DEVELOPING NATIONAL STUDENT ASSESSMENT SYSTEMS FOR QUALITY EDUCATION

LESSONS FROM THE REPUBLIC OF KOREA

Sungsup Ra, Sungsook Kim, and Ki Jong Rhee

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ASIAN DEVELOPMENT BANK

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CONTENTS

TABLES AND FIGURES

TABLES

FIGURES

PREFACE

Improving education quality is critical for raising human capital. Assessing student learning is a cornerstone for improving learning and formulating policies to enhance the quality of education. Increasingly, developing countries in many parts of the world seek to establish their own learning assessment systems to raise student learning outcomes in line with the Sustainable Development Goal 4 target of ensuring inclusive and equitable quality education. This study offers insights from the Republic of Korea's experience in developing a national student assessment system that other countries can learn from.

Raising learning outcomes and ultimately the quality of the education system requires an understanding of where countries stand in terms of learning achievement, and a diagnosis of the areas that need improvement. Many developing countries, including those in South Asia, lack an assessment system to measure learning outcomes over time, or have one that is still in the nascent stage.

The Korean experience in developing its national student assessment system, the National Assessment of Educational Achievement (NAEA), and utilizing it to design policies to improve education can be helpful to other countries as they develop and improve their own systems. The Republic of Korea has been recognized for turning its education system around to become one of the top performers in education. The country has consistently ranked high in international learning assessments over the last 25 years. While the context and constraints can vary across countries, understanding the Korean system can offer useful lessons.

This study presents an overview of the NAEA and its role in contributing to the country's progress in education. In addition to describing the historical evolution of the NAEA in terms of its coverage and design, the study explores the various ways in which large-scale student assessment data were utilized to inform and implement policies at the school and national levels to boost learning especially for underachieving students. The study also summarizes key lessons from the NAEA system.

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ABBREVIATIONS

KICE	–	Korea Institute for Curriculum and Evaluation
MEST	–	Ministry of Education, Science and Technology
NAEA	–	National Assessment of Educational Achievement
OECD	–	Organisation for Economic Co-operation and Development
PISA	–	Programme for International Student Assessment
SMC	–	small and medium-sized city
TIMSS	–	Trends in International Mathematics and Science Study
WEE	–	We+Education or We+Emotion

EXECUTIVE SUMMARY

Over the past 30 years, education reform in the Republic of Korea has increasingly focused on improving quality to enhance student learning outcomes. Indeed, this high-performing education system is often cited as a major contributor to the spectacular economic rise of the country. Several measures were adopted to improve the quality and performance of the education system, among which extensive efforts to develop and use student assessment data to track student performance were key. In particular, the National Assessment of Educational Achievement (NAEA), conducted annually since 1998, has enabled monitoring and improvement of student performance as well as school systems. As a result, the Republic of Korea has been a top performer in international standardized student assessments such as the Programme for International Student Assessment (PISA), and Trends in International Mathematics and Science Study (TIMSS).

This report describes the historical evolution and the role of the NAEA system, policies, and practices that have enabled schools to improve student learning and enhance the global performance of the Republic of Korea. It identifies the following three broad features of the NAEA system that contributed significantly to raising student performance and improving the education system in the country.

(i) A High-Standard Student Assessment System Contributing to High-Performing Students

The Republic of Korea's educational achievements can largely be attributed to effective student assessment. The country integrated policy measures on curriculum reform with effective student learning measurement and feedback mechanisms to strengthen the public school system. The NAEA developed academic achievement tests for Korean language, social studies, mathematics, science, and English through an in-depth analysis of the national curriculum. Based on the NAEA test scores, students are classified into four achievement levels for each subject: advanced, proficient, basic, and below-basic. Survey questionnaires are also administered to collect educational contextual variables related to school, teacher, and student background.

While the NAEA was initially conducted on a sample basis, it was changed into a census-based assessment in 2009, and thereafter transformed into a mechanism to check the quality of education and accountability of schools and provincial education offices. The purpose of the NAEA was further extended from education quality monitoring to diagnosing and improving the achievement level of individual students, and supporting the school education system.

(ii) Extending Student Assessment Data for School Accountability

In 2008, the government established the Zero Plan for Below-Basic Students, which propelled educational policy support for underachieving students. This basic academic level guarantee policy utilizes results from the NAEA and was proposed based on empirical studies in various national and international assessments. In particular, schools with a high share of students in the below-basic level are designated as "Schools for Improvement" and provided with administrative and financial support. This Schools for Improvement program has had a positive effect; however, there remain schools with a significant share of students in the below-basic achievement level. Also, it is necessary to manage the demands in supporting a target school's efforts to systematically improve student achievement.

School progress indexes have also been developed to track the yearly improvement of academic achievement at each school level based on NAEA results. Furthermore, disclosure of information on the school progress index for each school was made mandatory. This enabled better understanding of student achievement levels by school and region, thus serving as evidence to enhance the accountability of educational institutions.

(iii) Robust Student Learning Assessment Contributing to Strengthening the Education System

The evaluation and assessment framework to improve school outcomes is broadening its scope from student assessment to a thorough examination of the whole education system. The NAEA is intended to be the central link between the various systems of evaluation and assessment to correlate the findings of different elements and to more effectively boost impact. The NAEA results are also reflected when developing new curriculums by assisting decision-making on the scope, sequence, continuity, and difficulty of the curriculum. Recently, findings point to a need to strengthen teaching and learning support policies for the underprivileged to improve the education system and ensure equity in education. In addition, expert groups are actively involved for further research, which can generate evidence to help set policy directions for academic ability enhancement and impart substance in government initiatives to support schools.

The Republic of Korea's experience with the NAEA system can offer lessons for other developing countries in Asia as they seek to improve their own educational systems. Key lessons include investing in strong institutional capacity for student assessment, undertaking systematic and scientific tracking of student learning, establishing accountability for educational outcomes through public disclosure, and developing supplement programs to redress shortfalls.

Chapter 1
INTRODUCTION

A strong education system with major gains across all levels of education is often cited as a key factor in the Republic of Korea's economic success. According to the Organisation for Economic Co-operation and Development (OECD), 70% of those aged 24–35 years (OECD 2018) have completed some form of tertiary education, the highest in the world. The country consistently ranks among the best-performing in the OECD's Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS). Its significant accomplishments, particularly student academic performance, have earned international recognition and interest in learning about the reforms and measures behind the success.

Traditionally, the Republic of Korea's system of educational administration has been centrally controlled, vertically and hierarchically, connecting municipal and provincial educational offices, a local educational office, and schools to the central government. Government has implemented a series of initiatives to transfer much of the authority of the central government to the municipal and provincial education offices. These include the introduction of the autonomous local educational system in 1991, the revision of the Local Educational Autonomy Act, residents' direct election of superintendents in 2006, and the introduction of a school autonomy policy in 2008. While many policy parameters and standards were set nationally, this autonomy provided freedom to adopt context-specific strategies. At the same time, national monitoring and tracking allowed support for schools and districts that needed autonomy to improve their performance relative to high-performing peers. The student assessment framework is divided into evaluations carried out in schools (teachers), regionally (metropolitan and provincial offices of education), nationally, and internationally. From 2006 to 2009, the percentage of 15-year old students in schools where achievement data were tracked over time by an administrative authority rose from 33.2% to 55.7% (OECD 2014a).

The Republic of Korea adopted many measures to continuously increase its quality of education and innovations to augment performance. Some of these include hiring highly qualified teachers and paying good salaries; establishing and strengthening teacher groups, including peer review of teacher performance; enrichment and remedial education; and pedagogical innovations.

A. Stellar Performance in Standardized International Student Assessments

As noted, the Republic of Korea is among the highest-performing countries on PISA and TIMSS. Table 1 summarizes PISA 2015 results for the top 10 OECD countries while Table 2 presents core literacy scores and trends in PISA for the Republic of Korea. Table 3 presents TIMSS 2015 results in mathematics and science for the top 15 economies. Tables 4–5 show trends in ranking in Grade 8 mathematics and science for TIMSS 1995 to TIMSS 2015.

The Republic of Korea's strong performance is rooted in its tradition of structured learning systems. In recent decades, it has successfully

Table 1: Programme for International Student Assessment 2015—Domain-Specific International Comparison

Reading				Mathematics				Science			
Economies	Mean Score	Ranking		Economies	Mean Score	Ranking		Economies	Mean Score	Ranking	
		OECD	All			OECD	All			OECD	All
Canada	527	1–3	2–4	Japan	532	1	5–6	Japan	538	1–2	2–3
Finland	526	1–3	2–5	Korea, Rep. of	524	1–4	6–9	Estonia	534	1–3	2–5
Ireland	521	2–6	4–8	Switzerland	521	2–5	7–10	Finland	531	2–4	3–7
Estonia	519	3–6	5–8	Estonia	520	2–5	7–10	Canada	528	3–4	5–9
Korea, Rep. of	517	3–8	4–9	Canada	516	3–7	8–12	Korea, Rep. of	516	5–8	9–14
Japan	516	3–8	5–10	Netherlands	512	5–9	10–14	New Zealand	513	5–9	10–15
Norway	513	5–9	7–11	Denmark	511	5–10	10–15	Slovenia	513	5–9	11–15
New Zealand	509	7–11	9–14	Finland	511	5–10	10–15	Australia	510	6–11	12–17
Germany	509	6–12	8–15	Slovenia	510	6–10	11–15	England	509	6–13	12–19
Poland	506	8–14	10–17	Belgium	507	7–13	12–18	Germany	509	6–13	12–19
OECD Average	**493**			**OECD Average**	**490**			**OECD Average**	**493**		

OECD = Organisation for Economic Co-operation and Development, PISA = Programme for International Student Assessment.

Notes:
1. Average student mean score (500 points) is a scale score or an achievement score, with a standard deviation of 100 points. It provides a range of ranking in which the country's performance since 2006 is provided at the 95% level of confidence. A total of 35 OECD member countries participated in PISA 2015. The OECD average is the average of the national average of OECD member countries.
2. To calculate the range of ranking for countries, data are simulated using the mean and standard error of the mean for each relevant country to generate a distribution of possible values. Some 10,000 simulations are conducted. Based on these values 10,000 possible rankings for each country are produced. For each country, the counts for each rank are aggregated from largest to smallest until they equal 9,500 or more. The range of ranks per country is then reported, including all the ranks that have been aggregated. This method has been used in all cycles of PISA since 2003, including PISA 2015.

Source: Reconstructed from OECD. 2016.

Table 2: Programme for International Student Assessment— Republic of Korea's Rankings and Scores in Reading, Mathematics, and Science, various years

Literacy Scores			PISA 2000 (43 economies)	PISA 2003 (41 economies)	PISA 2006 (57 economies)	PISA 2009 (75 economies)	PISA 2012 (65 economies)	PISA 2015 (70 economies)
Reading	Mean score		525	534	556	539	536	517
	Ranking	OECD	6	2	1	1–2	1–2	3–8
		All	7	2	1	2–4	3–5	4–9
Mathematics	Mean score		547	542	547	546	554	524
	Ranking	OECD	2	2	1–2	1–2	1	1–4
		All	3	3	1–4	3–6	3–5	6–9
Science	Mean score		552	538	522	538	538	516
	Ranking	OECD	1	3	5–9	2–4	2–4	5–8
		All	1	4	7–13	4–7	5–8	9–14

OECD = Organisation for Economic Co-operation and Development, PISA = Programme for International Student Assessment.

Source: Reconstructed from OECD. 2016.

Table 3: Trends in International Mathematics and Science Study 2015—Results of Mathematics and Science Achievement

Fourth Grade						Eighth Grade					
Mathematics			Science			Mathematics			Science		
Rank	Economy	Average Scale Score	Rank	Economy	Average Scale Score	Rank	Economy	Average Scale Score	Rank	Economy	Average Scale Score
1	Singapore	618	1	Singapore	590	1	Singapore	621	1	Singapore	597
2	Hong Kong, China	615	2	Korea, Rep. of	589	2	Korea, Rep. of	606	2	Japan	571
3	Korea, Rep. of	608	3	Japan	569	3	Taipei,China	599	3	Taipei,China	569
4	Taipei,China	597	4	Russian Federation	567	4	Hong Kong, China	594	4	Korea, Rep. of	556
5	Japan	539	5	Hong Kong, China	557	5	Japan	586	5	Slovenia	551
6	Northern Ireland	570	6	Taipei,China	555	6	Russian Federation	538	6	Hong Kong, China	546
7	Russian Federation	564	7	Finland	554	7	Kazakhstan	528	7	Russian Federation	544
8	Norway (5)	549	8	Kazakhstan	550	8	Canada	527	8	England	537
9	Ireland	547	9	Poland	547	9	Ireland	523	9	Kazakhstan	533
10	England	546	10	United States	546	10	United States	518	10	Ireland	530
11	Belgium	546	11	Slovenia	543	11	England	518	11	United States	530
12	Kazakhstan	544	12	Hungary	542	12	Slovenia	516	12	Hungary	527
13	Portugal	541	13	Sweden	540	13	Hungary	514	13	Canada	526
14	United States	539	14	Norway (5)	538	14	Norway (9)	512	14	Sweden	522
15	Denmark	539	15	England	536	15	Lithuania	511	15	Lithuania	519

Note: Scale scores, also called achievement scores, are converted from raw scores.
Sources: Reconstructed from Martin et al. 2016; Mullis et al. 2016.

Table 4: Trends in International Mathematics and Science Study—Trends in Mathematics Achievement for Grade 8, various years

TIMSS 1995			TIMSS 1999			TIMSS 2003			TIMSS 2007			TIMSS 2011			TIMSS 2015		
Rank	Economy	Ave. Score	Rank	Economy	Ave. Score	Rank	Economy	Ave. Score	Rank	Economy	Ave. Score	Rank	Economy	Ave. Score	Rank	Economy	Ave. Score
1	Singapore	609	1	Singapore	604	1	Singapore	605	1	Taipei,China	598	1	Korea, Rep. of	613	1	Singapore	621
2	Japan	581	2	Korea, Rep. of	587	2	Korea, Rep. of	589	2	Korea, Rep. of	597	2	Singapore	611	2	Korea, Rep. of	606
3	Korea, Rep. of	581	3	Taipei,China	585	3	Hong Kong, China	586	3	Singapore	593	3	Taipei,China	609	3	Taipei,China	599
4	Hong Kong, China	569	4	Hong Kong, China	582	4	Taipei,China	585	4	Hong Kong, China	572	4	Hong Kong, China	586	4	Hong Kong, China	594
11	Russian Federation	524	5	Japan	579	5	Japan	570	5	Japan	570	5	Japan	570	5	Japan	586
13	Ireland	519	12	Russian Federation	526	10	Russian Federation	508	7	England	513	6	Russian Federation	539	6	Russian Federation	538
16	England	498	19	United States	502	15	United States	504	8	Russian Federation	512	9	United States	509	7	Kazakhstan	528
18	United States	492	20	England	496	‡	England	‡	9	United States	508	10	England	507	8	Canada	527
12	Canada	*	10	Canada	*	+	Canada	+	+	Canada	+	15	Kazakhstan	487	9	Ireland	523
+	Kazakhstan	+	+	Ireland	+	+	Ireland	+	+	Ireland	+	+	Canada	+	10	United States	518
+	Taipei,China	+	+	Kazakhstan	+	+	Kazakhstan	+	+	Kazakhstan	+	+	Ireland	+	10	England	518

Ave = average, TIMSS = Trends in International Mathematics and Science Study.
* Comparable data are not available.
\+ Did not participate in TIMSS grade 8 Mathematics test that year.
‡ Did not satisfy guidelines for sample participation rate or age/grade specifications in the sample.
Note: Average student mean score (500 points) is a scale score or an achievement score, with a standard deviation of 100 points. Average scores and rank reported for economies with rank 1 to 10 in TIMSS 2015.
Sources: Reconstructed from Martin et al. 2016; Mullis et al. 2016.

Table 5: Trends in International Mathematics and Science Study—Trends in Science Achievement for Grade 8, various years

TIMSS 1995			TIMSS 1999			TIMSS 2003			TIMSS 2007			TIMSS 2011			TIMSS 2015		
Rank	Economy	Ave. Score	Rank	Economy	Ave. Score	Rank	Economy	Ave. Score	Rank	Economy	Ave. Score	Rank	Economy	Ave. Score	Rank	Economy	Ave. Score
1	Singapore	580	1	Taipei,China	569	1	Singapore	578	1	Singapore	567	1	Singapore	590	1	Singapore	597
3	Japan	554	2	Singapore	568	2	Taipei,China	571	2	Taipei,China	561	2	Taipei,China	564	2	Japan	571
4	Korea, Rep. of	546	4	Japan	550	3	Korea, Rep. of	558	3	Japan	554	3	Korea, Rep. of	560	3	Taipei,China	569
6	England	533	5	Korea, Rep. of	549	4	Hong Kong, China	556	4	Korea, Rep. of	553	4	Japan	558	4	Korea, Rep. of	556
9	Russian Federation	523	9	England	538	5	Japan	552	5	England	542	6	Slovenia	543	5	Slovenia	551
10	Ireland	518	15	Hong Kong, China	530	9	United States	527	8	Slovenia	538	7	Russian Federation	542	6	Hong Kong, China	546
13	United States	513	16	Russian Federation	529	12	Slovenia	520	9	Hong Kong, China	530	8	Hong Kong, China	535	7	Russian Federation	544
16	Hong Kong, China	510	18	United States	515	17	Russian Federation	514	9	Russian Federation	530	9	England	533	8	England	537
+	Kazakhstan	+	13	Slovenia	*	‡	England	‡	11	United States	520	10	United States	525	9	Kazakhstan	533
‡	Slovenia	‡	+	Ireland	+	+	Ireland	+	+	Ireland	+	20	Kazakhstan	490	10	Ireland	530
+	Taipei,China	+	+	Kazakhstan	+	+	Kazakhstan	+	+	Kazakhstan	+	+	Ireland	+	10	United States	530

Ave = average, TIMSS = Trends in International Mathematics and Science Study.
* Comparable data are not available.
\+ Did not participate in TIMSS grade 8 Mathematics test that year.
‡ Did not satisfy guidelines for sample participation rate or age/grade specifications in the sample.
Note: Average student mean score (500 points) is a scale score or an achievement score, with a standard deviation of 100 points. Average scores and rank reported for economies with rank 1 to 10 in TIMSS 2015.
Sources: Reconstructed from Martin et al. 2016; Mullis et al. 2016.

expanded its educational opportunities to elementary education, and then to secondary and tertiary education. In particular, the country's educational achievements can be attributed to an effective student assessment system.

B. Overall Framework and Evolution of the System for Student Assessment

Student assessment refers to the collection and analysis of information on student achievement in school for all cognitive, affective, and psychomotor domains to get an objective measure and increase the understanding of students. Student assessment is classified into various types depending on the intended goal of the assessment. The Republic of Korea's student assessment framework is divided into evaluations carried out at the school, regional, and national levels (K. Kim et al. 2010).

1. Student Assessment Provided by Schools

Primary and secondary education in the Republic of Korea is provided according to a centralized system and consists of 6 years of primary school education (Grades 1–6), 3 years of middle school education (Grades 7–9), and 3 years of high school education (Grades 10–12).

The assessment of student learning outcomes is intended as an educational activity to ensure that all students successfully attain the objectives of education. Based on the school curriculum, individual students are assessed on how well they have achieved the educational goals of each subject and how they have performed in the course. Though differences exist between schools, assessment plans are drawn up every year, in time with the schools' yearly educational planning. Each school sets up the assessment plans, including regular testing period, subject, method, standards, grading, and reporting results.

The areas, methodology, frequency, and standards of the written test and performance assessment, as well as the test grading methodology and results utilization plan, are designed by a school's curriculum council. These are then submitted to the academic grade management committee for deliberation, whereupon the school head makes final decisions. Essay type tests including descriptive answer tests are graded by the test writer (usually the teacher). To secure fairness and reliability in grading, the test writer's grading results are placed under review before final scores are given. As performance assessment best reflects the academic standing of individual students at each school, assessment results are written in the students' school records to be used as core material for student placement, school entrance, etc.

2. Student Assessment Provided by Metropolitan and Provincial Offices of Education

Student assessment conducted by metropolitan and/or provincial offices of education is designed to diagnose student performance by region, city, or province; and to analyze the status of teaching and learning (K. Kim et al. 2010). Metropolitan and/or provincial offices of education can conduct self-developed assessments. Nationwide, two assessment programs are carried out by education offices: the Subject Learning Diagnostic Test and the Unified Academic Achievement Test. The Subject Learning Diagnostic Test is conducted among 4th, 5th, and 6th graders in primary school; and 7th, 8th, and 9th graders in middle school. The diagnostic test aims to analyze the level of students' curricular study achievements, identify those who lag, and provide responsible instruction to help them acquire basic academic ability. At the same time, it is intended to be used as a standardized evaluation tool and as a way of improving the assessment methodology of schools. The Unified Academic Achievement Test grew out of the need to help students adapt to the College Scholastic Ability Test. This test also met student and parent demands for materials

to help transition to higher levels of education, upon the agreement of the Nationwide Association of Superintendents.

3. Student Assessment Provided by the Government

National-level assessment refers to evaluation conducted by the government for all students nationwide. In the Republic of Korea, two national-level assessment systems are in place: the National Assessment of Educational Achievement (NAEA) and the College Scholastic Ability Test. The NAEA, launched in the late 1950s as an instrument for educational quality assurance, has been in full implementation since 1998 following the establishment of the Korea Institute for Curriculum and Evaluation (KICE) (M. S. Kim et al. 1998). Over time, KICE has built a systemic framework of assessment and has been producing data on the yearly change of student achievement results by means of a scaling and equating system. The College Scholastic Ability Test is aimed at raising the capacity to select persons most suitably qualified for higher education, contributing to the normalization of high school education, and providing fair and objective data on students to assist admission screening. KICE is responsible for writing the test, printing and distributing test papers, grading answer sheets, and reporting results. The test replaced the previous College Entrance Examination in 1994 that assessed students' ability required for higher education, under the goal of normalizing high school education, which leaned toward preparing students for entrance to university.

The Republic of Korea effectively merged policy measures on curriculum reform and innovative information and communication technology-based teaching to strengthen the public school system. The national assessment framework for improving school outcomes broadened its scope from student assessments to the entire education system. Zero Plan for Below-Basic Students was a policy formulated based on empirical studies of various national and international assessments and has been implemented with a focus on guaranteeing the basic academic level to narrow the academic achievement gap. This policy aims to have all citizens reach the basic academic level under the National Curriculum through school education. National policy support for low-performing students began in 1997, which went into full effect with the announcement of the Zero Plan for Below-Basic Students in 2008. The NAEA is intended to be the central link between the various systems of evaluation to correlate the findings of different elements more effectively. While less emphasis has been placed on accountability based on assessment results compared to many other OECD countries, significant effort is under way to improve use of the available data.

Chapter 2
OVERVIEW OF THE NATIONAL ASSESSMENT OF EDUCATIONAL ACHIEVEMENT SYSTEM

The NAEA is a comprehensive assessment system that manages school education quality, but also checks the current state and trends in academic achievement of Korean students based on the national curriculum. The NAEA measures the academic outcome of each student. The results of the assessment help clarify the general performance level of students by school and region and can serve as the basis on which educational institutions can be held accountable. The findings from the NAEA may contribute to the setting of directions for educational policies related to academic ability and to extension of support to schools and offices of education. Each school can use the results in understanding the academic performance of individual students and the subjects to which programs for improving basic academic ability are applied.

A. History of Changes in Assessment

After the establishment of KICE, the NAEA was systematically implemented based on academic curriculum. In the years since the formulation of the NAEA master plan in 1998 (M. S. Kim et al. 1998), there have been major and minor changes in the NAEA. During its implementation, various aspects of NAEA have continuously been developed, such as its purpose, dates, subjects, sampling method, scoring system, scope and contents of educational context variables, analyses and results, and legislative support. Also, key characteristics were added in accordance with assessment changes. The key content of annual NAEA studies from 1998 until 2017 can be summarized into six phases.

(i) Formulation of Master Plan (1998–2002)

The NAEA master plan that proposed the assessment of two to three subjects each year was formulated in the study on NAEA methods (M. S. Kim et al. 1998) undertaken by KICE in 1998. The assessment based on this plan was implemented until 2000. From 2001, at the request of the Ministry of Education and regional and local offices of education, the objectives and content of assessment were expanded. In addition, assessment results were notified to students. The timing of assessment was changed from June to November and the assessment framework coverage was changed from second-year high school students to first-year high school students. The first year in high school marks the completion of the national common basic curriculum; hence, the assessment at this stage helps to take stock of achievements among students.

(ii) Methodological Leap: Setting Achievement Level, Conducting Test Equating, and Systematization of Sampling Design (2003–2006)

As a criterion-referenced assessment, a key task of the NAEA is setting standards. Therefore, terms such as achievement standards, criteria, and

levels have been defined. A modified Angoff Method was introduced to certain subjects and, in 2003, was used to set standards in all subjects.[1] Also, to identify the student academic achievement trend from 2001, conditions of common items were explored as a basic equating study. In 2002, an equating study targeting third-year middle school mathematics was conducted, and items to analyze trends were developed and applied. In 2003, a method and design for scaling and equating were devised and a computer program was developed and applied. In addition, the cut scores to distinguish achievement levels were linked to analyze the annual trends of academic achievement levels.

To extract samples for the NAEA, a two-stage stratified cluster sample design was used to maintain a comparatively consistent method each year. In 2006, the existing sampling design was systematized by revising and supplementing it. The method of random sampling to select schools in the first-stage sampling unit was changed to a systematic sampling method using the probability proportional to size method. This was to ensure representative sampling probabilities for students of each school. Sampling of classes in the second-stage sampling unit (to enhance participation of schools) relied on convenience sampling wherein classes were sampled in the relevant schools.

(iii) Quantitative Expansion: Preparing for Census-Based Assessment by Expanding Sample Size (2007–2008)

The NAEA was implemented by extracting samples from the population of all Korean elementary and middle-high school students. The sampling ratio of the assessed students was gradually expanded in accordance with the change in education policies. Initially, about 1% of all students of the assessed grades were sampled, but in 2006 the sample size expanded to 3% for all grades (school years) assessed. In 2007, sampling was further expanded to 5% for first-year high school students. In 2008, 4% of sixth-grade elementary school students, and 5% of third-year middle school and first-year high school students were sampled.

(iv) Conversion into Census-Based Assessment and Mandatory Disclosure of Assessment Results (2009–2012)

The first year of the census-based assessment was 2009 when census data were collected, and from then on, the basic academic level guarantee policies based on objective data were implemented. In 2010, to cover the remedial education period, the date of assessment was changed from October to July. The assessment coverage was also changed from first-year high school students to second-year high school students. Also, since the assessed grades had been changed, the assessment frame including the cut scores were reset in 2010 (S. Kim et al. 2010).

[1] Standard setting is a procedure applied to systematically gather and analyze human judgment for deriving one or more cut scores of a test. A modified Angoff Method is a standard setting method. This method asks each judge to state the probability that the "minimally acceptable person" would answer each item correctly. The sum of these probabilities would represent the minimally acceptable score (see Cizek and Bunch 2007).

In addition, under the enforcement decree of the Act on Special Cases Concerning the Disclosure of Information by Education-Related Institutions from 2010, each school's percentage in the four achievement levels (advanced, proficient, basic level, and below-basic level) in the NAEA were posted in the "School Alimi" (official school information disclosure site).[2] Similarly, in 2011, information on school improvement (school progress index) beginning with high schools was disclosed. In this context, providing individual feedback to all students became important. Thus, from 2011, individual assessment reports for students were provided not only for the achievement level but also included various information helpful to teachers, students, and parents (S. Kim et al. 2011).

Students' relative position within the subject achievement level was presented in addition to the previous achievement level information so that efforts necessary to reach a higher achievement level could be formulated. Also, each subject's major content by field, and extent of student achievement in these fields, were presented. In 2012, the individual student assessment reports were supplemented by details of achievement levels and subject subfields to provide students and teachers with information on learning strengths and weaknesses.

(v) Reduction of Census-Based Assessment to Mitigate Assessment Burden (2013–2016)

In 2013, as a part of a new political administration's major educational policy tasks for "happy education, raising of creative talents," the abolition of the census-based NAEA assessment in elementary schools was proposed, along with the reduction of assessment subjects in middle school (MOE 2013). To mitigate the assessor's burden, elementary schools were excluded while middle and high schools retained the census-based assessment. However, the five existing census-based assessment subjects (Korean, social studies, mathematics, science, and English) in middle school were reduced to three (Korean, mathematics, and English) and sample-based assessments were conducted for social studies.

(vi) Return to Sample-Based Assessment to Control Quality of National Curriculum (2017–present)

In accordance with a new policy commitment, the census-based NAEA was switched back to sample-based assessment for middle and high schools in 2017, to check student academic achievements based on the national curriculum, rather than individual achievement status (MOE 2017). This change was also implemented to lessen the burden on schools and provincial offices of education.

[2] An Act on Special Cases Concerning the Disclosure of Information by Education-Related Institutions [Act No. 8492, Promulgated May 25, 2007]; An Act on Special Cases Concerning the Disclosure of Information by Education-Related Institutions [Presidential Decree No. 21119, Amended Nov. 17, 2008]; An Act on Special Cases Concerning the Disclosure of Information by Education-Related Institutions [Presidential Decree No. 23304, Amended Nov. 23, 2011].

The Republic of Korea's policies and practices in student assessment have continuously evolved. As noted, the country started with a sample-based assessment, moved to census-based assessment of all students, then returned to sample-based assessment. Table 6 provides a timeline of the changes in the assessment system.

B. Assessment Framework

The NAEA has been used to check the outcomes of school education on a national level. After the 1998 master plan, the NAEA was revised in 2008 in terms of its assessment purpose, students assessed, fields of assessment, test item type, time, sampling method, scoring system, analysis and use of results, scope of educational context variables collected, and legal or systemic support.

The switch to census-based assessment in 2009 was done under the government's policy of building and strengthening the "system to support the improvement of the basic academic level." Census-based assessment offers the advantage of assessing and providing information not only on the individual school, but also the individual student's achievement level and improvement at the population level. Thus, by checking the academic achievement of each student,

Table 6: Evolution of Student Assessment Policies and Practices

Year	Policies and Practices
1986–1997	National student assessment launched as an instrument for ensuring educational quality by Ministry of Education
1998	KICE established, an independent research institute funded by government, to take over national student assessment
1998	NAEA master plan prepared by KICE
1999–2000	Assessment framework, achievement standard, and preliminary test items prepared
2001	NAEA conducted as sample-based assessment for five subjects (Korean, social studies, mathematics, science, and English with multiple choice-type items)
2002	Assessment date moved from June to November to increase period of assessment to 2 days
2003–2006	2003 set as the reference year of trend analysis Systematic test development and administration pursued by improving test items and sampling design
2007–2008	Sample size and coverage of assessment expanded from 3% of students to 5%
2008	Basic academic level guarantee policies (Zero Plan for Below-Basic Students or eliminating below-basic schools) introduced
2009	Census-based assessment implemented Sampling begun to collect equating data (1%) each year
2010	The Act on Special Cases Concerning the Disclosure of Information by Education-Related Institutions was enforced for extensive disclosure to the public of assessment results (percentages for below-basic, basic, and above basic for every school)
2011	Information on high school progress index started being disclosed
2012	Information on middle and high school improvement (school progress index) started being disclosed
2013–2016	Census-based assessment dropped for elementary schools and the number of subjects included in census-based assessment reduced from five to three subjects for middle school
2015	Revised achievement level based on updated national curriculum set-up
2017–present	Switched back to sample-based assessment (about 3% of middle and high school) to check the quality of the national curriculum

KICE = Korea Institute for Curriculum and Evaluation, NAEA = National Assessment of Educational Achievement.
Source: Authors' construction of NAEA chronology based on historical evolution.

school, and provincial office of education through the NAEA results, accountability of individual schools or offices of education can be strengthened. Thus, the NAEA's function was expanded to manage curriculum quality as well as to check and to support school education accountability. Also, with the Act on Special Cases Concerning the Disclosure of Information by Education-Related Institutions (Act No. 8492, promulgated on May 25, 2007) which mandated the disclosure of the NAEA results, formulating education policies based on objective data became possible.

Students are provided with an explanation of their achievement levels for each subject through individual grade report cards, which enables them to understand their strengths and weaknesses for those subjects. This provides detailed and useful information for students as they seek to identify specific supplementation needs for improved academic performance. For teachers, assessment results serve as basic data to assist their instruction for students on academic aptitudes and counseling for future school enrollment plans. Results also enable better understanding of student performance by school and regional level, serving as evidence to enhance the accountability of educational institutions.

Gradually therefore, the purpose of NAEA has expanded from merely providing data to improve teaching–learning methodology and examining educational quality management, to broader dimensions covering diagnosing and elevating the achievement level of individual students, and checking and supporting the educational accountability of schools as well (Kim, Sang, and Lee 2009). The current objectives of the NAEA include the following:

(i) To diagnose educational achievements of elementary, middle, and high school students and track the trends of their achievements.

(ii) To provide basic data for improvement of the curriculum by analyzing students' achievements and monitoring issues with curriculum implementation at the school level.

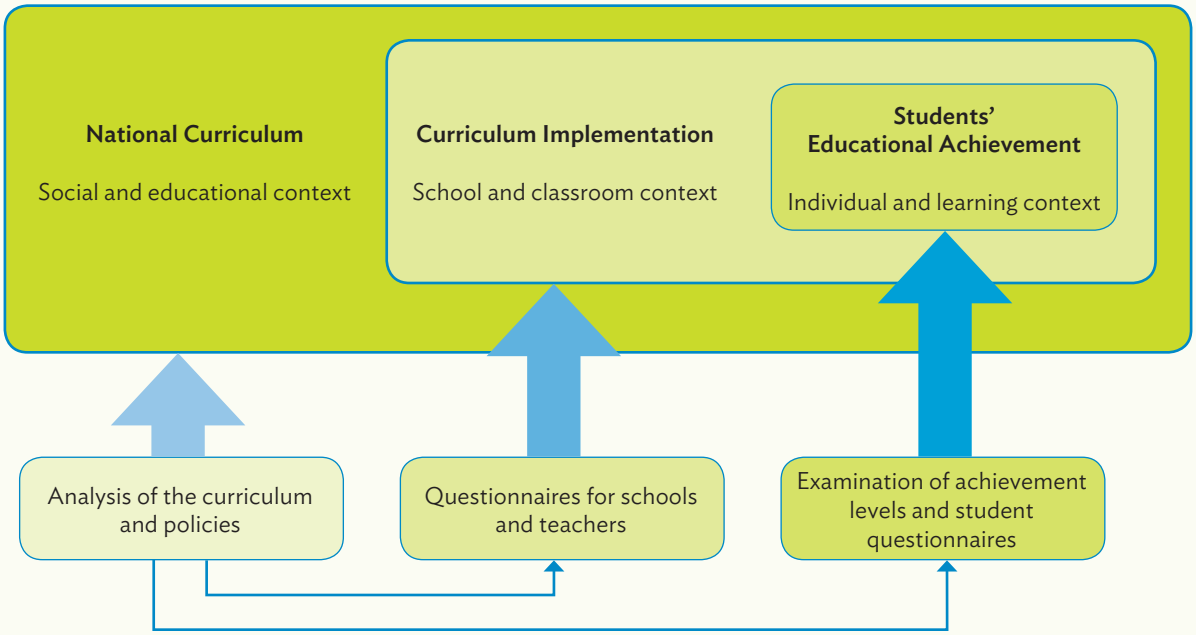
(iii) To improve teaching and learning methods by analyzing the test items and the relationship between the students' achievement and background variables.

(iv) To guide the schools toward better assessment methods by developing new and appropriate assessment tools.

(v) To explore further research design and methods to analyze the findings of the NAEA.

The new conceptual evaluation framework of NAEA identifies how curriculums formulated nationally actually get implemented in the schools (Figure 1), and has accordingly developed new assessment tools (S. Kim et al. 2009a). The new assessment tools include tests on Korean, social studies, mathematics, science, and English; and questionnaires for schools, teachers, and students to help analyze the contextual variables that impact students' achievement levels. This process helps provide a virtuous cycle between curriculum development, its implementation, and teaching and achievement of curricular objectives by students who are tested through NAEA.

Figure 1: Conceptual Evaluation Framework of the National Assessment of Educational Achievement



Source: S. Kim et al. 2009.

C. Assessment Design

The expansion of target students in the revised NAEA version improved evaluation planning, with major changes made to timeline, subjects, targets, and testing hours. In the new plan, the assessment period was moved from October to July to provide individual students sufficient time for supplementary education. At the high school level, 10th graders were placed under assessment, and the subjects of evaluation were limited to Korean, mathematics, and English, in line with preparations to operate an elective-centered curriculum. For middle and high school students, the testing time was reduced from 70 minutes to 60 minutes to ease the burden of evaluation on students. The 6th graders in primary school and 9th graders in middle school continued to be assessed across all five subjects: Korean, social studies, mathematics, science, and English. Table 7 shows the improved assessment plan of 2010. The assessment date was again changed to late June in 2012. From 2012 to 2017, NAEA has assessed the achievement of all students from Grade 9 to Grade 11 on Korean, mathematics, and English, on Tuesday during the 3rd week of June. Social studies and science are for the sampled students in Grade 9 only.

The following steps are implemented in conducting the annual NAEA:

(i) *Analyzing the national curriculum of each subject*. The assessment areas are decided according to the national curriculum of each subject and achievement standards set for each area.

(ii) *Developing achievement standards.* Achievement standards are the statements specifying the objectives and content of the national curriculum.

(iii) *Developing assessment standards.* Assessment standards are the statements that differentiate student achievement levels, with advanced, proficient, basic, and below-basic-level criteria for assessment of each subject.

(iv) *Developing assessment tools.* The test consists of multiple-choice items, short-answer items, and listening comprehension items for Korean and English.

(v) *Scoring, equating, and analyzing the results.* Scores are assigned to each item and common items are identified across different test years for analyzing trends in achievement.

1. Assessment Instrument by Subject

The NAEA has developed academic achievement tests for Korean, social studies, mathematics, science, and English through an in-depth analysis of the national curriculum. Because the conversion into a census-based assessment forced a change in the equating design for middle and high schools, beginning in 2010, the subject test tool has been developed into four types. Despite the difference among subjects, there are 30–40 subject assessment items. Constructive response items comprise 20%–30% of all items. Table 8 shows the number of items, points allocated, and so on, of the finalized 2013 middle and high school test tool.

Table 7: Design for Implementation of the National Assessment of Educational Achievement, 2010–2016

Year	Students	Subject	Scope	Assessment Time	Month	Type of Item
2010–2011	Grade 6	Korean, mathematics, English (survey) Social studies, science	Grade 4–5 entire curriculum, Grade 6 (1st semester)	50 min./subject; 20 min. for questionnaire	July July	Multiple choice and constructed response items (Korean, English listening included)
	Grade 9	Korean, social studies, mathematics, science, English (survey)	Grade 7–8 entire curriculum, Grade 9 (1st semester)	60 min./subject; 20 min. for questionnaire	July	
	Grade 11	Korean, mathematics, English (survey)	Grade 10 entire curriculum	60 min./subject; 20 min. for questionnaire		
2013–2016	Grade 9	Korean, mathematics, English (survey)	Grade 7–8 entire curriculum, Grade 9 (1st semester)	60 min./subject; 20 min. for questionnaire	June	Multiple choice and constructed response items (Korean, English listening included)
	Grade 11	Korean, mathematics, English (survey)	Grade 10 entire curriculum	60 min./subject; 20 min. for questionnaire		

min = minute.
Source: Adapted from Si et al. 2015.

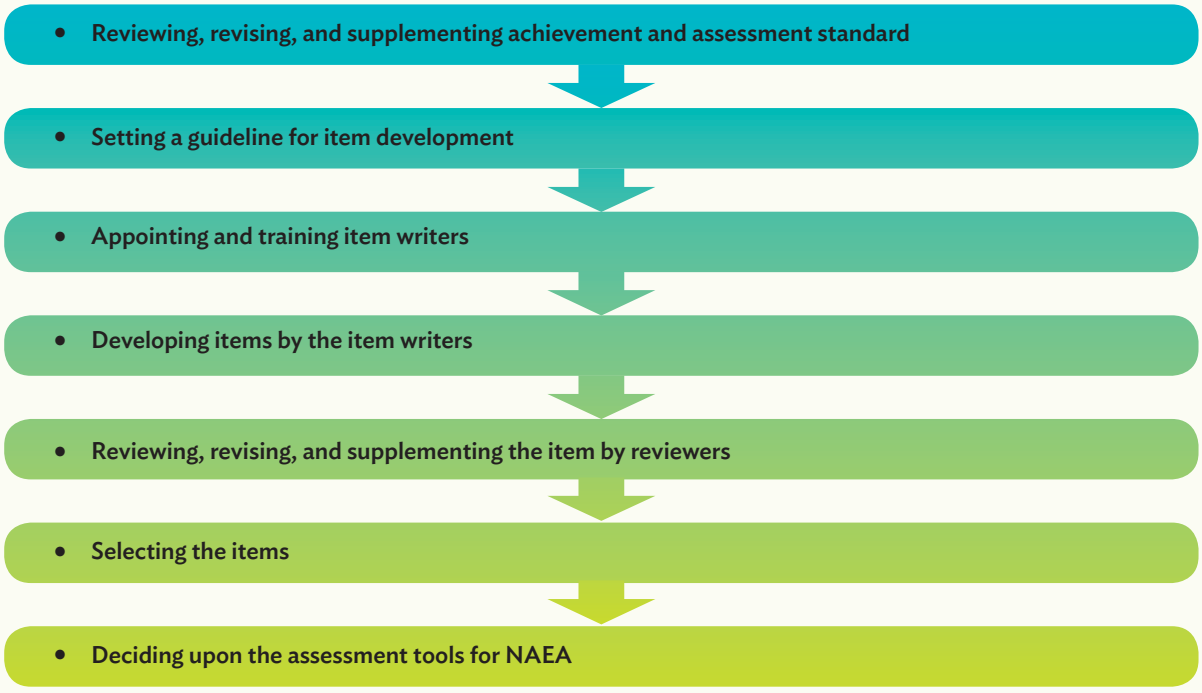
Table 8: Assessment Instrument for the National Assessment of Educational Achievement Test

Middle School (Grade 9)										High School (Grade 11)					
Korean		Social Studies		Mathematics		Science		English		Korean		Mathematics		English	
M	C	M	C	M	C	M	C	M	C	M	C	M	C	M	C
28	6(9)	33	9	29	4(8)	32	8(13)	34	6(10)	30	6(11)	29	4(10)	34	6(8)

C = constructive response items, M = multiple choice.
Note: Numbers in parentheses represent number of items (including subitems).
Source: Reconstructed from Si et al. 2015.

Developing the instrument for NAEA, including the survey questionnaire, takes more than 2 weeks in a secured place where all outside contact has been cut off (Figure 2). Given the census-based assessment's characteristics, the method of developing a good quality assessment tool cannot be the same as in the sample-based assessment. Because solving problems such as security of items and reliability of scoring is more difficult, an enhanced and secure standardized procedure has been adopted. The NAEA assesses the learning of educational goals and content required by the national curriculum through multiple choice and constructive response items. Listening in Korean and English is also assessed, using school broadcasting equipment. Educational context variables are assessed through a survey of the school principal and students. The result of the NAEA for each student, however, is not linked to his or her regular school grade.

Figure 2: Developing a National Assessment of Educational Achievement Instrument



NAEA = National Assessment of Educational Achievement.
Sources: Authors' illustration based on S. Kim et al. 2010; K. H. Kim et al. 2011.

2. Survey Questionnaire for Educational Context Variables

Through a survey, the NAEA identifies the educational context variables that affect subject achievement. Before the NAEA's conversion into a census-based assessment, the relationship between academic achievement and educational factors such as student, teacher and principal characteristics was analyzed based on school survey results. As the assessment coverage increased, however, a new questionnaire covering all schools and students was developed and administered starting in 2009 (Kim, Sang, and Lee 2009). Similarly, in 2011 and 2012, in consideration of the previous assessment's results and policy requirements, all surveys were supplemented by new items designed to strengthen information on affective characteristics, class attitude and preparedness, after-school activities, etc. In 2013, some of the student survey items on school life adjustment and school climate were revised and eight items on students' perception of competence, perception of autonomy, school environment satisfaction, and psychological stability were added, thus developing a measure of school life happiness.

In addition, a survey questionnaire is administered for collecting educational contextual variables related to school, teacher, and student background to explore their role in student achievement. For students, information related to their family background, school life, attitudes in class, after-school study; or type of extracurricular activities, learning method, and other information is collected. For teachers, information such as personal background, teaching activities, and satisfaction are collected. Also, context variables related to schools include school facilities, management, school climate, and parents' support.

D. Continuous Upgrade of Technical Dimensions

The NAEA is a criterion-referenced assessment that measures the degree to which the national curriculum has been achieved. Student achievement in the assessed subject is divided into the following achievement levels: "advanced", "proficient", "basic" and "below-basic" level (Figure 3). To address this standard setting of achievement levels, a modified Angoff Method for the cut-off scores was used. Subject

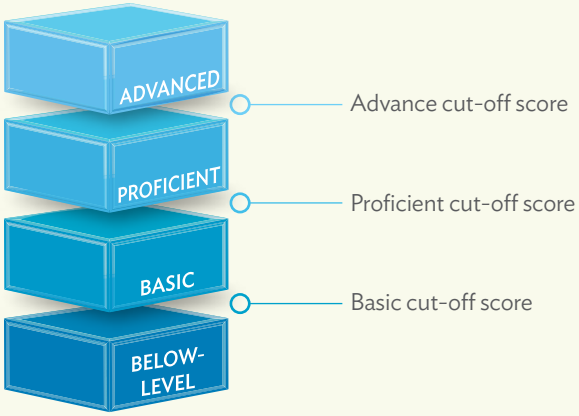
Figure 3: Achievement Levels in the National Assessment of Educational Achievement

ADVANCED
Denotes superior performance

PROFICIENT
Represents solid academic performance

BASIC
Denotes partial mastery of prerequisite knowledge and skills that are fundamental for proficient work

BELOW-BASIC



Source: Adapted from Kim et al. 2010.

achievement levels are determined by considering the characteristics of the relevant subject. For each achievement level within each subject, the knowledge and abilities that students are expected to demonstrate are identified.

The NAEA tracks the student achievement trend by year, with 2003 achievement set as the standard for comparison against which scale scores, i.e., achievement scores, are developed. Raw scores given for students' responses to questions on Korean, social studies, mathematics, science, and English are converted into scale scores. Starting with the 2003 assessment, achievement levels are divided and cut-off scores are set. The division and description of each achievement level are notified to individual students. To analyze how students' educational achievements change year on year, an equating procedure is carried out to statistically adjust the difference of difficulty levels between yearly assessments and to compare test scores. Since 2010, a new rating scale that improves the scoring system has been in use.

Chapter 3

NATIONAL ASSESSMENT OF EDUCATIONAL ACHIEVEMENT RESULTS

The NAEA results are used to analyze overall student performance by school, by region, and nationally, and to provide evidence on the degree of accountability of educational institutions. Such evidence helps set policy direction for academic ability enhancement and substantiate government initiatives for school support. For schools, the NAEA provides information on student performance and enables identification of the targets and areas to which academic ability enhancement programs should be applied. To this end, evaluation results are disclosed according to the classification system of the School Information Disclosure System. For local educational authorities, NAEA results lead to the establishment of detailed plans to provide schools with financial support and special programs. Local educational authorities also determine the amount of a school subsidy upon examining how well schools are reflecting NAEA results in academic supplementary programs and academic ability enhancement plans.

To utilize the NAEA results further, starting with the 2010 NAEA, the government ordered that the ratios of student achievement levels be disclosed in individual schools, in line with the Special Act on the Information Disclosure of Educational Institutions. Results of the assessment are being used as baseline data to understand whether the current curriculum has been incorporated in schools effectively and to identify existing problems. This, in turn, leads to efforts to revise or improve the quality of the national curriculum. In addition, public availability of educational information at multiple levels allow civil, parent, and educational expert groups to continuously monitor how well national education policies are being implemented in schools.

Results are also utilized when developing new curriculums. They are used to make decisions on the scope, sequence, continuity, and difficulty of the curriculum. Assessment results also provide information on the status and trends of Korean student achievement, enable analysis of the various contextual variables of education correlated with achievement, and help formulate and implement practical policies to increase educational effectiveness. Tables 9 and 10 outline the educational context variables collected through school and student surveys.

One of the most important uses of the NAEA is tracking improvement in student achievement over time. The NAEA study analyzes the change in the share of students in each of the four achievement levels across assessment years. For each subject, the study reports disaggregated data on the mean scale scores and percentage of students in each level by gender, region, and other characteristics. Figures 4–13 report trends in achievement for Korean, English, and mathematics for students in Grades 9 and 11.

Table 9: Constructs of Student Survey Questionnaire in the National Assessment of Educational Achievement

Construct	Subconstruct	Variables
Personal and home environment	Home environment	Family type Activities with parents and family Quantity of books owned
	Personal characteristics	Sleeping time Reading time Sports time
School life	School life happiness	Perception of competence Perception of school autonomy Peer relation Teacher relationships School climate School environment satisfaction Psychological stability
	Learning attitude and understanding	Class preparation and concentration Class participation Class understanding Reasons for study Favorite subjects
After-school life	After-school learning	After-school program Homework Self-directed learning EBS education program or internet lecture Home study materials or private internet lecture Private learning institution or tutoring
	After-school/EBS programs and utility	Participation program Degree of utility perception
	Leisure activities	Leisure activities Internet technology activity
Learning-related affective characteristics	Academic efficacy	Academic efficacy
	Subject attitude (interest, value)	Korean Math English

EBS = Educational Broadcasting System.
Source: Adapted from Si et al. 2015.

Table 10: Constructs of School Survey Questionnaire in the National Assessment of Educational Achievement

Construct	Subconstruct	Variables
School organization	Organizational characteristics	Type of school funding Gender Purpose Autonomous school School for improvement Equalization of students' entrance to school
School finance	School finance	School finance
School principal's characteristics	School principal	Principal's personal background Open (recruited principal) Principal's activities
Student body composition and teacher characteristics	School size	Number of classes Number of students
	Characteristics of student body	Student characteristics
	Teacher	Current state of teachers
	Characteristics	Subject teaching training Teacher counseling training
Curriculum and school climate	Class and program	Ability grouping between classes Alter-school program Subject classroom WEE class Student club activities Program for low performers
	School climate	Teacher climate Student climate Parents climate School management committee Parents' school event participation
	Use of results	Items using assessment results

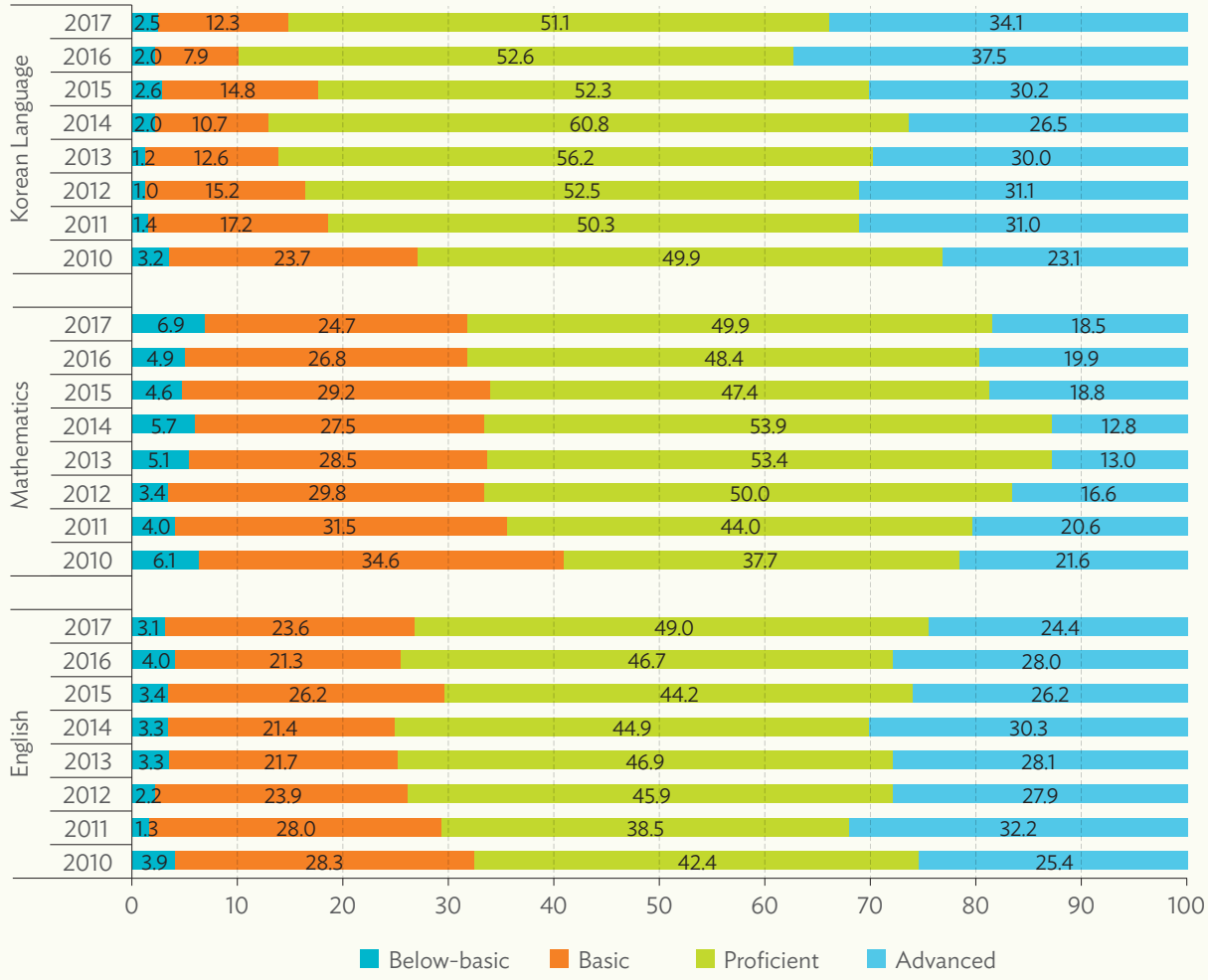
MEST = Ministry of Education, Science and Technology, WEE = We+Education or We+Emotion.
Note: The WEE classes were introduced in 2008 under the WEE project initiated by MEST in response to increasing instances of school bullying and its negative impacts on students. MEST introduced multi-level counseling service programs: WEE class at the school level, WEE centers at the district level, and WEE schools at the city or provincial education office level.
Source: Adapted from Si et al. 2015.

A. Grade 9 Results

Figure 4 shows the trend of each subject achievement level of NAEA 2010 to 2017 for middle school (Grade 9).

For Grade 9, the overall trend results show that the percentage of below-basic, basic, proficient, and advanced levels differed across subjects; the below-basic rate ranged from 1.0%–3.2% in Korean, 3.4%–6.9% in mathematics, and 1.3%–4.0% in English. The number of students in the below-basic achievement level decreased in all subjects from 2010 to 2012, but has increased since 2012, especially in mathematics, from 3.4% to 6.9%. The percentage for advanced

Figure 4: Trends in Achievement Levels for Grade 9 in NAEA 2010 to NAEA 2017
(%)

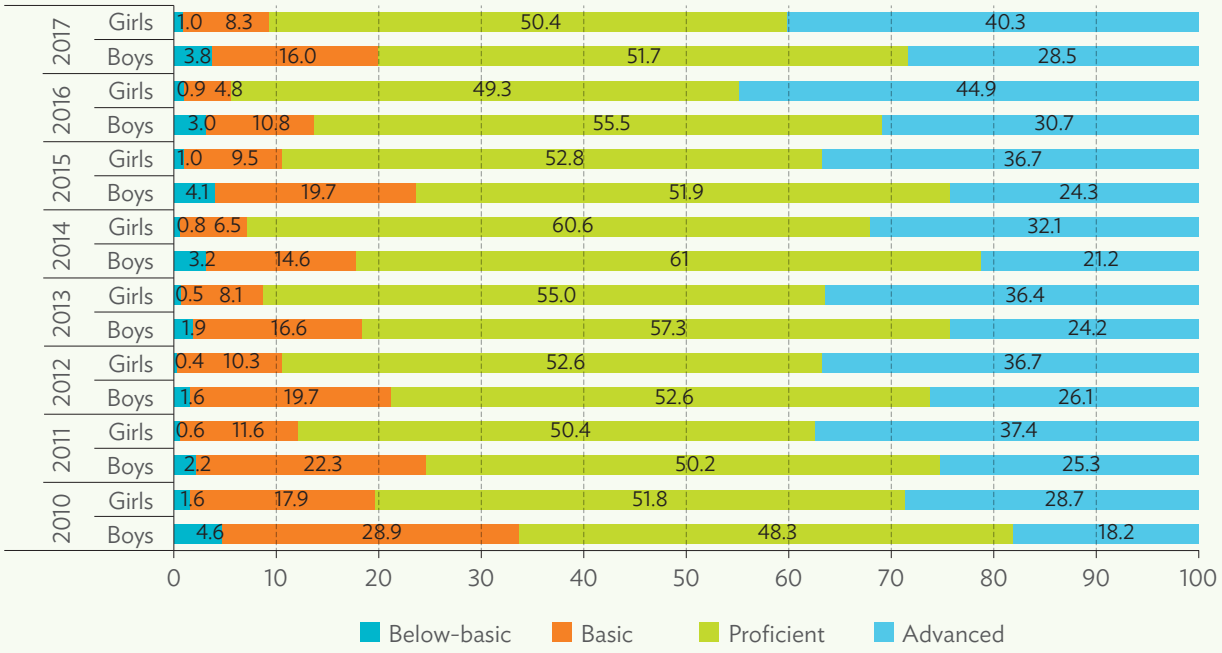


NAEA = National Assessment of Educational Achievement.
Note: Assessment was census-based from 2009 to 2016. The assessment was switched back to sample-based in 2017.
Source: Authors' estimates based on NAEA data (2010–2017).

achievement level varied widely across subjects. While the number of "advanced" students increased in English from 2010 to 2014, it decreased dramatically in mathematics from 21.6% to 12.8% over the same period. This calls for careful interpretation across subjects.

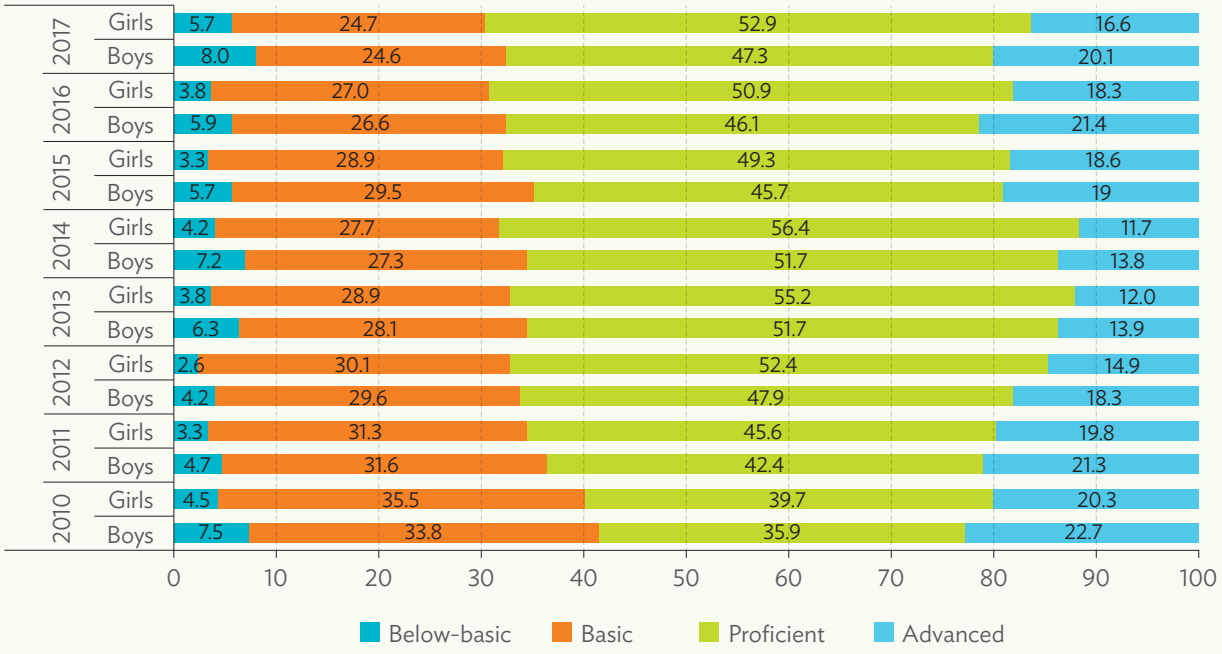
In addition, for all Grade 9 students, the girls' achievement level seems to be higher than that of boys. That is, the percentage of girls in the below-basic level in all subjects is lower than that of boys. However, boys are in the advanced level for mathematics compared to girls (Figures 5, 6, and 7).

Figure 5: Achievement Levels in Korean Language by Gender, Grade 9
(%)



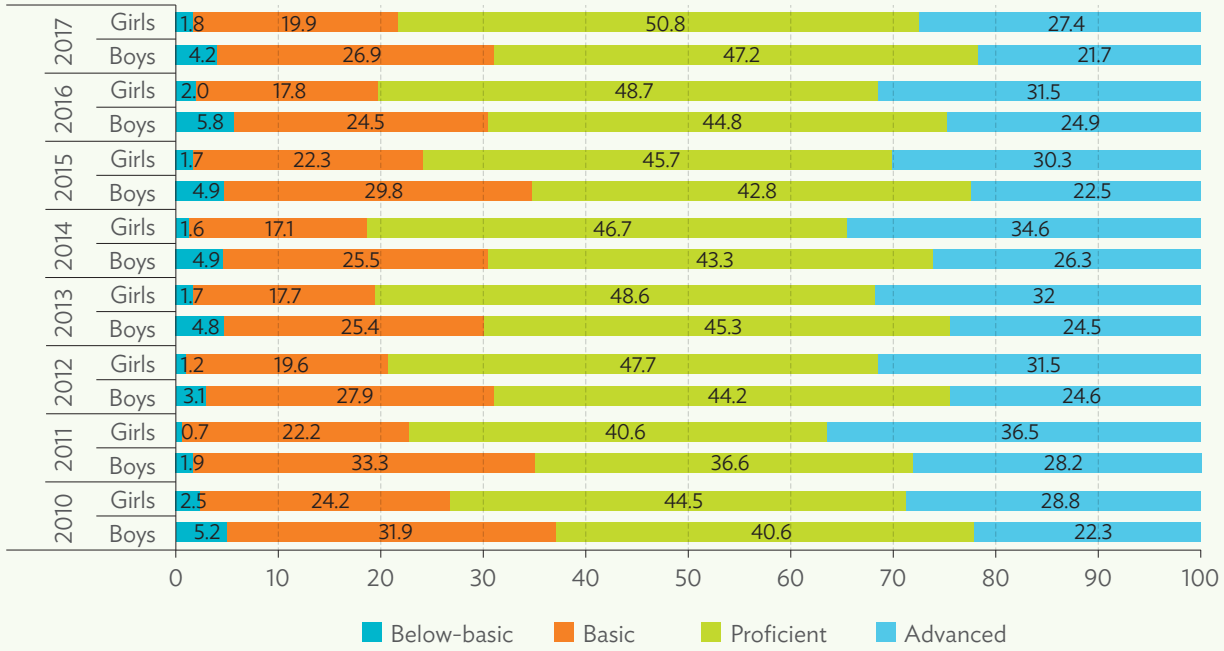
Source: Authors' estimates based on National Assessment of Educational Achievement data (2010–2017).

Figure 6: Achievement Levels in Mathematics by Gender, Grade 9
(%)



Source: Authors' estimates based on National Assessment of Educational Achievement data (2010–2017).

Figure 7: Achievement Levels in English by Gender, Grade 9
(%)



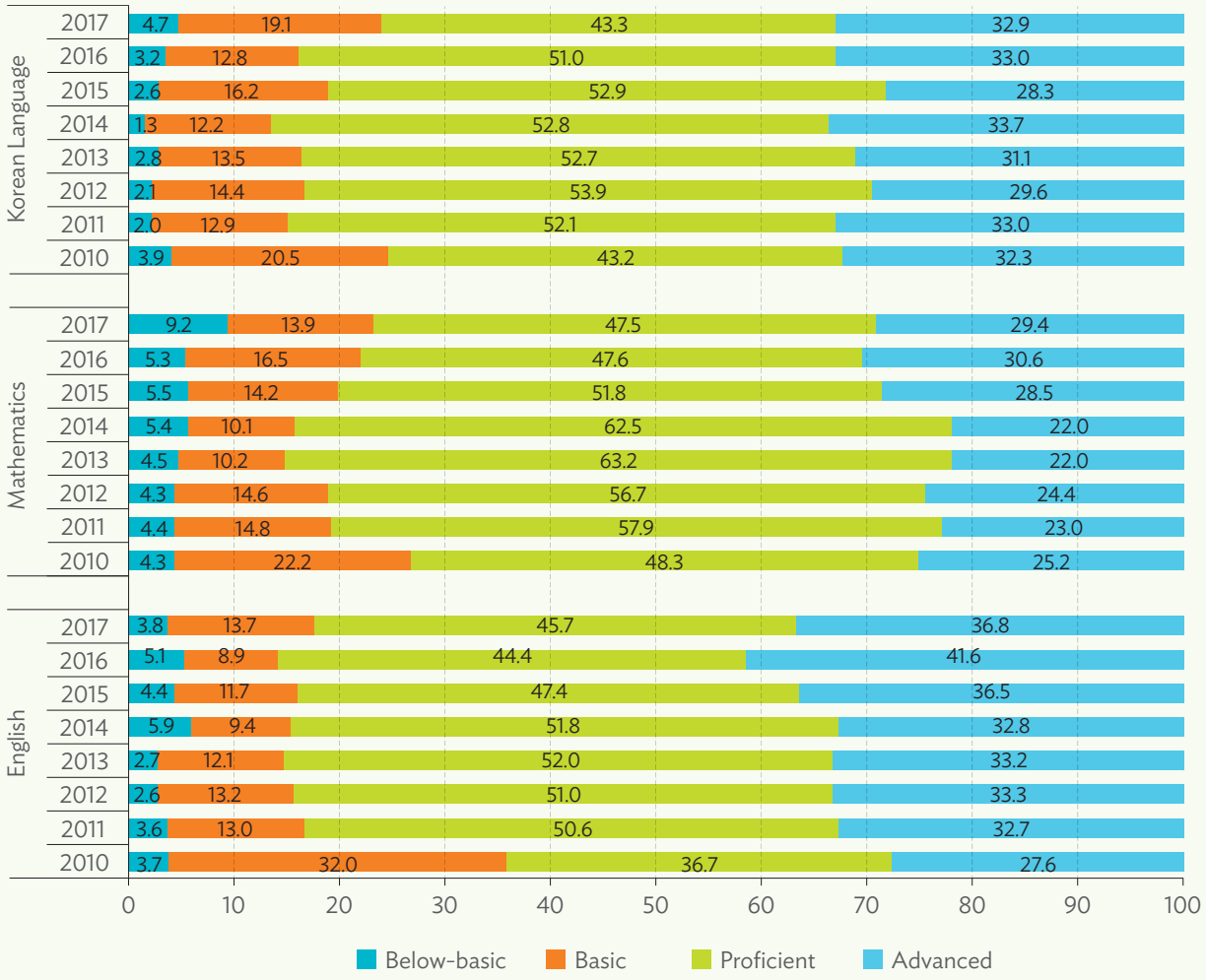
Source: Authors' illustration based on National Assessment of Educational Achievement data (2010–2017).

B. Grade 11 Results

For Grade 11, the overall results show that the percentage of students in the below-basic level varied by subject: 1.3%–4.7% in Korean, 4.3%–9.2% in mathematics, and 2.6%–5.9% in English. The number of students in the below-basic level decreased in Korean, but suddenly increased in 2017, especially in mathematics, from 5.3% to 9.2% because the NAEA had been changed to sample-based test. The percentage of the advanced level varied widely across subject, and the number of advanced students decreased in English, from 41.6% to 36.8% (Figure 8).

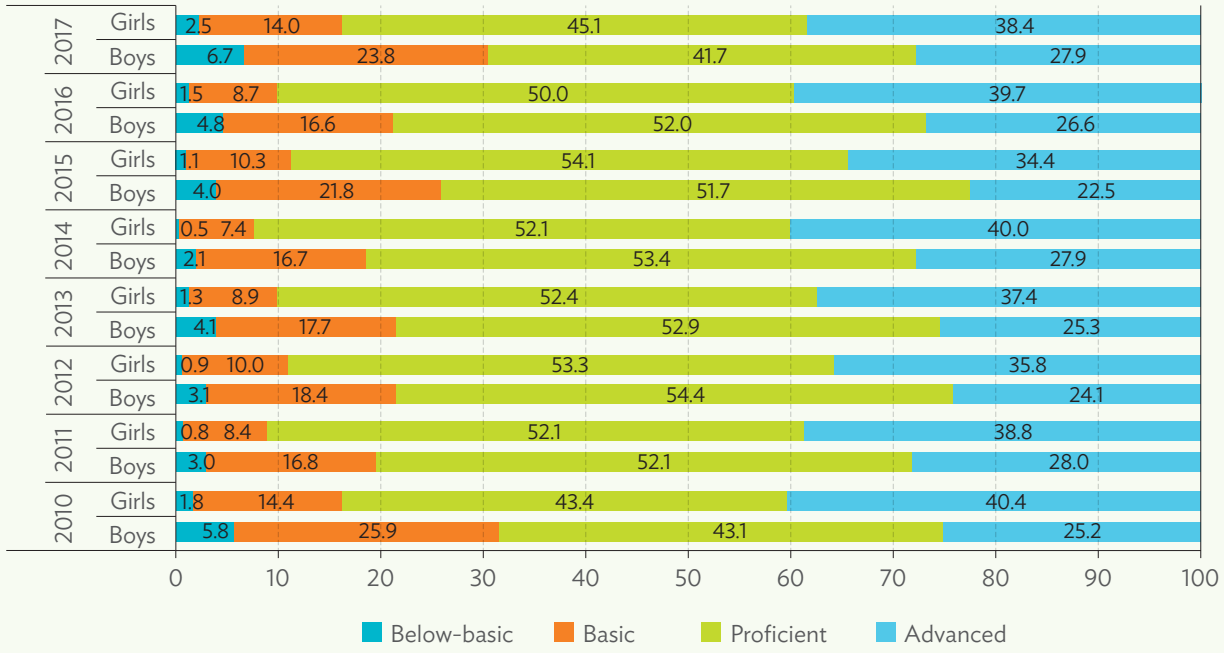
Like in Grade 9, for all subjects in Grade 11, the percentage of girls in the below-basic level was lower than that of boys. For advanced level, however, boys particularly excelled in math, whereas the girls were better in Korean and English (Figures 9, 10, and 11).

Figure 8: Trends in Achievement Levels for Grade 11 in NAEA 2010 to NAEA 2017
(%)



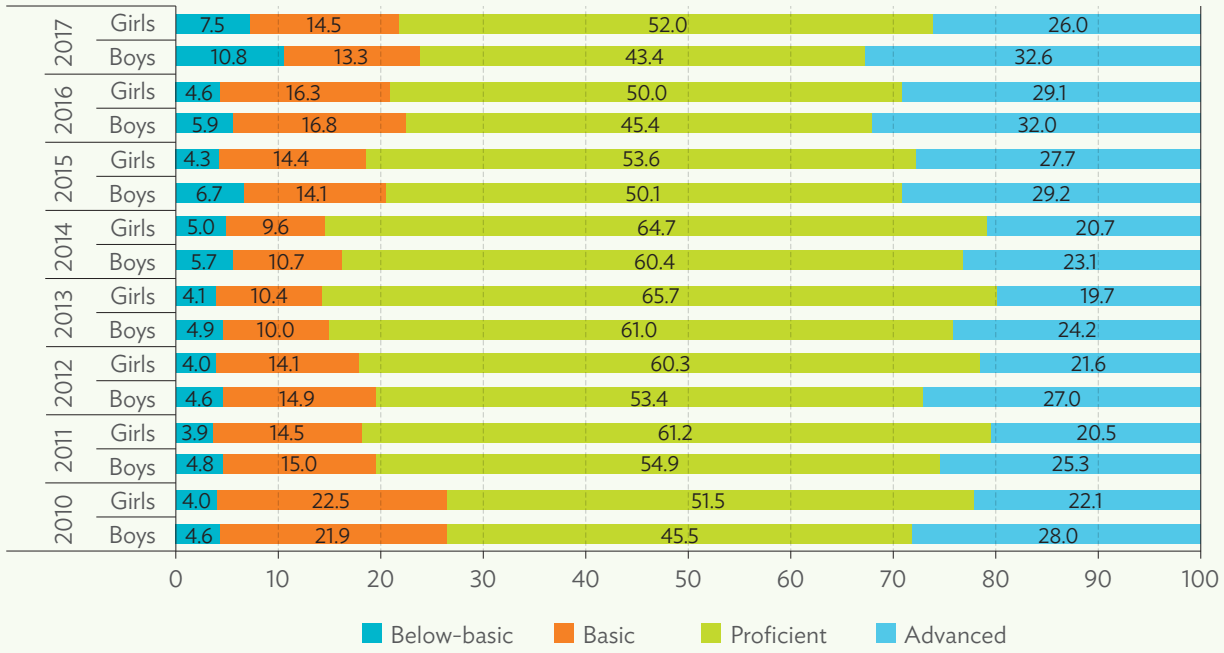
NAEA = National Assessment of Educational Achievement.
Source: Authors' estimates based on NAEA data (2010–2017).

Figure 9: Achievement Levels in Korean Language by Gender, Grade 11
(%)



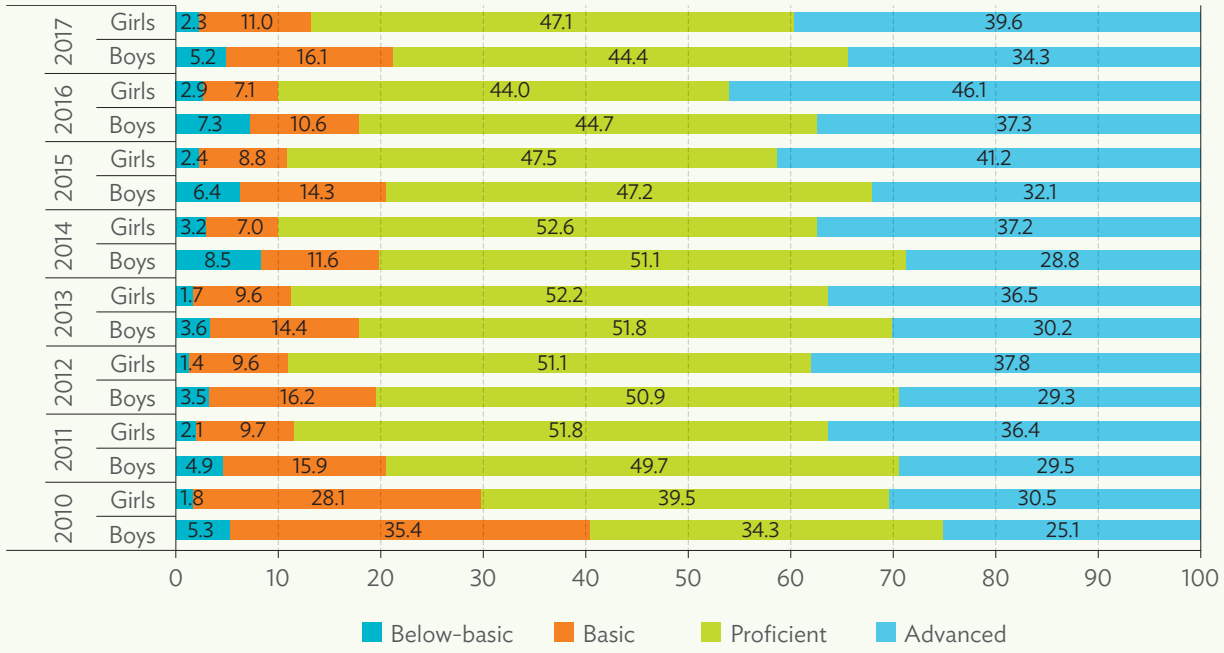
Source: Authors' estimates based on National Assessment of Educational Achievement data (2010–2017).

Figure 10: Achievement Levels in Mathematics by Gender, Grade 11
(%)



Source: Authors' estimates based on National Assessment of Educational Achievement data (2010–2017).

Figure 11: Achievement Levels in English by Gender, Grade 11
(%)



Source: Authors' estimates based on National Assessment of Educational Achievement data (2010–2017).

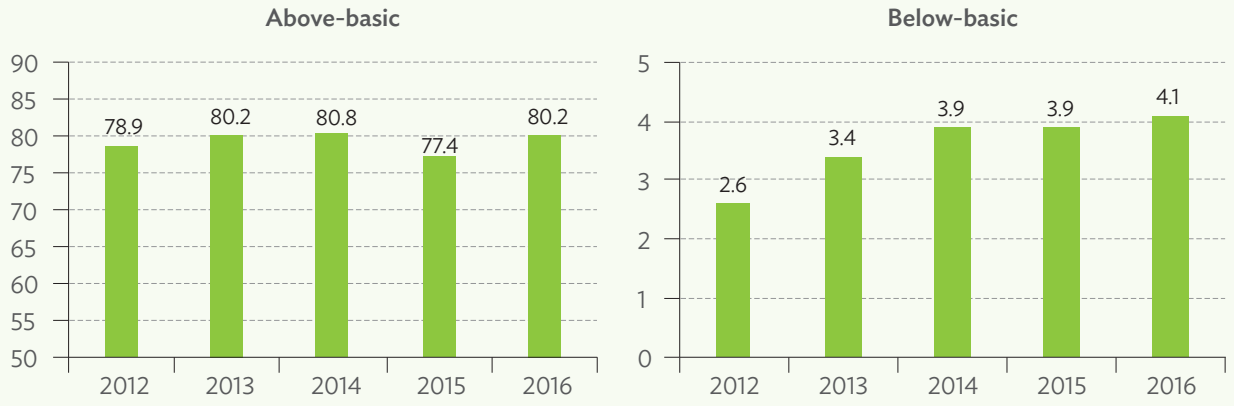
The average percentage of students in the above-basic level in all subjects has remained stable from 2012 to 2016, but the percentage at the below-basic level has increased since 2012 (Figure 12). Gender differences in the percentage of students at below-basic level were observed among middle and high school students (Figure 13) (MOE 2016).

C. School Progress Index

The school progress index is a measure of a school's improvement based on NAEA findings. The NAEA provides information on academic achievement levels that can accurately identify the academic outcomes of individual schools and students. Since 2011, information on improvement of NAEA results through a school's effort has also been calculated and disclosed to provide an academic index that can better identify the outcomes of school education and lay the foundation for academic improvement in all schools. The school progress index, based on the amended Act on Special Cases Concerning the Disclosure of Information by Education-Related Institutions, along with its enforcement decree, was initially introduced in 2011 for high schools to objectively assess how the school's efforts improved student academic achievement. To develop the school progress index,[3] considerations for factors such as school circumstances, specific areas of improvement needed and the nature of the data collected by the NAEA, were discussed in depth. Based on the discussions, three models were proposed: a simple improvement model, an added-value model, and a school improvement model based on student-level longitudinal data (K. H. Kim et al. 2011).

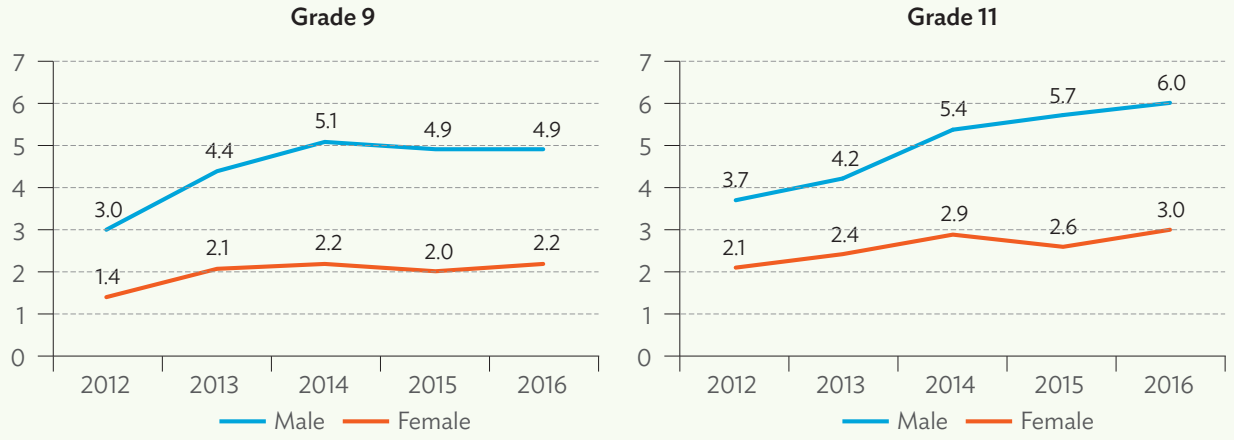
[3] The school progress index is calculated based on the model developed in K. H. Kim et al. (2011).

Figure 12: Percentage of Students at Above-Basic and Below-Basic Achievement Levels



Source: Ministry of Education, Government of Republic of Korea. 2016.

Figure 13: Percentage of Students at Below-Basic Achievement Level in Grade 9 and Grade 11, by Gender



Source: Ministry of Education, Government of Republic of Korea. 2016.

Using a simple improvement model based on the absolute difference in achievement between assessment years may give a biased picture in favor of schools that already have high-performing students. To address such fairness concerns, an added-value model that controls for prior achievement is applied. Using student-level longitudinal data, a school's prior achievement or expected score is calculated based on students' existing scores.

The school progress index for a given year is then calculated as the percentage difference between the school's actual achievement in that year and the expected achievement for the school based on results of previous assessments. Effectively, the school progress index measures the extent to which a school met or surpassed its expected achievement. This customized school progress index also indicates schools' effort.

After disclosure of the high school progress index in 2011, the middle school progress index was made publicly available in 2012. Each year thereafter, the middle and high school progress indexes have been calculated and disclosed. Table 11 and Figure 14 present the trend in the high school progress index between 2011 and 2013 for each subject by type of location (Si et al. 2015).

Figure 14 shows that the improvement in the school progress index was high in metropolitan areas for all three subjects in 2011, for Korean language and mathematics in 2012, and for Korean language in 2013. Improvement in small and medium-sized cities (SMCs) was generally low between 2011 and 2013. The SMCs improved less than metropolitan areas.

In 2011, metropolitan areas improved more than expected in all three subjects (0.57%, 0.55%, and 0.30% for Korean, mathematics, English, respectively). In contrast, SMCs failed to reach expected scores in all three subjects (–0.26%, –0.67%, and –0.30% for Korean, mathematics, and English, respectively). Rural areas improved more than expected in mathematics and English but failed to reach the expected score in Korean (–0.54% for Korean, 0.18% for mathematics, and 0.01% for English).

In 2012, metropolitan areas again improved more than expected in all three subjects (0.39% for Korean, 0.49% for mathematics, and 0.12% for English). The SMCs improved less than expected in all three subjects (–0.33% for Korean, –0.70% for mathematics, and –0.28% for English). Rural areas improved more than expected in mathematics and English (–0.12% for Korean, 0.34% for mathematics, and 0.26% for English).

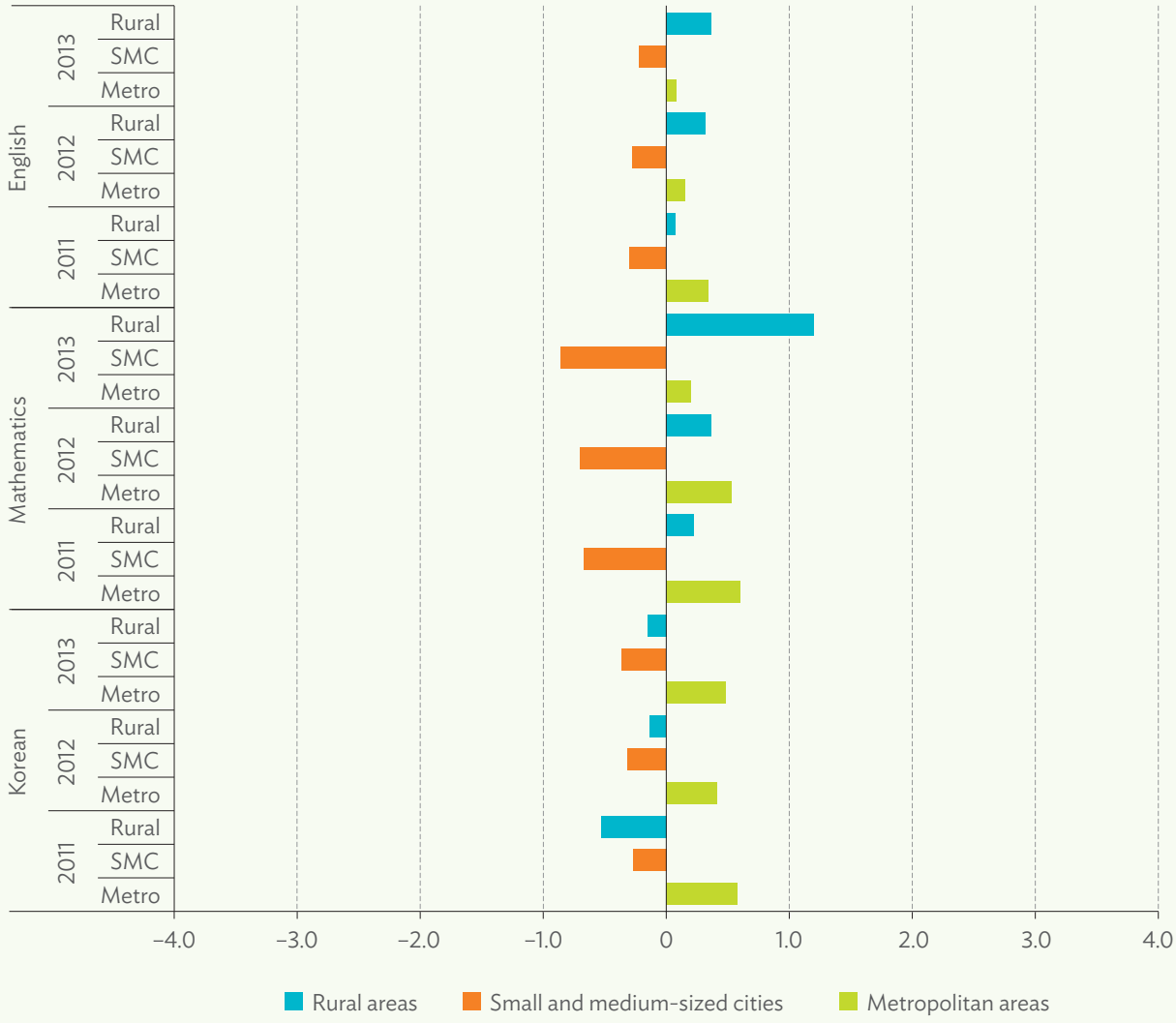
In 2013, metropolitan areas continued to improve more than expected in all three subjects (0.45% for Korean, 0.15% for mathematics, and 0.01% for English). The SMCs improved less than expected in all three subjects (–0.35% for Korean, –0.85% for mathematics, and –0.21% for English). Rural areas improved more than expected in mathematics and English (–0.16% for Korean, 1.16% for mathematics, and 0.33% for English).

Table 11: High School Progress Index by Regional Type, 2011–2013

		Number of Schools		Korean		Mathematics		English	
		Frequency	%	Mean	SD	Mean	SD	Mean	SD
2011	Metro	581	39.2	0.57	(1.87)	0.55	(2.49)	0.30	(2.02)
	SMC	568	38.4	–0.26	(2.00)	–0.67	(2.58)	–0.30	(2.24)
	Rural	332	22.4	–0.54	(2.14)	0.18	(3.40)	0.01	(3.00)
	Total	1,481	100.0	0.00	(2.04)	0.00	(2.81)	0.00	(2.37)
2012	Metro	588	38.7	0.39	(1.96)	0.49	(2.57)	0.12	(2.28)
	SMC	581	38.2	–0.33	(2.12)	–0.70	(2.79)	–0.28	(2.59)
	Rural	352	23.1	–0.12	(2.14)	0.34	(3.73)	0.26	(3.24)
	Total	1,521	100.0	0.00	(2.09)	0.00	(3.01)	0.00	(2.65)
2013	Metro	605	38.2	0.45	(2.14)	0.15	(2.85)	0.01	(2.15)
	SMC	606	38.3	–0.35	(2.03)	–0.85	(3.31)	–0.21	(2.59)
	Rural	371	23.5	–0.16	(2.40)	1.16	(3.98)	0.33	(3.13)
	Total	1,582	100.0	0.00	(2.19)	0.00	(3.40)	0.00	(2.58)

SD = standard deviation, SMC = small and medium-sized city.
Note: Standard deviation in parentheses.
Source: Si et al. 2015.

Figure 14: High School (Grade 11), School Progress Index by Region



Metro = metropolitan area, SMC = small and medium-sized city.
Source: Si et al. 2015.

Chapter 4
IMPLICATIONS FOR EDUCATION POLICY AND PLANNING

Assessment of educational achievement, after its conversion into census-based assessment in 2009, was expanded into a mechanism that checks school education quality and the accountability of individual schools and provincial offices of education. The results of the NAEA can be utilized effectively for students and schools to promote basic academic ability. School progress indexes can be developed to properly explain the yearly improvement of academic achievement in each school level. Also, expert groups are actively involved for further research and significant results should be reflected in data-based policy making.

A. Disclosing Results of the National Assessment of Educational Achievement

The expansion of the NAEA to all students nationwide, together with the policy to disclose assessment results, marked a critical turning point in utilizing educational data and making policy decisions. The change is pursuant to the Special Act on the Information Disclosure of Educational Institutions (Law No. 8492, promulgated on 25 May 2007) and the Enforcement Decree of the Act (Presidential Order No. 21119, enacted on 17 November 2008).

Starting in 2010, school heads also disclose ratios of NAEA achievement levels for each individual school on the web portal of the School Information Disclosure System.[4]

The disclosure of assessment results spurs interest and puts pressure on educational institutions, while analyzing results supports data-based policy making. In Korean education, a clear comparison of pros and cons exists in the policy to disclose results of the NAEA in line with the School Information Disclosure System. The advantage, as described in a report of the Ministry of Education, is that reporting results help induce education policy changes at schools and regions and raise quality in school education. Results disclosure is also viewed positively in that it secures the right to access educational information and expands the educational choices of students and parents based on school competition.

On the other hand, teachers' unions and educational experts express concern about the side effects of results disclosure, and raise questions about the educational effectiveness of the national assessment system. They point out that the system only hinders the act of balanced teaching, and generalizes teaching to the test, increases self-study in school after regular school hours, and supplemental classes. A particular concern is that disclosing results will generate excessive competition between regions and schools, leading to a further expansion of private education. In line with the new president's policy commitment, the census-based NAEA was switched to sample-based one in 2017 and the school information disclosure system no longer includes the NAEA results.

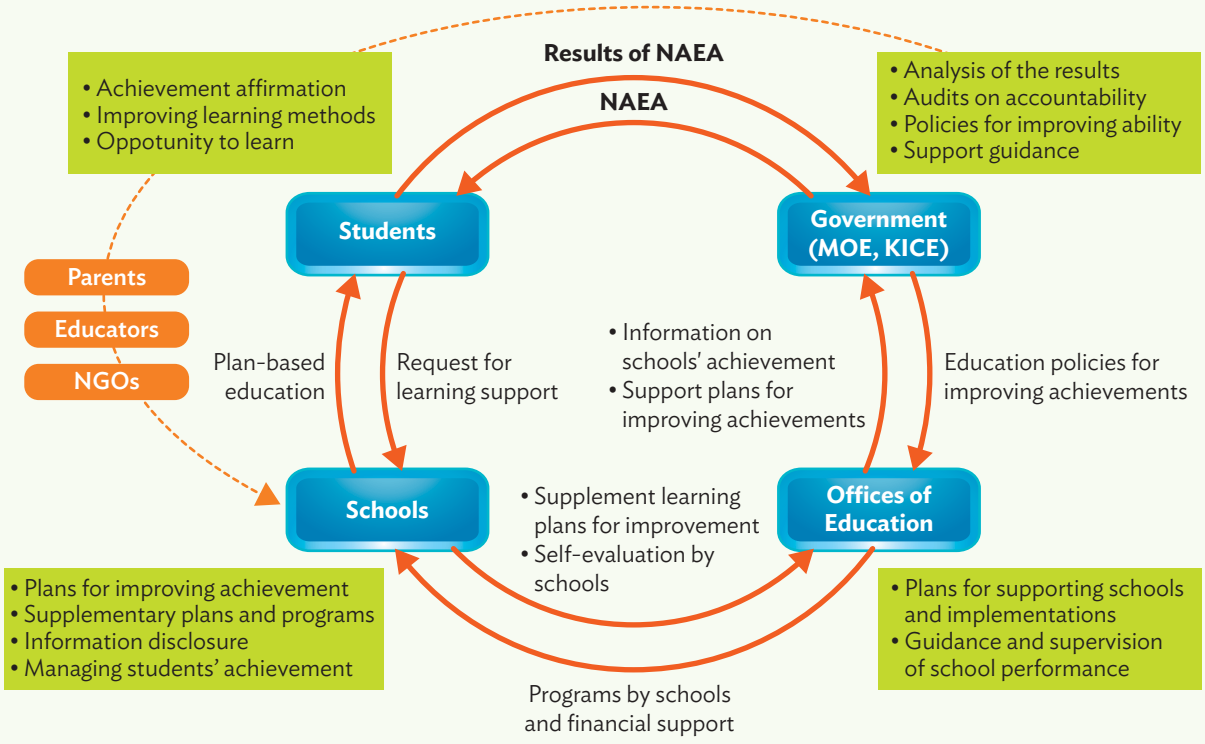
4 See www.schoolinfo.go.kr for information.

B. Utilization of Student Assessment Results

The Ministry of Education and KICE provide NAEA results and material for research, making NAEA data useful in analyzing educational policy effectiveness and improving teaching–learning activities. In addition, school and regional achievements are being reviewed, and the relationship to other educational variables is being analyzed, offering basic information for policy decisions. Thus, diagnosing the trends in academic achievement levels has been made possible, and support has been provided to schools based on schools' characteristics and efforts at academic improvement. Moreover, a network linking schools, expert evaluation institutes, and the government has been formed. This further helps in offering an objective measurement of school education outcomes and education policy effectiveness.

A practical model for utilizing NAEA results has been developed that describes the roles of all components and stakeholders involved in the assessment program and their functions for feedback, planning, development, implementation, and application. Figure 15 illustrates this model for effectively utilizing NAEA results.

Figure 15: Model for Utilization of National Assessment of Educational Achievement Results



KICE = Korea Institute for Curriculum and Evaluation, MOE = Ministry of Education, NAEA = National Assessment of Educational Achievement, NGO = nongovernment organization.
Source: K. Kim et al. 2010.

C. Securing School Accountability for Academic Achievement

The NAEA helped install a school education system that guarantees achievement of basic academic levels to narrow the academic achievement gap and enable improvement. The Zero Plan for Below-Basic Students helps put NAEA results into use to support schools with a large proportion of students in below-basic achievement level. Designating schools as "School for Improvement" helps identify schools in need of improvement and minimizes the number of underachieving students.[5] The ministry provided administrative and financial support to schools to improve academic achievement (MEST 2009). Starting in 2011, the ministry used the NAEA results to provide incentives to local education offices and schools (MEST 2011). The plan is a specific policy strategy of the ministry, drawn from a survey of metropolitan and provincial offices of education reflecting their demand for practical utilization of NAEA results.

In implementing the plan, Ministry of Education seeks four basic directions:

(i) establish a system to comprehensively diagnose and manage academic underperformance at "target schools in need of academic ability enhancement;"

(ii) provide tailored programs enhancing academic ability that consider individual student needs;

(iii) support teachers to raise their capacity for caring for and instructing underperforming students;

(iv) strengthen the accountability of schools for improvement of academic achievement and build a support system that links schools, local educational authorities, and regional societies.

In 2009, a total of 1,440 schools were identified for improvement. Of this, 733 primary schools (12.1%) and 305 middle schools (10.0%) were target schools. Among general high schools, this number was 223 (15.0%) while 179 vocational high schools (12.4%) were identified as target schools. The ministry's financial support for these schools spans a 3-year period starting in 2009, with plans to provide subsidies differentiated by level each year. The ministry also collects mandatory matched funds from the metropolitan or provincial level office starting with the second year of subsidy provision.

Within the allocated subsidy, the office decides the amount to be distributed to schools based on each school's characteristics and educational status. Considerations include school size, status of financial support for each school, and the effort of the school head to raise students' academic ability. The government recommends that local educational authorities provide subsidies in lump sums, so schools can manage them according to specific needs. That is, the government's policy direction is to secure operational flexibility for school heads so that they may provide incentives for teachers, appoint assistant staff, develop and operate education programs, support students' study activities, and so on, based on autonomous decision-making.

[5] A school is designated for improvement if more than 5% of students are below-basic in elementary schools, more than 20% in middle or general high schools, and more than 40% in vocational high schools.

D. Providing Targeted Support to Improve Academic Achievements with Equity

Based on the NAEA results, various types of support are being implemented to strengthen provincial offices of education in educational accountability; and individual schools in their educational capacities, such as comprehensive student support services, including building "diagnosis–guidance–management system(s) for underachieving students"; customized support for elementary schools; and regional and local consulting systems and counseling. The support system for the target schools provides differentiated support to eligible schools based on school size. Elementary, middle, and general high schools with fewer than 300 students receive $46,000, while larger schools receive $74,000. Vocational high schools with students at the below-basic level get $28,000 for 99 students or less below basic level; $46,000 for 100–200 students; and $74,000 for more than 200 students at the below-basic level. The financial support provided to Schools for Improvement are used to recruit personnel through internships and scholarships and to operate programs for improving academic achievement.

During NAEA 2012, students falling below the basic academic level decreased to about a third compared to 2009 (the first year of census-based assessment). In particular, the percentage of elementary school students below the basic academic level fell below 1%. These are an indication of the effectiveness of the NAEA results-based policies (K. H. Kim et al. 2013).

In 2014, Ministry of Education announced the basic academic improvement support program master plan, which focuses on a "comprehensive learning clinic center," "online basic academic-level diagnosis–remedial system," and the "Do-Dream School" (MOE 2014). The program provides tailored support by accurately diagnosing the cause of the lack of basic academic level or ability and providing for learning coaching and psychological counseling. As such, its beneficiaries, scope, and support method were greatly expanded. The existing basic academic level guarantee policy that had been providing financial support by school size based on the number of below-basic level students in NAEA, had short-term success. With the number of below-basic level students in NAEA being extremely small, the new basic academic improvement support program presents a new direction for the national basic academic level guarantee policy.

E. Introducing Comprehensive Policies, Strategies, and Support System

In 2008, the Ministry of Education announced policy and strategies in five areas to advance the support system for students with below-basic achievement and to improve school performance (Figure 16). Rather than making dramatic changes in school leadership and teaching staff, the focus is on striking a balance between autonomy and accountability, and providing support to staff. The five areas include the following:

(i) *School leadership*. Establish a system that ensures autonomy of curriculum organization and school personnel and that strengthens school accountability.

(ii) *Staffing*. Provide incentives to effective teachers and improve human resources by placing learning assistant teachers, internship teachers, and university student tutors who can assist instruction for underachieving students in schools.

(iii) *School climate*. Establish a school environment for supporting instruction by creating consulting and monitoring groups for school management for different education offices, and operating a dedicated class and website support for basic academic achievement for underachieving students.

(iv) *Instructional practice*. Develop and replenish the school's instructional program based on student needs and provide an after-school supplementary class, during-vacation supplementary class, homeroom teacher accountability, subject-dedicated teacher, and individual learning materials for underachieving student instruction.

(v) *External support*. Provide connections with local community networks, such as a regional children's center, the We+Education or We+Emotion (WEE) class, and WEE center that improve safety and discipline; and address students' social, emotional, and physical health needs.[6]

The NAEA results are also reflected when developing new curriculums by assisting decision-making on the scope, sequence, continuity, and difficulty of the curriculum. Recently, findings suggest a need for strengthening teaching and learning support policies for the underprivileged to improve the Korean education system and ensure equity in education.

Figure 16: Policies and Interventions for Low-Performing Schools in the Republic of Korea

Source: Ministry of Education, Science and Technology. 2010.

[6] The WEE centers provide counseling for students who are at risk of bullying or delinquent behavior. They were introduced in 2008 under the WEE project initiated by the Ministry of Education, Science and Technology (MEST) in response to increasing instances of school bullying and its negative impacts on students. MEST introduced multi level counseling service programs: WEE class at the school level, WEE centers at the district level, and WEE schools at the city or provincial education office level.

Chapter 5
KEY LESSONS

Improving student assessment systems is a key strategy developing countries seek to adopt to enhance student learning outcomes. Ministries of education are investing considerable sums in national assessment of student learning in various grades and in school cycles. The Republic of Korea has shown that investing in a robust student learning assessment system can lead to improvements in the quality of education, not just for students, but also in the performance of the overall education system. The following lessons can be gleaned from the experience of the Republic of Korea:

(i) **Investing in institutional capacity for student assessment.** Setting up a high-caliber institution such as the Korea Institute for Curriculum and Evaluation helped provide long-term technical support and engagement for improving student assessment. The national assessment system and practices were entirely developed nationally, underscoring the high degree of national capacity and ownership. The Republic of Korea's student assessment framework is divided into evaluations carried out at the school level (teachers); regionally (metropolitan and provincial offices of education); nationally; and internationally. The country was also able to develop excellent test items for various levels to monitor the quality of the national curriculum.

(ii) **Systematic and scientific tracking of educational achievements.** The Republic of Korea's approach to understanding the educational achievements of elementary, middle, and high school students and tracking their achievements systematically and scientifically provided the basis for actions to redress shortfalls in quality. Student assessment relates scholastic achievements with specific contexts. For instance, the survey questionnaire for collecting educational variables includes information on the context related to school, teacher, and student background, which better explain student achievement results and allow appropriate policy actions based on those. The country also made extensive efforts to ensure the high quality of test items and continuous investment in improving the reliability of testing of student learning.

(iii) **Tracking student assessment is the business of national and decentralized bodies.** The assessment methodology, tools, and instruments, though developed nationally, benefited from high decentralization in use and application. The extensive role played by decentralized agencies, particularly local bodies and schools in using assessment data for improving learning, contributed significantly to ensuring that assessment was a

very important lever in improving the quality of student learning. The implementation of the Zero Plan for Below-Basic Students was particularly noteworthy.

(iv) **Establishing accountability for student learning results.** The Republic of Korea made extensive efforts to increase accountability of the education system toward student learning results. Legal provisions were put in place for disclosure of assessment findings, starting from 2010. This helped create a climate of transparency and accountability for ensuring results in student learning.

(v) **Attention to school factors to improve student learning.** The School Progress Index was developed as an objective measure of schools' efforts to improve student learning achievements, and to enhance an individual school's academic performance. Using student-level longitudinal data, the index adopts a value-added model that manages and improves the quality of personnel who provide learning support and arrangements to ensure a guidance program for underachieving students. Such school-specific measures that use student assessment data to improve quality helped provide individualized support to students. For teachers, assessment results served as baseline data to assist in their instruction in relation to academic aptitude and counseling on future school enrollment plans. Results also enabled better understanding of student achievement levels by school and region, thus serving as evidence to enhance the accountability of educational institutions.

(vi) **Establishing academic enhancement incentives.** The Republic of Korea took measures to ensure that student assessment is backed by academic enhancement incentives to address shortfalls and underachievement. The country has implemented special programs and has provided financial support to provinces and schools to improve student learning. The results of national assessment contribute to academic supplementation programs to develop basic academic ability. Such effective use of student assessment data to redress shortfalls in learning helped the country realize gains across the board in student learning.

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Developing National Student Assessment Systems for Quality Education

Lessons from the Republic of Korea

This study presents an overview of the national student assessment system in the Republic of Korea, the National Assessment of Educational Achievement (NAEA), and its role in the country's progress in education. The report explains the historical evolution of the NAEA's coverage and design. It summarizes how large-scale student assessment data have been used to inform and implement crucial policies to improve student learning and the overall education system. The study can help other countries draw lessons from the Korean experience as they seek to develop their own assessment systems to improve student learning.

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