Achieving Excellence in Teacher Workforce and Equity in Learning Opportunities in South Korea

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Akiba, LeTendre, and Scribner (2007) identified two problems with mathematics education in the United States: (a) a shortage of qualified mathematics teachers and (b) unequal access to those teachers by students of high and low socioeconomic status. Akiba et al. called for further research on how South Korea and other countries have achieved excellence in their teacher workforces and equity in access to qualified teachers. They also called for research on what mediates the relationship between opportunity and achievement gaps. In response, the authors of this article describe pertinent South Korean educational contexts and policies. To ensure teacher quality in the United States, the authors propose establishing teaching as a professional occupation by offering competitive salaries, improving working conditions, and increasing teachers' out-of-class time for planning and professional development. As a way to close the achievement gap, they recommend that accessible supplementary learning opportunities be provided for students who lack family and community resources.

Keywords: achievement gap; equity; South Korea; teacher quality; teacher recruitment; teacher retention; teacher workforce; TIMSS

On the basis of data from the 2003 Trends in International Mathematics and Science Study (TIMSS), Motoko Akiba, Gerald K. LeTendre, and Jay P. Scribner ("Teacher Quality, Opportunity Gap, and National Achievement in 46 Countries," *Educational Researcher,* October 2007) identified two problems with mathematics education in the United States: (a) a shortage of qualified mathematics teachers,[1] and (b) unequal access to those teachers by students of high and low socioeconomic status (SES). These two problems are widespread in K–12 education in the United States (Ingersoll, 1999, 2001). In the interest of improving this situation in the United States, Akiba et al. called for comprehensive research on how other countries, specifically South Korea and Russia, have achieved both excellence in the teacher workforce and equity in access to qualified teachers (p. 380). In response to this call for research, we hope to provide insight into Akiba et al.'s findings based on the pertinent literature and on our experiences as professional teacher educators in both South Korea and the United States.

Akiba et al. (2007) reported three major conclusions. First, overall teacher quality indicators are significantly and positively associated with national achievement in mathematics. Second, national achievement and student achievement gaps between high- and low-SES students are not significantly correlated; in other words, a nation's achievement level does not predict the size of any achievement gap between its high- and low-SES students. Third, opportunity gaps in access to qualified teachers do not predict achievement gaps between high- and low-SES students. Our close comparison of data from the United States and South Korea represents the first finding clearly: Countries with excellence in the teacher workforce produced high student achievement. Among 46 countries, South Korea ranked 2nd in eighth-grade mathematics achievement (with a mean score of 589), whereas the United States ranked 15th (with a mean score of 504). The difference in achievement was reflected in teacher quality, in the sense that a higher proportion of students in South Korea were taught by qualified teachers. According to Akiba et al.'s (2007) criteria, South Korea achieved excellence in the teacher workforce because only 4.8% of its teachers taught mathematics without a major in mathematics or mathematics education; in the United States the percentage was 29.7%.

Although they differed significantly in achievement scores, the two countries shared a large achievement gap between high- and low-SES students (both countries had a gap about 27% greater than the international average). This comparison illustrates the second finding, that there was no correlation between achievement and achievement gaps. In the TIMSS data, high-achieving countries such as South Korea did not necessarily produce a smaller achievement gap.

The third finding was puzzling. In terms of access to qualified teachers, the United States demonstrated a large opportunity gap between students of high and low SES. In contrast, among the top five countries in student achievement, South Korea was the only one where low-SES students were more likely than high-SES students to be taught by qualified teachers. The U.S. data seem logical in that one would expect unequal access to qualified teachers to be reflected in a large achievement gap between low- and high-SES students. However, the data from South Korea challenge the assumption that teacher quality is a major source of achievement.

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Table 1
Teacher Working Conditions at the Lower Secondary Level

Country	Class Size[a]	Ratio of Students to Teaching Staff[b]	Number of Teaching Hours per Year	Number of Working Hours per Year	Annual Salary After 15 Years of Experience[c] (Starting Salary)	Ratio of Annual Salary After 15 Years of Experience to GDP per Capita
South Korea	36.0	20.8	570	1,613	$51,516 ($30,058)	2.33
United States	24.9	15.1	1,080	1,368	$41,090 ($32,225)	0.98

Note. Data are from *Education at a Glance, 2007: OECD Indicators,* Organisation for Economic Co-operation and Development, 2007 (Paris: Author).
[a]OECD average: 23.8.
[b]OECD average: 13.7.
[c]In U.S. dollar equivalents using a purchasing power parity index.

Even with equity in access to qualified teachers, South Korea produced an achievement gap as large as that of the United States. On the basis of this puzzling result, Akiba et al. (2007) call for research on cross-national differences in mediators of the relationship between educational opportunity and achievement gaps.

In the next two sections, we respond to Akiba et al.'s (2007) question of how South Korea "achieved both excellence and equity in teacher quality" (p. 380). We then identify prominent mediators in the South Korean educational context that could solve the puzzle concerning the South Korean data. It is our hope that these explorations will offer further insight into mathematics education and relevant policy in the United States.

Excellence in the Teacher Workforce

Wang, Coleman, Coley, and Phelps (2003) have examined eight countries' mechanisms for shaping the quality of the teacher workforce at seven "policy points" that influence teacher supply. The United States and South Korea differ significantly on two of these points: (a) policies affecting entrance into teacher education and (b) policies affecting recruitment (hiring, tenure, and compensation). In contrast to the United States (Ingersoll, 1999), South Korea attracts highly qualified people to the teaching profession, and their retention rate is very high (Organisation for Economic Co-operation and Development [OECD], 2005; United Nations Educational, Scientific and Cultural Organization [UNESCO], 2004). These significant differences seem to originate from the sociocultural status of the teaching profession in South Korea. Understanding that status requires knowledge of both the high regard in which the teaching profession is held and the occupational conditions of the profession (OECD, 2005).

High Regard for the Teaching Profession in South Korea

Traditionally, in South Korea the teaching profession has been regarded as an honorable job, a view that is rooted in Confucianism, a foundation for Korean cultural values (Sorensen, 1994). In the Confucian saying "King, teacher, and parents are equal," the meaning, clearly, is that king, teacher, and parents should be respected equally for their noble jobs. Confucian respect for teachers is epitomized in an old Korean admonition: "Don't even step on the shadow of a teacher." Although South Korean culture has changed radically through modernization, traditional respect for teachers is still evident in the high standards set for the prestigious role of teachers in the society (Sorensen, 1994).

Confucianism's emphasis on belles lettres and its contempt for practical learning also influence the sociocultural status of the teaching profession (Sorensen, 1994). In industrialized South Korea, the differential treatment of academic and practical learning has been translated into a preference for occupations that require higher education, which brings greater social recognition and monetary rewards. Teaching is oriented to academic learning and requires higher education. Thus, in combination with the cultural respect that it receives, the teaching profession is socially recognized and preferred over other occupations. The value of respect and social recognition outweighs that of monetary compensation for many Koreans and hence attracts highly qualified people to the teaching profession (Korea Research Institute for Vocational Education and Training, 2007; OECD, 2005).

Occupational Conditions of Teachers in South Korea

Working conditions are one likely factor in teacher quality in South Korea (OECD, 2007; Wang et al., 2003). The OECD uses class size, teachers' working time, and annual salary as indicators of teachers' working conditions. At the lower secondary level, the average class size in South Korea is 1.4 times larger than that in the United States; however, the amount of in-class teaching time of a teacher per year in South Korea is just under half that in the United States (Table 1). Teaching for fewer hours may compensate for large class size in terms of teacher workload. Moreover, teaching less could mean that less time is required for preparing classes because teachers may teach a smaller number of different classes.

In-class teaching time is only 35% of the total teacher working time in South Korea, whereas in the United States it is 80% of working time. South Korean teachers have much more time for tasks other than in-class instruction. Even with the difference in class size, the considerable difference in the amount of out-of-class time given to teachers might indicate that teachers in South Korea are able to complete all work-related tasks in school (e.g., preparation for instruction, grading, and administrative work), whereas U.S. teachers have to complete such tasks outside their statutory working time. This interpretation is compelling, particularly because the class size difference (1.44 times larger in South Korea) is comparable to the difference in ratio of students to teaching staff (1.37 times larger in South Korea). Teachers are major teaching staff in both countries (i.e., there is not much difference in the number of instructional supporting staff), and

South Korean teachers have much more time to prepare for classroom instruction and to fulfill other professional responsibilities. This makes a statement to teachers: The structure of the job in South Korea explicitly accommodates its high demands and recognizes teachers as professionals.

In addition to workload, the two countries demonstrate a stark difference in teacher annual salaries (OECD, 2007). Starting salaries for teachers in the two countries are similar, but after 15 years of teaching, U.S. teachers are paid much less than South Korean teachers (Table 1). To compare teacher salaries with those of other occupations in each country, teacher salary is expressed as a ratio of a country's overall wealth, defined by gross domestic product (GDP) per capita (OECD, 2007). The salary of South Korean teachers has an economic power about 2.4 times higher than that of U.S. teachers (Table 1). South Korean teachers do far better economically than U.S. teachers, and "one often finds that some of the brightest and most ambitious graduates enter the teaching profession" (Wang et al., 2003, p. 33). In a recent nationwide survey of South Korean K–12 students' job preferences, teaching ranked highest of all (Korea Research Institute for Vocational Education and Training, 2007). A recent analysis of the South Korean labor market (Korea Labor Institute, 2004) also provides compelling data that explain the popularity of the teaching profession. When compared with other occupations that require a 4-year college education or beyond, the medical field has the highest income level (27% above average), followed by education (15% above average) and engineering (13% above average). As a result, the medical field tends to attract the highest achieving students, followed by education and engineering (pp. 112–139). By contrast, in the United States teaching is less attractive than other occupations in terms of salary (Ingersoll, 1999). Teachers' working conditions are also unfavorable in the United States as compared with those in other countries, including South Korea (OECD, 2005).

South Korean Policies on Teacher Recruitment, Selection, and Employment

The relatively high status of the teaching profession in South Korea, anchored in cultural beliefs and occupational conditions, upholds multistage teacher recruitment, selection, and employment processes there. South Koreans who want to obtain a teaching license must undergo two major screening procedures: an entrance exam to teacher education programs and the National Teacher Employment Test (NTET). A majority of students who enroll in teacher education programs come directly from high school. Admission committees for South Korean teacher education programs use four criteria, with a range of weights on each criterion across various programs: high school records (grade point average and teacher recommendations), the college entrance exams administered once a year by the government, essay exams, and interviews. These criteria are used to assess academic preparation, aptitude, and disposition. Because of the popularity of the teaching profession, high-achieving students enter teacher education programs (the top 10% of high school graduates, according to a recent report [Korea Labor Institute, 2004]). For example, in the year 2007, universities in Busan (the second-largest city in South Korea) announced the prospective cutoff scores from the college entrance exam that applicants need to achieve to enter various departments of the universities in the city (Oh & Kwon, 2007). Secondary teacher education departments had the highest cutoff scores, followed by pharmacy and medical schools (in some programs, South Korean students start medical school as undergraduates). With regard to academic preparation, students in teacher education programs are comparable to their peers in other professional programs.

Upon successful completion of the required program of study[2] (see OECD, 2005, or Wang et al., 2003, for comparisons of teacher education programs), all students in a teacher education program obtain a lifetime teaching certificate. Mathematics majors can also obtain a secondary mathematics teaching certificate at the undergraduate or graduate level. To obtain a teaching certificate, they need to be admitted by a teacher education program based on certain criteria established by the program, such as grade point average and aptitude. This process is also competitive because the government limits admissions on the basis of demand for teachers in each subject area. Once accepted, the students are required to take education courses to meet the teaching certificate requirements. From a South Korean perspective, therefore, the distinction between a mathematics major and a mathematics education major is blurred. In the TIMSS data, the 40.4% of South Korean teachers with a mathematics major must have taken the required number of education courses to be certified in addition to the courses required for their mathematics major.

Once certified to teach, graduates are eligible to take the NTET in competition for jobs in public schools. The NTET is not part of the licensure process but part of the selection/hiring process. The test is designed and administered by the Korea Institute for Curriculum and Evaluation, a research institute funded by the South Korean government. The NTET assesses applicants' knowledge, skills, and dispositions through a three-tier process: preliminary (100 points), secondary (100 points), and final (100 points). The preliminary and secondary tiers are written exams that assess applicants' mathematics knowledge (52%–56% of total score), pedagogical knowledge (20% of total score), and mathematics-specific pedagogical knowledge (24%–28% of total score) in multiple-choice and short-answer formats (preliminary exam) and essay writing (secondary exam). Compared with the required coursework in teacher education programs, the proportion of each assessment area indicates that the NTET emphasizes mathematics-specific pedagogical knowledge more than general pedagogical knowledge (26% in the NTET versus 14% in most teacher education programs). The final exam assesses knowledge, skills, and dispositions through teaching performance and an interview (Hankook Kyoyook Shinmoon, 2008). The assessment results are used to rank the applicants within the city or province where they have applied for a position, and the number of applicants who pass the test depends on the projected number of positions to be filled in the public schools of each city or province.

Because of the popularity of the teaching profession, the test is very competitive. For example, the probability of being hired as a mathematics teacher in Seoul was 1 in 28.2 for 2007 and 1 in 20.3 for 2008 (Seoul Metropolitan Office of Education,

2007). The hiring process involves very high standards because the competition takes place among the outstanding applicants who are admitted to and complete teacher education programs.

Once hired, teachers are automatically tenured until they reach the retirement age of 62 years. This job security is an attractive factor in South Korea, where lifetime service and employment are respected and valued (Korea Labor Institute, 2004; OECD, 2005).[3] Because of teachers' automatic tenure, the South Korean government has emphasized inservice professional development (Coolahan, 2004; OECD, 2005). After 3 years of teaching, teachers are eligible to enroll in a 5-week (180-hour) professional development program approved by the government to obtain an advanced certificate. An advanced certificate provides an increase in salary and eligibility for promotion to administrative positions within a teacher's school or district, or in the government education department. In addition, teachers are required to take 90 hours of professional development courses every 3 years after their fourth year of teaching (Hankook Kyoyook Shinmoon, 2008).[4]

So far, we have discussed how cultural beliefs about teaching and occupational conditions uphold South Korean policies for recruitment, selection, and employment that ensure excellence in the teacher workforce. The South Korean case supports Ingersoll's (1999) claim that "ultimately . . . the way to upgrade the quality of teaching and teachers is to upgrade the quality of the teaching job. Well-paid, well-respected occupations that offer good working conditions rarely have difficulties with recruitment or retention" (p. 35).

Equity in Access to Highly Qualified Teachers

It seems that because South Korea has a high percentage of qualified teachers, the probability of students' having equal access to a qualified teacher is high. During the past half century, South Korea has achieved the fastest economic growth in the world, mainly by developing human resources through formal education (Morris, 1996). Education has been the best path for upward mobility in South Korea because high educational attainment is coupled with more opportunities in the labor market and greater economic success. Therefore, South Koreans put high demands on the government to ensure equal access in education (Sorensen, 1994). Currently, two major government policies encourage equal access: teacher rotation and incentives. Teachers are hired at the city or provincial level and assigned to positions in schools in the city or province. Then every 5 years, they are required to move to a different school within the city or province. In doing so, they have a virtually equal probability of teaching in any given school within the city or province.

Regular rotation of teachers among schools might sound onerous to teachers in the United States because it means adjusting to a new school setting every 5 years. However, South Korean schools are fairly standardized, which makes a 5-year rotation plausible. A majority of South Korean lower secondary schools have similar school settings. Students stay in a classroom while teachers move around to different classrooms. During out-of-class time, teachers work in a shared office space, which naturally increases interactions among them and enables them to share their instructional resources. Such an arrangement is supportive to teachers new to the school. A national curriculum reduces variances in curriculum content; thus teachers need mainly to become familiar with different curricular materials such as textbooks, technologies, and hands-on equipment. All South Korean lower secondary schools have six to seven 45-minute class periods per day, and teachers teach three to four class periods per day. Given the similarities in work settings among schools, teacher rotation is less burdensome for teachers than might be expected. In return, all students are equally likely to have teachers of the highest quality.

In addition, teachers have incentives for working at schools in regions with disadvantaged populations, including remote rural areas, islands, and low-SES urban areas (UNESCO, 2004). The incentives include smaller class size, less in-class teaching time, stipends in addition to salary, an opportunity to choose one's school after teaching in an area with a disadvantaged population, and advantages in seeking promotion to administrative positions. The advantage in promotion plays a critical role because, in South Korea, administrative positions generally are preferred as the final stage of the teaching profession, in terms of both social recognition and salary. In the United States administrative positions are on a separate track, but in South Korea mostly former teachers who have accumulated long years of teaching experience and received recognition for excellence in teaching and service are promoted to administrative positions, after appropriate professional development in administration. Administrative positions are highly respected and desired by teachers in South Korea; hence there is a greater likelihood there than in the United States of finding qualified teachers in disadvantaged schools, as can be seen in the TIMSS data.

So far, we have discussed how South Korea achieved its excellence in the teacher workforce and equality in access to qualified teachers. In the following section, we discuss the mediating factors that shed some light on the country's persistent achievement gap. Recall that even with equal opportunity in access to qualified teachers, there exists an achievement gap in South Korea as large as that in countries with unequal access.

Achievement Gap and Equity

The achievement gap between high- and low-SES students might be explained by unequal access to the private instruction that is prevalent in South Korea. In this section, we first describe two sociocultural beliefs about education as sources of the prevalence of private instruction; we then discuss policy responses to the inequity.

Emphasis on Effort

The great zeal for education in East Asian countries is well known, and South Korea is no exception (McGaw, 2005; Shen, 2005; Stevenson & Stigler, 1994). The Confucian belief in success through hard work, the economic emphasis on developing human resources, and the role of education as a critical tool for upward mobility have created tremendous enthusiasm for education in South Korea (Morris, 1996; Sorensen, 1994). South Koreans believe that students can succeed in school when they study hard and thus consider spending more time on study as the main way to succeed in learning (Sorensen, 1994). This belief is reflected in the finding that at 15 years of age, students in South Korea ranked top among 29 comparison countries in effort to learn as measured by time spent on study (OECD, 2004). South

Table 2
Student Learning Time for Mathematics in Hours per Week

	Formal Learning			Informal or Free-Choice Learning					
Country	Instruction Time	Homework or Other Assignment by Teachers	Total Study Time Led by School Teachers	Remedial Classes Offered by School	Enrichment Classes Offered by School	Private Tutors	Out-of-School Classes	Other Study	Total Informal Study Time
South Korea	4.1	1.8	5.9	1.4	0.7	0.7	1.4	0.4	4.6
United States	3.7	2.8	6.5	0.5	0.5	0.2	0.1	0.2	1.5
OECD average	3.3	2.4	5.7	0.3	0.2	0.2	0.3	0.2	1.2

Note. Data are from *Learning for Tomorrow's World: First Results From PISA 2003,* Organisation for Economic Co-operation and Development, 2004 (Paris: Author).

Korean students spend more time than students in other countries studying outside classrooms. In 2003, about 75% of South Korean students in Grades 7 to 9 (C. J. Lee, 2005) received instruction outside school through tutoring and cram schools. The participation rate may be higher when we include after-school academic programs offered by schools. Recent data show that 22.1% of students in Grades 7 to 9 participated in after-school academic programs (Korea National Statistical Office, 2008).

U.S. students spend more time on learning mathematics in classrooms and working on school assignments at home (6.5 hours per week) than do South Korean students (5.9 hours per week). However, South Korean students' greater participation in informal or free-choice learning goes beyond compensating for the difference. South Korean students spend much more time than U.S. students in remedial or enrichment classes offered by schools, in private instruction, and in other forms of study (Table 2). In total, they study mathematics for 2.5 hours longer per week, and they participate in outside formal instruction for 3.1 hours longer. In South Korea schools offer more remedial or enrichment classes to students (1.1 hours per week more), and students take more private instruction (1.8 hours per week more) than in the United States.

The prevalence of private instruction in South Korea reflects the social norm of parental commitment to children's education as the path of social mobility (Rohlen & LeTendre, 1996; Stevenson & Stigler, 1994). In South Korea, household expenditure on private instruction in 2003 made up 56% of the national spending on formal education, and it has increased since then (Korea National Statistical Office, 2008; C. J. Lee, 2005). Although South Korea has achieved equity in access to qualified teachers in formal education, access to private instruction is not equal (Bray, 2006; C. J. Lee, 2005). Therefore, the roles of public education and equity in access to private instruction have become significant social issues in South Korea (Kim, Lee, & Lee, 2005).

The quality and quantity of private instruction may vary depending on its cost (Ireson, 2004). Unequal access to private instruction in South Korea has been studied with respect to three aspects of SES: *parental income, parental education level,* and *residential area.* First, parental income is positively related to family expenditure on private instruction. Using a scale with four levels for household income (low, lower middle, upper middle, and high), a survey found that high-income households in South Korea spent 2.9 times more per student on private instruction than did low-income households (Choi et al., 2003). Second, parental education level is positively related to students' access to private instruction. In 2007, about 90% of students whose parents had a college degree or beyond reported taking private instruction, as compared with only 75% of students whose parents had a high school education (Korea National Statistical Office, 2008). Third, residential area is related to access to private instruction. Students in rural areas have less access to private instruction than do students in cities. It was found that 66% of students in rural areas took private instruction, as compared with 78% to 81% of students in cities of various sizes. Moreover, students in cities spent 1.8 to 2.3 times more money on private instruction. In both quantity and quality, students in rural areas had less access to private instruction (Korea National Statistical Office, 2008). The low level of participation by students in rural areas is attributed to there being fewer tutors and fewer private institutions available and to lower economic status of the students' families (Choi et al., 2003).

Education Fever

Inequities in access to private instruction have long been a concern in South Korea. In the 1950s and 1960s, before Korea's period of most dramatic economic growth, only elementary education was compulsory, and access to secondary education was limited. Entrance exams for secondary schools were used to make them accessible to the best qualified students. The result was an increase in private tutors for those who could afford them, enabling those who were talented but underprivileged to pursue higher education through earnings from tutoring (Ireson, 2004; Sorensen, 1994). The exams also created a common perception among South Koreans that secondary schools and universities could be ranked by a scale based on cut scores on the entrance exam (Sorensen, 1994). The rankings increased demand for private instruction to prepare students to compete for entry to prestigious schools. It became common, among students who could afford it, to take a year or two off from school for private instruction to prepare for entrance exams.

With economic growth, public secondary education became more accessible, and initially the middle school entrance exam

was abolished. To ameliorate exam pressures and to mix ability among schools, all students are assigned to schools by lottery based on their residential areas. School buildings and equipment are standardized nationwide. The high school entrance exam continues to this day, but the test scores are used to select students for special schools, such as magnet schools and vocational schools, while students in the regular academic track are assigned to schools by lottery. However, the college entrance exam maintains its historical value and perceived importance, which has created what South Koreans call "education fever." Education fever drives students to work hard to enter prestigious universities as a way to expand their opportunities for success (Kim et al., 2005; C. J. Lee, 2005). Institutions that provide private instruction increasingly thrive, developing their own systems of quality control to compete in the market and becoming a significant part of the South Korean economy (C. J. Lee, 2005; Yoo, 2002).

The prevalence of private instruction in South Korea, therefore, obscures the effect of public education on student achievement. Students' unequal access to private education (J. Lee, 2007) may explain the achievement gap between students of high and low SES. Although public schools provide students with an equal opportunity to learn mathematics from qualified teachers, the students with access to private instruction may perform better. This argument is compelling when we consider students' reasons for participating in private instruction: enrichment and, to a lesser extent, remediation (J. Lee, 2007; Ireson, 2004). A recent survey revealed that only 51% of low-achieving students (the bottom 20% of students) participated in private instruction, whereas the participation rate was 89% among the top 10% (Korea National Statistical Office, 2008). Moreover, the expenditure of the high-achieving students was 3.1 times higher than that of the low-achieving students. High-achieving students participate more in private instruction, a circumstance that could widen the gap between the two groups. Although further research is needed to determine the effect of private instruction on student achievement (Bray, 2006; Ireson, 2004; J.-T. Lee, Kim, & Yoon, 2004), it seems clear that in the South Korean context, private instruction contributes to the student achievement gap between high- and low-SES students.

The prevalence of private instruction in South Korea is related to inherent limitations in the capacity of public education to meet various student needs (Ireson, 2004). South Korean public education has a national curriculum, which limits teachers' flexibility in making adaptations to meet student needs. Although the average class size has been continuously reduced, it is still larger than in most countries (OECD, 2005). Moreover, public educational goals such as developing well-rounded, creative citizens do not necessarily meet parental or student needs for college preparation. Competition for entry to prestigious universities drives students to try to do "more" than others, which means studying outside school. Private instruction has become a necessary evil in South Korean society.

Policy Response

In response to demands arising from education fever and unequal access to private instruction, the South Korean government took several actions to provide equal opportunities for underrepresented students while looking for ways to redirect exam-driven education fever. For those with limited access to private instruction, the government now provides free lessons on TV or the Internet, has increased the offerings in academic after-school programs, and promotes differentiated instruction (C. J., Lee, 2005; J. Lee, 2007). At the same time, the inclusion of creative problem solving in school assessment and college entrance exams has been promoted to reduce drill-and-practice-driven private instruction. In addition, in 1996 the South Korean government established a policy for affirmative action programs for applicants from rural areas, and the government and universities are providing special scholarship programs for low-income families.

The literature and data suggest that the achievement gap in South Korea can be explained at least in part by unequal access to private instruction. Such an explanation may not apply in the United States, however, given that U.S. students on average do not take much private instruction (Table 2). Rather, unequal access to qualified teachers may explain the achievement gap in the United States because 81% of students' total study time is directed by schoolteachers through classroom instruction and homework assignments. In addition, the relatively large amount of time spent on homework by U.S. students (35% of total study time) implies a critical role played by family. For example, when students are assigned substantial amounts of homework, family support, in the form of direct tutoring or an encouraging home environment, is critical. Thus low-SES students (defined in terms of parental education level and educational resources at home in the TIMSS data) are disadvantaged by the lack of resources at home. As Akiba et al. (2007) point out, the two countries have different mediators for the relationship between educational opportunity and achievement gaps.

To summarize, the mediators of the relationship between opportunity and achievement gaps in South Korea include unequal access to private instruction. The prevalence of private instruction in South Korea is anchored in parents' commitment to their children's education and an emphasis on effort as the path to educational success. To promote equity in access to out-of-school learning, various policy responses are under way in South Korea, and research into the effects is in order. In contrast, teacher quality seems to be a critical mediator of the achievement gap in the United States.

Implications

What are the implications of the South Korean data for U.S. education policy regarding the teacher workforce, student achievement, and equity in learning opportunities?

In the view of Akiba et al. (2007), the TIMSS data suggest that it would be beneficial in the United States to (a) provide additional resources and incentives to attract and retain qualified teachers for low-SES students and (b) provide teachers with sufficient professional development opportunities to ensure high quality in the teacher workforce. The South Korean case described in this article supports these two recommendations. As Ingersoll (1999) has pointed out, in the United States teaching is not treated as a "professional" livelihood, either within or outside schools, and not enough highly qualified students find teaching attractive. By contrast, in South Korea the best and the brightest students are attracted

to teaching. To ensure high quality in public education, it is necessary to treat teaching as a professional occupation with competitive salaries and working conditions (OECD, 2005). In particular, the large proportion of in-class instruction time to working time in the United States should be reconsidered. Teachers should have enough time to plan and assess their instructional practices and to develop professional knowledge with their colleagues (Kang, 2007; Little, 2003). In addition, to encourage them to learn together, teachers should have shared space within the school building. The current small ratio of out-of-class time to total working time, together with teachers' limited opportunity for interaction with colleagues, may not only lower the quality of classroom instruction but also undermine the status of the teaching profession and make it less attractive. When fundamental teaching conditions become better, the quality of the teaching workforce should improve.

To attract qualified teachers to schools in underserved areas, additional incentives should be provided. South Korea provides one possible model. Salary incentives, links to promotion, and better teaching conditions, such as reduced teaching time and smaller class size, should be provided to compensate for the additional challenges that teachers face in such areas.

High turnover is a major cause for the prevalence of underqualified teachers in U.S. schools, particularly in schools that need the most highly qualified teachers (Ingersoll, 1999). To treat teaching as a profession, it is necessary to allow time for reflective practice and to provide significant salary increases according to years of teaching in the challenging schools. When working conditions are better and salaries increase with experience, teachers in regions with disadvantaged populations are more likely to stay than to leave.

We report that the excellence of South Korean public school teachers may not in itself explain their students' high achievement. South Korean students study more than U.S. students do because a majority of them participate in private instruction. However, it would be naïve to conclude that more private instruction and the added study time associated with it explain the high achievement of South Korean students. The effect of private instruction on individual students' achievement is not conclusive (Bray, 2006), and research indicates that the level of participation in private instruction is not related to nations' achievement in mathematics (Baker, Akiba, LeTendre, & Wiseman, 2001). The considerable difference between the two countries in student effort in learning mathematics instead reveals national differences in the level of emphasis placed on mathematics learning. Students in South Korea spend a great amount of out-of-school time studying mathematics. Although they may perform well in mathematics, they may lose time for other valuable childhood experiences (McGaw, 2005). In contrast, U.S. students spend less time than South Korean students on studying mathematics outside school (OECD, 2004). These findings suggest that both countries should reflect on goals and efforts in mathematics education and find ways to promote more effective, efficient, and equal learning opportunities for students.

U.S. students who lack educational resources might benefit from a policy like that in South Korea that aims to mitigate the opportunity gap by providing supplementary learning opportunities in public schools (Table 2). To close achievement gaps, supplementary learning opportunities should be publicly funded.

As private instruction becomes more prevalent around the world (Ireson, 2004; OECD, 2004), further research is needed on how it affects individual students' learning in comparison with public education. Moreover, research on how student learning is affected by differences in the purposes of private instruction across countries could shed light on how such instruction mediates the relationship between public education and student achievement. Meanwhile, public education should continue to evolve—drawing from successful examples of informal or free-choice learning—to better meet the contemporary needs of individuals and of society.

NOTES

[1]Akiba, LeTendre, and Scribner (2007) used three criteria for determining whether a mathematics teacher is qualified: (a) possession of a teaching certificate, (b) a major in mathematics or mathematics education, and (b) teaching experience of 3 or more years. Ingersoll (2001) provides further discussion on the subject.

[2]Most mathematics education programs in South Korea require 33 or more semester hours of mathematics, 21 semester hours of pedagogy (e.g., curriculum and assessment, technology in education), and 9 semester hours of mathematics education (e.g., technology and mathematics education, mathematics history and mathematics education, geometry teaching methods, algebra teaching methods).

[3]In South Korea the teacher retention rate is high (Korean Educational Development Institute, 2004; OECD, 2005), not only because of the high sociocultural and economic status of the teaching profession but also because of the sociocultural respect for perseverance in one occupation. High retention is part of the Korean culture, which in turn leads Koreans to place a high priority on job security when choosing an occupation.

[4]The quality of inservice professional development in South Korea has recently been criticized, and its reform is under public discussion ("Kyo-won yun-soo [Teacher professional development]," 2008).

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