the education information system can be presented in two parts:

First of all, it is believed to have enhanced efficiency, fairness and expertise in pursuing large-scale disaster recovery system projects. In terms of efficiency, the Act provided that school life information (e.g., grades, students' record) could be safely protected by early implementation through integration of the disaster recovery system, and that social confusion caused by disasters and disasters could be prevented in advance to enhance the credibility of the country by preventing interruption of work. In addition, it is assessed that the government will be able to strengthen its expertise in building construction projects and ensure transparency in project implementation by conducting construction management through the signing of 'Customized Service' agreements between the procurement agency and the facility corporation in the areas of enhancing fairness and professionalism. In addition, the integrated disaster recovery system is expected to reduce the number of people who operate the disaster recovery system at the municipal and provincial education offices. The site required for the construction of the disaster recovery center is also believed to have greatly reduced the cost of purchasing land by purchasing land in the northwestern development zone created by Sejong City in the form of a circular land for public use rather than private land.

4. Future Plans

The schedule for the construction of a new disaster recovery center and the establishment of a disaster recovery system is as shown in the table below. In the second half of 2018, the government will proceed with bidding for the selection of construction/electricity/communication contractors through the Public Procurement Service, as well as the selection of construction project management services, to decide the winning bidder and to pursue the contract for construction/construction project management service. Construction of the disaster recovery

center will be completed by the end of 2019 by construction/electricity/communication engineering.

Based on the results of the system design for the establishment of the disaster recovery system, the government plans to calculate the scale and quantity of the establishment of the remote backup and disaster recovery system of the education information system and secure and reflect the relevant budget in the main budget (special bridge) of 2019. In addition, as part of the 4th generation NEIS ISP project, the company will push for detailed design of the establishment of a disaster recovery system and preparation of the request for the project's proposal and review of the security of the request so that bids for the disaster recovery system operator can be carried out in the first half of 2020. Afterwards, the operator of the disaster recovery system will install the related system at the center after the construction is completed, and complete the integrated test and initial data construction, and the first stage of the disaster recovery system will be started from the beginning of 2020.

Part 9

International Exchange Cooperation
and e-Learning Industry Status

Chapter 1.
International Exchange Cooperation

1. A Project to Support ICT in Education for the Bureau of Exchange and Cooperation

The Ministry of Education has been carrying out a training program for leading teachers since 2005 in cooperation with 17 municipal and provincial education offices to support sustainable ICT in education in exchange and cooperation countries. By the end of February 2018, 5,677 teachers from 25 countries, including Uzbekistan and Cambodia, were invited to teach ICT in education.

In addition, it has supported various e-Learning equipment such as PCs, laptops and beam projectors to exchange partners since 2005 in cooperation with 17 municipal and provincial education offices, and provided a total of 29,683 equipment to 27 countries by February 2018. The e-Learning international consulting project, which has been promoted by the Ministry of Education and the Korean Education and Research Information Service, began in 2006 as an international cooperation project in the education and information service sector that spreads Korea's ICT in education policy performance to exchange partners.

In addition, in order to systematically transfer Korea's ICT in education experience to developing countries, it has been operating e-Learning International Consultation Development Process (Basic/Advanced Process) since 2007 and a total of 661 people have completed it by the end of February 2018.

2. International Organizations and Multilateral e-Learning Cooperation Projects

A. 2018 E-learning Korea

The Ministry of Education has been hosting e-Learning Korea events with related ministries, including the Ministry of Trade, Industry and Energy, since 2006 to promote e-learning policies at home and abroad and share trends. The 2018 e-Learning Korea event was held at the COEX in Seoul from September 13 to 15, co-hosted by the Ministry of Education, Ministry of Trade, Industry and Energy, Ministry of Science and ICT and Seoul Metropolitan Office of Education, and co-managed by the Korea Education and Research Information Service, National IT Industry Promotion Agency and the Korea EduTech Industry Association.

B. Korea-International Organization for Cooperation and Global Symposium on ICT in Education

The Ministry of Education has been hosting a 'Global Symposium on ICT in Education, GSIE' with international organizations such as the World Bank and UNESCO since 2007 to address the global knowledge and information gap and strengthen the country's international leadership in the education sector. The 2017 Korea-International Organization for Cooperation and Global Symposium on ICT in Education was held at the Sheraton Seoul Dcube City Hotel for three days from October 25 to 27 under the theme of 'the 4th Industrial Revolution and Education: Digital Citizenship'.
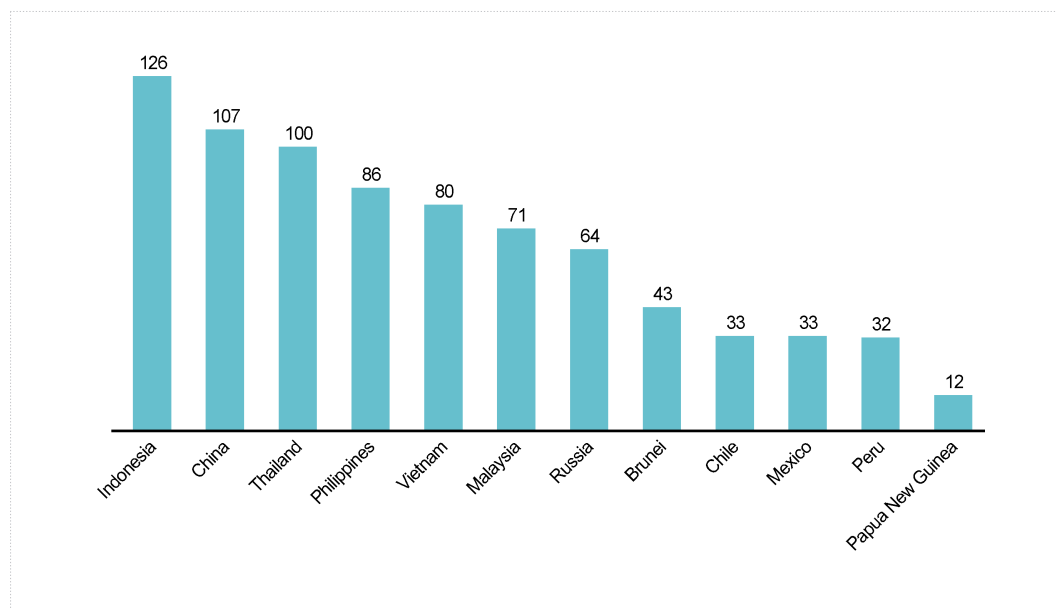
C. APEC e-Learning Training Program

The APEC e-Learning Training Program (APEC) is a multilateral educational cooperation project proposed by our Ministry of Education to APEC and officially approved by APEC, and has been operating it since 2006 with the aim of narrowing the digital gap in the APEC region and enhancing Korea's status as an e-learning leader. This training is designed for

developing countries in the field of education among APEC members, and is carried out as a training course to support the implementation of practical problems in each country's education policies, as well as disseminating excellent e-learning policy cases in Korea by inviting education policymakers who have been officially recommended by the Ministry of Education of the Member States every year.

[Picture 9-1-1] Status of participants in APEC e-Learning training by country (2006~2017)   (Unit: Person)

※ Reference: APEC Institute for International Education Cooperation, 'APEC e-Learning Training 2017 Results Report' 2017.12

D. e-ICON World Cup

The Ministry of Education has been hosting the e-learning International Contest of Outstanding New Ages (e-ICON) since 2011 as part of its content development competition involving global talents in e-learning. The e-ICON World Cup is a competition in which 645 students from 22 countries participated in on- and off-line activities together with domestic and foreign students, and develop e-learning contents that can be used in the global educational environment on a per-team basis until February 2018.

3. Project to support the establishment and operation of a pilot classroom using advanced ICT

Since 2011, the Ministry of Education has selected exchange and cooperation countries from two to three countries each year to promote the project of supporting the establishment and operation of pilot classes using advanced ICT, which is a focus of the nation's experiences and know-how in ICT in education. Korea's experience and know-how in implementing ICT policies are spreading to developing countries through 'Experimental Classes on the Use of Advanced ICT', and is being implemented with the aim of developing sustainable education in recipient countries and narrowing the gap in knowledge and information. By 2017, a total of 17 countries (2011: Indonesia, Colombia, Brunei, 2012: Mongolia, the Philippines, 2013: Cambodia, Azerbaijan, 2014: SriLanka, Paraguay, 2015: Vietnam, Uzbekistan, 2016: Peru, Laos, 2017: Kenya (Scheduled) and Nepal) established advanced ICT classroom.

4. The Solar School Utilization Education Support Project

The Ministry of Education is supporting ICT-based teaching-learning activities in Africa, where the power infrastructure is unstable, through its 'Solar School Utilization Education Support Project'. The project was discussed as part of Korea-Africa plan to expand international education cooperation in the region at the African Development of Education Associate (ADEA) held in Burkina Faso in 2012, and has been working with Samsung Electronics to pursue the project since 2013.

The Solar School Utilization Education Support Project began in 2013 with three major countries: Ghana, Kenya and Ethiopia, and will expand the scope of exchanges to nine countries in 2016 to Uganda, Rwanda, Mozambique and Zambia, Zimbabwe and Tanzania in 2017, and will cooperate with a total of 12 countries including new partners Namibia, Malawi and Botswana in 2018.

Chapter 2.
Status of e-Learning Industry in Korea

1. Domestic e-Learning Supply Market

According to the annual e-learning industry survey conducted by the Ministry of Trade, Industry and Energy and the National IT Industry Promotion Agency, total sales of e-learning in 2017, which shows the size of the e-learning supply market, stood at 3.69 trillion KRW. This is a 6.1 percent increase from 2016, which has continued to grow.

As e-learning operators with more than 10 billion KRW in sales, which account for 3.1 percent of the total number of businesses, accounted for 42.1 percent of the total sales of 1.582 trillion KRW, the report showed that the sales of the top business were heavily weighted. On the other hand, sales of small businesses with less than 100 million KRW, which accounts for 51.3 percent of the total number of businesses, stood at 59.2 billion KRW, accounting for only 1.6 percent of sales. Most e-learning operators are small enough to account for 74.2 percent of the total, with average sales estimated at 2.2 billion KRW in 2017.

[Table 9-2-1] Distribution of e-Learning sales amount in 2017   (Unit: case, %, million KRW)

Claissfication	Number of Business		Total Sales Amount		Average Sales Amount
	Number of Business	Rate	Sales Amount	Rate	
Total	1,680	100.0	3,699,183	100.0	2,201.9
less than 100 million KRW	861	51.3	59,187	1.6	68.7
0.1 to 1 billion KRW	384	22.9	332,520	9.0	865.9
1 to 3 billion KRW	189	11.3	510,487	13.8	2,701.0
3 to 5 billion KRW	111	6.6	517,479	14.0	4,662.0
5 to 10 billion KRW	83	4.9	721,341	19.5	8,690.9
more than 10 billion KRW	52	3.1	1,558,169	42.1	29,964.8

※ Reference: Ministry of Trade, Industry and Energy/the National IT Industry Promotion Agency, 'Survey on e-Learning', 2017

Sales of service providers increased 6.0 percent year-on-year, accounting for 70.9 percent of the total market size. Content providers' sales stood at 720.8 billion KRW, accounting for 19.5 percent and solution providers 9.6 percent with 356.1 billion KRW, the report showed.

[Table 9-2-2] Total e-Learning sale amount by representative business (Unit: million KRW, %)

| Total	2013 Sale Amount	Rate	2014 Sale Amount	Rate	2015 Sale Amount	Rate	2016 Sale Amount	Rate	2017 Sale Amount	Rate	Increase and Decrease compared last year
Total	2,947,083	100.0	3,214,167	100.0	3,485,119	100.0	3,487,574	100.0	3,699,183	100.0	6.1
Content	586,433	19.9	645,691	20.1	689,372	19.8	678,941	20.2	720,765	19.5	6.2
Solution	270,476	9.2	303,514	9.4	346,644	9.9	333,649	9.9	356,114	9.6	6.7
Service	2,090,174	70.9	2,264,962	70.5	2,449,103	70.3	2,474,984	69.8	2,622,304	70.9	6.0

※ Reference: Ministry of Trade, Industry and Energy/the National IT Industry Promotion Agency, 'Survey on e-Learning', 2017

2. Status of e-Learning personnel in Korea

As of 2017, there were a total of 27,250 workers working for e-learning businesses, up 953 from 26,297 in 2016. When looking at the cost of staffing by job, course operators account for the largest portion of the e-learning workforce at 26.7 percent. Next came 18.7 percent of system developers, 15.0 percent of content developers and 13.8 percent of consultants.

[Picture 9-2-1] Trend of e-Learning industry workers (Unit: Person)
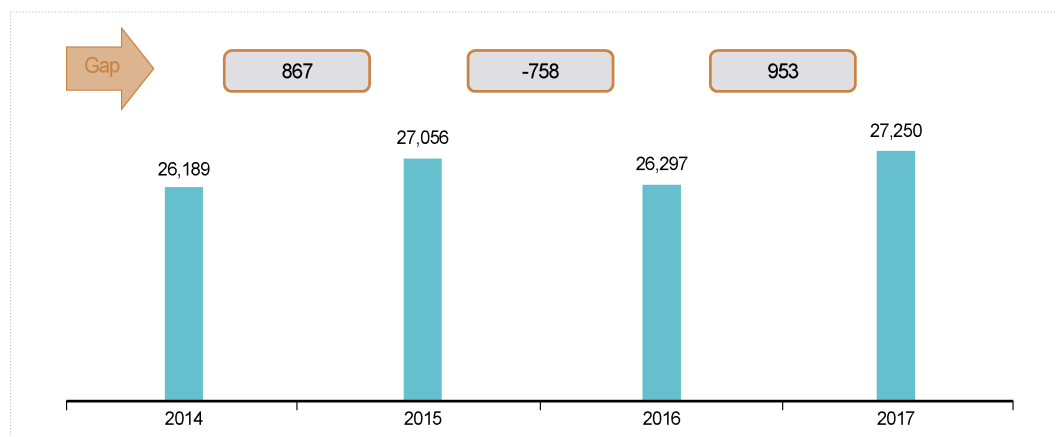
※ Reference: Ministry of Trade, Industry and Energy/the National IT Industry Promotion Agency, 'Survey on e-Learning', 2017

3. Domestic e-Learning Demand Market

The size of the domestic e-learning demand market, estimated based on the 2017 survey of spending expenses of e-learning consumers in Korea, totaled 3.629 trillion KRW, the data showed. It was estimated that individuals spent 1.6682 trillion KRW, or 46.0 percent of the total demand market, and that businesses spent 1.514 trillion KRW, or 41.7 percent. The portion of spending in the two major sectors accounts for 87.7 percent of the total market. The government/public sector is 6.8 percent with 248.2 billion KRW, and educational institutions account for 5.5 percent with 99.5 billion KRW with the lowest portion.

[Table 9-2-3] Size of e-Learning demand market in 2017 (Spending amount)   (Unit: million KRW, %)

Classification	Total	Individual	Business	Regular Educational Institution	Government/ Public Institution
Amount	3,629,870	1,668,192	1,513,983	199,500	248,195
Rate	100.0	46.0	41.7	5.5	6.8

※ Reference: Ministry of Trade, Industry and Energy/the National IT Industry Promotion Agency, 'Survey on e-Learning', 2017

Total e-learning expenditure in 2017 (estimated) increased 5.9% from 3.4287 trillion KRW in 2016. By class of demand, spending by regular educational institutions has been growing at 16.1 percent compared to last year.

A. Individual

When looking at the total amount and proportion of individual spending, the amount spent by teenage students came to 551.3 billion KRW, accounting for 33.0 percent, followed by those in their 20s, 151.6 billion KRW (30.9 percent), and 363.7 billion KRW (21.8 percent). Of the total e-learning users, 60.4 percent spent, 287,000 KRW per person on average per year, and relatively high per-capita spending in teenagers by age.

In the field of e-Learning use by individuals, 29.0 percent of the e-Learning market, and 17.8 percent of the e-Learning market were basically big markets. In addition, it was found to be using e-learning with 11.8 percent of 'Second and Middle School Curriculum', 12.6 percent of 'Duty' and 9.8 percent of 'Information Technology'.

B. Educational Institutions

The number of educational institutions that are using the 2017 e-Learning stood at 88.3 percent, up 0.3 percent from 2016, the report showed. According to the introduction rate of each school, 94.2 percent was the highest, followed by 87.5 percent for middle schools, 84.0 percent for four-year universities, 77.5 percent for private high schools, 75.2 percent for professional universities and 74.2 percent for national and public high schools. The e-learning increase and decrease rate is unchanged from 2016 for other educational institutions, while that for elementary, middle and private high schools rose 0.3 percent, the survey showed.

[Picture 9-2-2] Status of e-Learning in Educational Institution   (Unit: %)
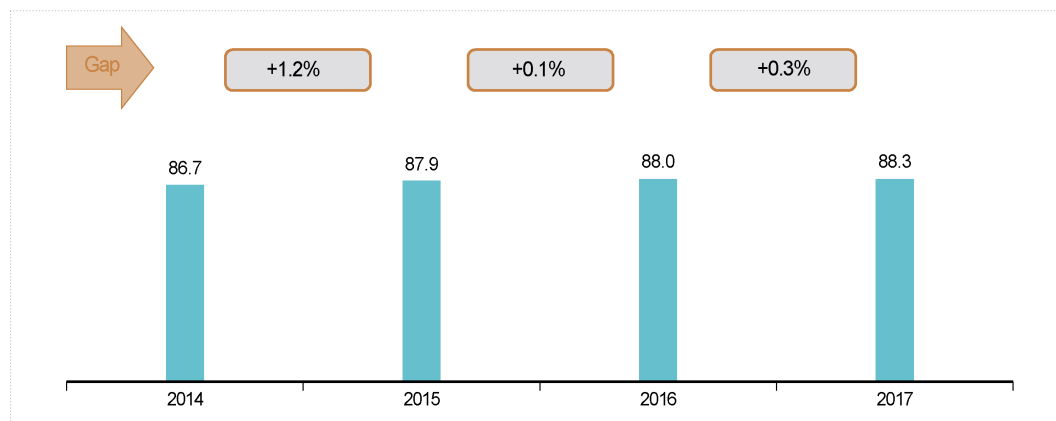
※ Reference: Ministry of Trade, Industry and Energy/the National IT Industry Promotion Agency, 'Survey on e-Learning', 2017

Currently, 43.7 percent of all schools operate the e-learning sector, which is 'Used as an Aid to Regular School Subjects'. The ratio of regular curriculum was 30.6 percent, and more than 70 percent of e-learning-operating institutions are using their own or auxiliary materials for regular subjects.

C. Business

Among all businesses, 6.6 percent were businesses that are introducing or using e-learning. It was up 0.2% from the previous year, with a 0.9% increase in businesses with more than 300 employees.

[Table 9-2-4] e-Learning adoption rate by company size   (Unit: %, %p)

Classification	2013	2014	2015	2016	2017	Rate of increase and decrease
Total	5.5	5.8	6.3	6.4	6.6	0.2
Business with over 300 employees	65.1	66.1	66.2	68.9	69.8	0.9
Businesses with less than 300 employees	5.4	5.6	6.2	6.4	6.5	0.1
not more than 9 people	4.3	4.6	4.7	5.1	5.1	0.0
10-49 people	18.4	18.7	18.8	19.2	20.9	1.7
50~299 people	37.8	43.2	45.1	45.3	47.1	1.8

※ Reference: Ministry of Trade, Industry and Energy/the National IT Industry Promotion Agency, 'Survey on e-Learning', 2017

According to introduction of e-learning rates by industry, the financial and insurance industries had the highest rate of introduction at 50.4 percent. The following were followed by 20.9% for electric/gas/vaporation and waterworks, 17.9% for publishing/video/television communication and information service, 16.3% for educational services, 13.4% for health and social welfare services, 13.1% for business facility management and business support services, 12.6% for agriculture/forestry and fishing.

Among the areas that are currently adopting e-learning, 56.9 percent of the respondents said they use 'Occupation' field the most, followed by 9.3 percent for 'Foreign Language' and 7.1 percent for 'Basic Grounding' and 31.2 percent for the areas that they expect the most from the introduction of e-learning.

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