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ABSTRACT

This paper examines the results of the Third International Mathematics and Science Study (TIMSS) for the United States and South Korea. Eighth-grade mathematics scores for the two countries were studied as a function of school level variables and student level variables using Hierarchical Linear Modeling. Urban settings were found to be advantageous for Korean students, whereas U.S. students from suburban settings had higher mathematics scores. The urban-rural distinction was more significant in Korea. School level variables had little effect on Korean outcomes but accounted for over one-third of the variance in U.S. data, which was consistent with the hypothesis that highly centralized education systems leave little room for the effects of social capital variables. Educational technology shortages as perceived by school principals played no apparent role in the scores for either nation. Korean culture plays an important role in preventing the urban decline which has apparently affected urban education in the United States. Contains 25 references. (WRM)

An International Perspective on Eighth Grade Mathematics Performance in Rural, Urban, and Suburban Schools: The United States vs. Korea.

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Abstract

The TIMSS results of the United States and Korea's in eighth grade mathematics were studied as a function of school level variables and student level variables using Hierarchical Linear Modeling. Urban settings were found to be advantageous for Korean children, whereas suburban settings favored US students. Also, the urban - rural distinction played a greater role in Korea than in the US. Consistent with the hypothesis that highly centralized education systems leave little room for the effects of social capital variables, the Korean data showed little effect of school level variables, whereas such variables accounted for over one-third of the variance in US schools. Educational technology shortages, as perceived by school principals, played no apparent role in either nation. The authors hypothesize that Korean culture plays in important role in preventing an urban decline in that country similar to that in the US.

[1] This paper grew out of the authors' cooperation during the National Center for Education Statistics (NCES) Third International Math and Science Study (TIMSS) Database Training Seminar, held in Rockville, Maryland, November 10-13, 1997. Requests for reprints should be sent to the second author at the Illinois State Board of Education E216, 100 N. First, Springfield, IL, 62777-0001.

An International Perspective on Eight Grade Mathematics Performance in

Rural, Urban, and Suburban Schools: The United States vs. Korea.

In this paper we exploit the riches of the 1995 Third International Mathematics and Science Study (TIMSS, see e.g., Beaton, Mullis, Martin, Gonzalez, Kelly, and Smith, 1996; Illinois TIMSS Task Force, 1997; Robitaille, 1997; Schmidt, McKnight, Valverde, Houang, and Wiley, 1997) by studying rural, urban, and suburban schools in an international context. Specifically, we relate "social capital" and educational technology variables to mathematics performance in eighth grade students in the United States and in Korea. As is explained below, these countries were selected because they differ with respect to the extent to which social capital can be expected to benefit student performance. The approach taken here is primarily descriptive. That is, we inspected the questions on TIMSS teacher and principal questionnaires for variables indicative of social capital and educational technology and investigated their relation to student test scores. TIMSS definition of a school location as either rural, urban, or suburban, is strictly in geographical terms and was taken from a questionnaire administered to school principals.

Throughout, our interest extends both to the individual level (i.e., the students) and the more aggregate level (the schools visited by these students). To avoid drawing erroneous conclusions due to the mixing of these two levels of analysis, the US and Korean TIMSS data were analyzed using hierarchical linear model techniques (HLM, Bryk & Raudenbush, 1992).

Social Capital

By social capital we mean a type of resource that arises from the existence of a particular configuration of social relations in the students' direct environment. Although the present study cannot do justice to Coleman's (1990) formulation of intergenerational closure, the present research includes some limited aspects of the social networks in which students, their parents, and the school system are embedded. Classical theory (e.g., Durkheim, 1964; Simmel, 1971; Tonnies, 1961) suggests that the availability of social capital coincides to some extent with the distinction between urban and rural since rural areas are richer in social network closures (especially those based on kinship and proximity factors). Other formulations (e.g., Fisher's [1982, 1995] urbanization theory) imply that urban ties are not necessarily "weaker" than rural ties, and a debate exists regarding whether urban relations are actually weaker than rural relations or just "different" (see also Wellman and Leighton 1979). In fact, urban social networks may be "richer" than those in rural areas in some respects because urbanites may hold crosscutting ties across different sub-cultural groups which arch over and beyond family and residential locales (For theories of cross-cutting ties, see e.g., Burt, 1992; Granovetter, 1983).

Although the availability of social capital is expected to produce a push towards better student performance, any positive effects may be lost to the extent that the school systems cannot accommodate this energy. In particular, it would seem that highly centralized education systems that rely little on participation from its community are unable to respond constructively to the availability of social capital. This hypothesis can be tested by a comparison of nations that differ with respect to their levels of centralized versus local control and administrative flexibility. For the reasons outlined below, the United States and Korea appear well suited for this purpose.

An Overview of the US and Korean Educational Systems

According to Kim (1997), governance in the Korean elementary and high school system consists of three layers: the Ministry of Education, and offices at the provincial as well as the county levels. The Ministry of Education publishes and approves textbooks, and all schools are required to follow a national curriculum set by this Ministry. The latest (1995) implementation of this curriculum outlines the intended learning outcomes, the contents to be taught by grade level and subject, and the time to be allocated to each subject. Decisions about instructional methods and classroom processes are made by teachers and schools. All students follow a compulsory mathematics program until the end of Grade 12 which comprises four courses: General Mathematics, Mathematics I and II, and Applied Mathematics, where Mathematics II is an advanced course for science majors and Applied Mathematics is intended for vocational secondary students.

Korean teachers stimulate students to discover principles and rules to solve problems and students are not allowed to use calculators in mathematics instruction, except in Applied Mathematics. This circumstance is perhaps explained by the fact that Korean "mathematics teachers believe that the use of calculators may cause a decline in student's computational skills " (Kim, 1997, p. 230). The lecture method is generally preferred due to its greater flexibility, although peer tutoring, small group activities, and discussion are also used consistently. At the end of the ninth grade 98% of all students face highly selective high school entrance exams. These entrance exams are a source of great concern to students and parents alike, and teachers try to help their students by emphasizing short term recall activities to prepare for them for these exams. In addition, many students receive "juku," which is a Japanese term referring to after-school tutoring.

In addition to the absence of high school entrance exams, the United States' educational system differs from that in Korea in many important ways. The curriculum in US schools is typically determined at the school level in accordance with their states' guidelines. Consequently, large differences exist in the mathematics curriculum taught in schools across the states (Robeck, 1997). In addition to problem solving, US schools also emphasize mathematical "literacy," while increasing attention is paid to social and cultural issues related to mathematics. Textbook selection is a local decision, although the choice may be limited to books approved by the state in which the school resides. In general, memorization is de-emphasized, whereas the use of calculators and computers is encouraged. According to Robeck (1997) there currently are computers in 99% of all public schools, nationally there is one computer for every 11 students, and by 1993-94 well over one-third of the US schools had computer networks, modems, or both.

The wide differences in US and Korean use of educational technology was the major reason for including this variable in the present study.

Method

TIMSS

The Third International Mathematics and Science Study (TIMSS) was carried out in 1995 as the most ambitious survey in education research to date. TIMSS was designed by task forces of 41 countries to measure mathematics and science achievement in the early, middle, and final years of schooling in as many as forty-one nations. Also, some US states (e.g., Illinois) participated as "mini-nations." (Illinois TIMSS Task Force, 1997). As mathematics is arguably the most "culture-free" topic being taught, the present research focuses exclusively on this subject area. Although TIMSS also included nine year olds (Population 1) and students in their final year of secondary education (Population 3), the present research uses the eighth grade student (Population 2) data only as this grade represent the core of TIMSS (Schmidt et al., 1997, p. vii). The United States' sample includes 7087 students from 181 different schools, while the Korean sample includes 2920 students from 150 different schools. The data used in this study are in the public domain and can be accessed on the "wwwcsteep.bc.edu/timss" Internet web site.

TIMSS assessed the following sub-areas in mathematics: Fraction and Number Sense (34% of the test), Geometry (15%), Algebra (18%), Data Representation, Probability (14%), Measurement (12%), and Proportionality (12%). Sample items can be found in the released item set (TIMSS Mathematics Items, 1997). Schools, students, and items were randomly selected based on a matrix sampling design and IRT methods were used to arrive at a common scale suitable for making international comparisons. TIMSS relies on a "plausible values" approach (or, "multiple imputation method") to reflect the reliability of student's performance indicators (for details, see TIMSS, 6-1). The first plausible value was used throughout, while standard TIMSS weighting was employed.

Other Variables

In order to possibly simplify the presentation, we attempted to create Rasch type latent dimensions (Linacre & Wright, 1997; Wright & Masters, 1982). Unfortunately, with the exception of a mathematics related equipment shortage factor (see below), this proved impossible.

Urban, Rural, and Suburban. In addition to student tests, TIMSS also administered questionnaires to teachers and school principals. School principals were asked to identify their school's location as either being rural (location is in a "geographically isolated area" or "Village or rural [farm] area"), urban (location is "close to the center of a town/city"), or suburban (location is "on the outskirts of a town/city"). The rural, urban, and suburban classification is represented by the dummy variables DRURAL, DURBAN, and DSUBURB. A fourth dummy variable (DLOCMISS) was introduced to accommodate missing answers.

Teacher Variables. The proportion (PMSBOTH) of classroom teachers who teach "three quarters or more of their teaching load in mathematics AND science subjects. PYEAR5 is the percentage of the classroom teachers who have been at their current school for 5 or more years. This variable is a proxy for teachers' job commitment and may also reflect teacher specialization.

Perceived Equipment Shortage. School principals were also asked whether their schools faced shortages in computer hardware, computer software, library materials, audio-visual resources. Rather surprisingly, it was found that the answers to these questions followed a Rasch model such that relatively reliable latent factors (MSHORT) could be constructed in each country (the classical KR-20 reliability of the resulting scales was .84 for US principals and .75 for Korean principals). However, as is discussed in the result section, the nature of this latent factor differed in the US and Korea.

Social Capital. Principals were asked to indicate whether their schools have "an official policy related to promoting cooperation and collaboration among teachers" (DPOLCOOP), whether teachers "meet regularly to discuss instructional goals and issues" (DMEETCOOP), and whether teachers are "encouraged to share and discuss instructional ideas and materials." This last item was omitted because every principal in the two nations answered "yes." In addition, principals' activities in the community are reflected by the hours per month spent on "representing the school at official meetings" (TALKCOM) and "talking with parents" (TALKPARE).

Student Variables. Student gender was coded in the variable DGIRL (0 = boy, 1= girl), whereas PEDMAX students' parents highest level of education (0 = I don't know, 1 = primary education, 2 = secondary education, and 3 = university). This encoding assumes that students whose parents received primary education only are better off than those of parents who do not share educational experiences with their children. Analogously, the variable SED reflects the student's expectation concerning the highest level of education they themselves would achieve in the future (again, "I don't know" is coded as 0). The variable MOMMTH represents students' agreement with the statement "my mother thinks it is important for me to do well in mathematics in school" on a seven point scale ranging from 1 (= strongly disagree) to 4 (= strongly agree). ITEM3 is a dummy variable indicating whether a student possesses a computer, a study desk, and a calculator (i.e., simultaneously).

Finally, DJUKU is a binary variable reflecting whether students receive outside-school mathematics lessons. The original questionnaire item regarding extra lessons asked the time spent for "taking extra lessons in mathematics" before or after schools and if a respondent spends time at all, then, they are considered receiving juku instruction. However, this question item is ambiguous because such instruction may include not only private lessons, but also after-school programs at schools where students receive tutoring from their own teachers. This interpretation is supported by the surprising fact that 33% of the US students indicated receiving at least some after-school instruction in mathematics.

Analyses

Since students are selected from the same schools and because they have shared experiences or similar reasons to have attended to the same schools, their individual responses are not independent. Hierarchical Linear Modeling (HLM, see, e.g., Bryk & Raudenbush, 1992) solves this problem by incorporating into the model a unique random effect for the schools in which individual students are nested. Thus, HLM yields a decomposition of total variance into variances specific to the student (Level-1) and school (Level-2) unit-levels.

In the present research we are interested in how much variation exists between schools and how much of this inter-school variation can be explained by urban, suburban, and rural differences, and other school-level factors in conjunction with individual level student variables. To this end, mathematics achievement score is regressed against a matrix X containing Level-1 predictors, such as gender and parents' education level, which have been centered around their grand means. Due to this centering, the Level-1 intercepts have substantive meanings. For instance, when *X* contains continuous variables such as parents' education level, then the Level-1 intercept reflects the score for students of each school whose parents' education corresponds to the grand mean. Further, when grand-centering is applied to dummy variables such as gender, the intercept is the school mean outcome adjusted for differences among units in the percentage of one gender group (see e.g., Bryk and Raudenbush, 1992, p. 25-29).

Level-1 intercepts are allowed to vary across school units and they become outcome variables at Level-2. Let *Q* be the matrix that contains Level-2 predictors, such as region dummy variables and other school-level indicators. Then, in substantive terms, HLM determines whether the school outcome mean, i.e., the Level-1 intercepts, vary across schools and how much of their variation can be explained by Level-1 predictors (*X*) and Level-2 predictors (*Q*). Since we have no particular hypotheses concerning the interaction between individual and school level variables, the coefficients in *X* are assumed to be fixed rather than random (for a similar approach, see: Bryk, Lee, and Holland, 1992).

Results

Preliminaries

Table 1 provides a summary of all variables measured at the student level, together with their average values in rural, urban, and suburban areas. It can be seen that Korean eighth graders scored over an entire standard deviation higher (M = 607, SD = 91) than their US counter parts (M = 500, SD = 109). In fact, Korea ranked second (after

Singapore) among the 41 participating countries, whereas the US ranked in 28th position (see e.g., Beaton, et al., 1997). Yet, although Korean students were more likely to receive additional instruction after school, and while they had higher educational aspirations for themselves, the other student level variables would seem to favor US students. That is, US students' parents are more highly educated, these students are more likely to possess a computer, calculator, and study desk, and their mothers believe more strongly that mathematics is important for them.

Insert Tables 1 and 2 about here

In addition, the sub-tables of Table 1 show rural-urban comparisons of student level variables. Consistent with the above, it can be seen that most student level variables point to an urban advantage in Korea and a suburban advantage in the United States. The only exception is the students mothers' perception of the importance of doing well in mathematics, which is highest in the suburban areas of both countries.

The international differences at the school level are summarized in Table 2. It appears that US school principals are more heavily involved in communication with parents and the community, as indicated by the greater number of hours spent by principals in talking with parents and representing the schools in the community. Also, US students tend to have more experienced teachers (as indicated by the percentage of teachers with five or more years of experience), and a greater percentage of specialized mathematics teachers. The only social capital variables that favor Korean students are the greater emphasis on cooperation and the greater frequency of meetings between teachers in this country.

The variable MSHORT is a latent Rasch variable representing principals' perception of their school's shortage of educational technology items. The two scales are not comparable between the two countries as the location of the individual items on the latent variable differs between countries. In the US the locations of the technology items (shown between parentheses) is "computer software" (-.77), "computer hardware" (-.53), "library material" (.62), and "audio visual material" (.68). In Korea the positions of these same items are -.49, -.04, .59, and -.06, respectively. Thus, the greatest perceived shortage in the US concerns audio visual material, whereas Korean principals focus on library materials. This finding agrees with the emphasis placed by Korean teachers on the use of the traditional black board.

Main Analyses

The main results of this study consist of HLM analyses of the Korean and United States student data, using the location, technology, and social capital as school level information as Level-2 variables, and using the student level information as Level-1 variables. Since the choice of the Korea and the US can neither be thought of as exhausting the domain of countries, nor as representing a random sample of countries, country could not be used as third level of analysis. Instead, as reported in Tables 3 and 4, HLM analyses were performed separately for Korean and US schools, respectively, using models of varying levels of complexity (Models 1 through 4).

Models 2, 3 and 4 control for location by taking suburban schools as the point of reference. That is, the INTERCEPT row in the top of Tables 3 and 4 refers to the estimated performance in suburban schools. The effects of the other variables on eight-grade mathematics are shown as deviations (d) from this intercept. Finally, the bottom sections of Tables 3 and 4 show the overall percent of variance explained at the school and student levels of analysis.

Insert Tables 3 and 4 about here

Korea. Model 1 in Table 3 shows that Korean suburban schools had a mean eight-grade mathematics score of 601.5, and the results for Model 2 indicate that rural schools performed significantly worse ($d = -39.7$, $p < .001$), whereas urban schools performed better ($d = 15.2$, $p < .05$) than suburban schools. Adding technology and social capital variables in Model 3 changes the value of INTERCEPT somewhat due to variations in the number of missing cases. However, none of these Level-2 variables had a significant effect (all $p > 0.10$). Thus, contrary to expectations, school variables such as teacher experience and specialization, teacher cooperation, meetings among teachers or between the principal and the community or parents, do not make a difference at the school level. Interestingly, eighth grade mathematics performance bears no relation to principals' perceptions of teaching technology shortages ($d = 0.8$, $s = 1.7$).

Model 4 incorporates all Level-1 student variables, each of which had a statistically significant ($p < .001$) d value. Specifically, eight-grade Korean girls performed worse than boys ($d = -17.0$), whereas math performance increases with parental education ($d = 10.6$), taking after-school mathematics classes ($d = 25.7$), possessing study items such as a computer, calculator, or study desk ($d = 10.0$), and the students' expectations concerning their future educational levels ($d = 6.9$). Finally, the strongest student level covariate is the students mothers' perception of the importance of mathematics (d = 36.7, s = 3.5).

The United States. The US results summarized in Table 4 differ considerably of those presented above. First, in contrast to Korean urban schools, Model 2 shows that US urban schools perform worse (d = -18.0, $p < .05$) than their suburban counterparts. However, this effect is absent in Models 3 and 4, and a definite interpretation is further complicated by the large number of schools (15%, see Table 2) with unknown location which also perform worse than suburban schools (DLOCMISS, d = -45.5, $p < .01$). Second, the results for Models 3 and 4 show significant effects ($p < .05$) of teacher experience, promoting cooperation among teachers, and the number of hours spent by principals talking with parents. However, contrary to expectations, this last variable has a slightly negative impact on student performance (d = -.62 to -0.50), suggesting that this time is mainly spent dealing with parental complaints.

Finally, whereas girls perform less well then boys in Korea, Model 4 indicates that the performance of US male and female eight-graders is approximately equal (DGIRL, d = -1.72, s = 1.8). It should be pointed out, however, that this finding is contingent upon the inclusion of the MOMMTH, DJUKU, ITEM3, and SED covariates. Additional analyses (not shown here) indicated that omitting these variables yields a negative DGIRL effect, regardless whether parental education is included (d = -5.4, s = 1.9) or excluded (d = 5.1, s = 1.9) as a covariate. Since the gender effect disappears after taking the mothers' and the students expectations into account, this finding suggests that Korean girls are not expected to perform as well as boys in mathematics.

School vs. Student Level Variance. Perhaps the most suggestive information is contained in the bottom sections of Tables 3 and 4 which show the respective percentages of variance explained by the school and student level variables. These data allow the intra-class correlation to be estimated as the ratio of the Level-2 variance to the total (i.e., Level-1 + Level-2) variance, yielding "the proportion of the variance in the outcome that is between the Level-2 units" (Bryk and Raudenbush 1992, p. 18). The intra-class correlation was 0.39 in the US and 0.07 in Korea, indicating that students' mathematics performance differs more widely across US schools than Korean schools. [2]

In addition, the Korean data in Table 3 indicate that school location, when considered in isolation, explains 53.7% of the variance (Model 2), and that adding other Level-2 variables (Model 3) has little effect since the amount of variance explained remains basically the same (i.e., 52.4%). However, this percentage rises to 83.2 when student level variables are taken into account also (Model 4). This dramatic increase means that school location and student characteristics covary with the geographical urban - rural distinction. In contrast to urban areas, rural areas are characterized by lower parental education, lower perceptions of the importance of mathematics by students' mothers, fewer after-school classes, and lower student expectation of future educational achievement.

As is shown in Table 4, the pattern in the United States is decidedly different. Although Models 2 and 3 again explain about the same amount of variance, the absolute levels are much lower than those in Korea (6.6 and 8.8%, respectively). Also, the percentage of variance explained rises to only 26.1% when Level-1 student variables are included (Model 4). Thus, in the US, school as well as student variables are less affected by the urban - rural distinction.

Summary and Discussion

One of the major findings is that urban settings are advantageous for Korean children while urban settings are associated with a decrease in performance of eighth graders in the United States. Further, consistent with our hypothesis that highly centralized education systems leave little room for the effects of social capital variables, the Korean data showed little effect of Level-2 (i.e., school level) variables, whereas such variables accounted for over one-third of the variance in US schools. Given the more centralized and uniform Korean school system, it is not surprising therefore that this country's performance is affected more strongly by Level-1 (i.e., student level) variables than is the US' performance. It is further significant to note that educational technology shortages, as perceived by school principals, played no apparent role in eighth grade mathematics performance in either nation. However, Korean principals saw shortages of library materials as the most serious, whereas US principals focused on shortages in audio visual materials.

Our findings imply that the urban - rural distinction cannot be understood in purely geographical terms and that other factors should be considered as well. For instance, it has long been argued (Kasarda 1985; Willson, 1987; Lash & Urry, 1994) that structural economic changes (e.g., the advent of advanced transportation systems, the use of cheaper labor oversees) caused a degradation of US urban life, fueling an exodus of well-off urbanites to the suburbs while leaving the poor (and poor schools) behind. The fact that this has not (yet?) occurred in Korea may have its roots in local cultural factors. In Korea, a family's house and land are perceived as an integral part of its heritage, and it is taken for granted that first-born sons succeed their elders to maintain this heritage. Similar considerations once played a role in the US (see e.g., Firey, 1982), and they sometimes still do.

Simultaneously, Korea has shown a rapid urban economic development which attracts those determined to improve their economic situation. Initially this may cause relatively favorable conditions, including an emphasis on educational performance. However, unless Korean culture is strong enough to resist urban decay, we suspect that this advantage is temporary and likely to diminish over time. In future research we intend to test this hypothesis through a comparison of countries at various stages of economic and social development.

Footnote

2. Because the achievement distributions are not exactly the same in the U.S. as in Korea some caution is called for in the interpretation of this difference. However, the magnitude of the difference is judged sufficiently large to be meaningful.

References

Beaton, A.E., Mullis, I.V., Martin, M.O.,Gonzalez, E.J., Kelly, D.L., and Smith, T.A. (1997). Mathematics Achievement in the Middle School Years: The IEA's Third International Mathematics and Science Study (TIMSS). Chestnut Hill, Mass.: Boston College.

Bryk, A.S. and Raudenbush, S. (1992). Hierarchical Linear Models: Applications and Data Analysis Methods. Newbury Park: Sage Publications.

Bryk, A.S., Lee, V.A. & Holland, P.B. (1992). Catholic Schools and Common Good. Cambridge, Mass.: Harvard Press.

Coleman, J. S. (1990). Foundation of Social Theory. Cambridge, Mass.: Harvard University Press.

Burt, R. S. (1992). Structural Holes: the Social Structure of Competition. Cambridge, MA: Harvard University Press.

Durkheim, E. (1964). On the Division of Labor in Society. New York: Free Press.

Firey, W. (1982). Sentiment and Symbolism as Ecological Variables In G.A. Theodorson (Ed.) Urban Patterns: Studies in Human Ecology. University Park: Pennsylvania State University Press.

Fischer, C. (1982). To Dwell among Friends: Personal Networks in Town and City. Chicago, Il: University of Chicago Press.

Fischer, C. (1995). The Structural Theory of Urbanism: a Twentieth Year Assessment American Journal of Sociology, 101.

Granovetter, M. (1983). The Strength of Weak Ties: A Network Theory Revisited. Sociological Theories, pp. 201-33.

Hastings, E.C. (1977). United States. In: D.F. Robitaille (Ed.), National Contexts for Mathematics and Science Education: An Encyclopedia of the Education Systems Participating in TIMSS, pp. 386-396. Vancouver, Canada: Pacific Educational Press.

Illinois TIMSS Task Force (1997). An Initial Analysis of the Illinois Results from the Third International Mathematics and Science Study (TIMMS). Illinois State Board of Education, September, 17, 1997.

Kasarda, D. J. (1990). Structural Factors affecting the location and timing of urban underclass growth. Urban Geography, 11: 234-64.

Kim, J. (1997). Republic of Korea. In: D.F. Robitaille, National Contexts for Mathematics and Science Education: An Encyclopedia of the Education Systems Participating in TIMSS, pp. 226-234. Vancouver, Canada: Pacific Educational Press.

Linacre M. J. & Wright, B.D. (1997). A User's Guide to BIGSTEPS: Rasch-model Computer Program, Version 2.7. Chicago, Il: Mesa Press.

Lush, S. & Urry, J. (1994). Economies of Signs and Space. London: Sage publications.

Tonnies, F. (1961). "Gemeinschaft and Gessellschaft." In T. Parsons, E. Shils, K. D. Naegele, & J. R. Pitts (Eds.). Theories of Society pp. 191-201. New York: Free Press.

Robitaille, D.F. (1987). National Contexts for Mathematics and Science Education: An Encyclopedia of the Education Systems Participating in TIMSS. Vancouver, Canada: Pacific Educational Press.

Schmidt, W.H., McKnight, C.C., Valverde, G.A., Houang, R.T., Wiley, D.E. (1977). Many visions, many aims, Volume 1: A Cross-National Investigation of Curricular Intentions in School Mathematics. Dordrecht, The Netherlands: Kluwer.

Simmel, G. (1971). Georg Simmel on Individuality and Social Forms. Ed. Donald N. Levine. Chicago, IL:University of Chicago Press.

TIMSS (1997). User's Guide for the Third International Mathematics and Science Study TIMSS) and U.S. Augmented Data Files. Available at an internet homepage "wwwcsteep.bc.edu/timss."

TIMSS (1997). TIMSS Mathematics Items: Released Set for Population 2. Chestnut Hill, Mass.: Boston College.

Wellman, B. & Leighton, B. (1979). Networks, Neighborhoods and Communities: Approaches to the Study of the Community Question. Urban Affairs Quarterly, 14, 3, 363-90.

Wilson, J. W. (1991). The Truly Disadvantaged: The Inner City, the Underclass and Public Policy. Chicago: University of Chicago Press.

Wright, B.D. & Masters, G. (1982). Rating Scale Analysis. Chicago, Il: Mesa Press.

TABLE 1

Student level variable definitions and descriptive statistics by country

Variable	Korea N	Korea Mean	Korea Std	Korea Max	Korea Min	United States N	United States Mean	United States Std	United States Max	United States Min

BIMATSCR : TIMSS Eighth Grade Mathematics Score

	N	Mean	Std	Max	Min	N	Mean	Std	Max	Min
	2920	**607.04**	**109.01**	**279.07**	**987.44**	**7087**	**490.88**	**92.22**	**172.03**	**816.67**

	n	mean	s.e.		n	mean	s.e.
*rural**	471	567.3	4.61	*ural*	1093	503.9	7.31
urban	1551	618.5	3.63	*urban*	3116	498.2	7.25
suburb	858	609.3	4.39	*suburb*	1784	513.4	6.50

* Schools with missing location were omitted

Djuku: Receive extra instruction in math before or after school (0 = no, 1 = yes)

	N	Mean	Std	Max	Min	N	Mean	Std	Max	Min
	2890	**0.46**	**0.5**	**0**	**1**	**6762**	**0.33**	**0.47**	**0**	**1**

	n	mean	s.e.		n	mean	s.e.
*rural**	461	0.237	0.045	*ural*	1049	0.2959	0.024
urban	1542	0.54	0.017	*urban*	2964	0.312	0.018
suburb	847	0.4659	0.023	*suburb*	1718	0.3392	0.017

SED: Student's self-assessment of educational completion level
(0='don't know," 1=primary, 2=secondary, 3=some vocational, 4=some university, 5=university)

	N	Mean	Std	Max	Min	N	Mean	Std	Max	Min
	2903	**4.43**	**2.28**	**0**	**6**	**6682**	**4.13**	**2.29**	**0**	**6**

	n	mean	s.e.		n	mean	s.e.
rural	468	4.337	0.099	*ural*	1040	3.9	0.113
urban	1544	4.488	0.061	*urban*	2946	4.235	0.094
suburb	851	4.411	0.075	*suburb*	1693	4.362	0.097

PEDMAX: Parent's maximum education level
(0='don't know," 1=primary, 2=secondary, 3=university)

	N	Mean	Std	Max	Min	N	Mean	Std	Max	Min
	2917	**1.85**	**0.82**	**0**	**3**	**6823**	**2.11**	**0.79**	**0**	**3**

rural	n	mean	s.e.		n	mean	s.e.
urban	*471*	*1.409*	*0.051*	*ural*	*1057*	*2.0589*	*0.032*
suburb	*1549*	*1.977*	*0.03*	*urban*	*2998*	*2.167*	*0.027*
	857	*1.89*	*0.043*	*suburb*	*1733*	*2.2608*	*0.03*

DITEM3: Possessing computer, calculator, and study desk (0 = no, 1 = yes)

2907	**0.38**	**0.49**	**0**	**1**	**6953**	**0.52**	**0.5**	**0**	**1**

rural	n	mean	s.e.
urban	469	0.2183	0.037
suburb	1548	0.417	0.016
	850	0.413	0.021

	n	mean	s.e.
ural	1066	0.4837	0.026
urban	3057	0.5441	0.019
suburb	1756	0.671	0.022

MOMMTH: Mother thinks it is important to do well in math
(1= strongly disagree, disagree, agree, 4=strongly agree)

2912	**3.52**	**0.6**	**1**	**4**	**6905**	**3.67**	**0.56**	**1**	**4**

rural	n	mean	s.e.
urban	*1066*	*3.6311*	*0.0283*
suburb	*3040*	*3.666*	*0.014*
	1747	*3.6991*	*0.019*

	n	mean	s.e.
ural	*468*	*3.415*	*0.027*
urban	*1549*	*3.554*	*0.017*
suburb	*855*	*3.52*	*0.025*

TABLE 2

School level variable definitions and descriptive statistics by country

	KOREA					United States				
VARIABLES	N	Mean	Std	Max	Min	N	Mean	Std	Max	Min
School location										
DRURAL	150	0.16	0.37	0	1	181	0.17	0.38	0	1
DSUBURB	150	0.29	0.46	0	1	181	0.25	0.43	0	1
DURBAN	150	0.53	0.5	0	1	181	0.43	0.5	0	1
DLOCMISS (location missing)	150	0.01	0.12	0	1	181	0.15	0.36	0	1
PYEARS5: % of teachers who have been teaching more than 5 years										
	150	19.6	32.09	0	96	181	61.87	21.27	0	100
PMSBOTH: % of teachers who teach both science and math.										
	150	20.65	20.99	0	95	181	7.26	10.06	0	50
DPOLCOOP: Cooperation is an official policy (0 = no, 1 = yes)										
	150	0.89	0.31	0	1	181	0.59	0.45	0	1
DMEETCOOP: Regular meetings are held (0 = no, 1 = yes)										
	150	0.66	0.47	0	1	181	0.9	0.27	0	1
TALKCOM: Principals represent schools in community (hrs / mnth)										
	150	5.59	11.96	0	97	181	8.81	7.07	0	50
TALKPARE: Principals talk with parents (hrs. / mnth)										
	150	8.29	12.19	0	97	181	23.4	12.98	0	60
MSHORT: Rasch indicator of Mathematics equipment shortage indicator										
	150	0.77	1.82	-4.41	4.59	181	0.14	2.35	-5.07	5.1

TABLE 3

Korean 8th Graders

2-level HLM Estimates

Dependent Variable: Mathematics Achievement Score.

School-level predictors

	Model 1			Model 2			Model 3			Model 4		
School-level	Coef.	Std		Coef.	Std		Coef.	Std		Coef.	Std	
INTERCEPT	601.5	(3.3)	***	602.6	(5.2)	***	593.6	(11.5)	***	602.30	(9.5)	***
Location												
Drural				-39.7	(7.4)	***	-38.5	(7.6)	***	-20.36	(6.1)	**
Durban				15.2	(6.7)	*	15.0	(6.9)	*	7.94	(5.8)	
*Dsuburb												
Dlocmiss				-7.1	(22.4)		-7.7	(22.6)		-4.56	(18.1)	
Technology												
Mshort							0.8	(1.7)		0.64	(1.4)	
Pmsboth							0.2	(0.1)		-0.02	(0.1)	
Pyear5							0.1	(0.1)		0.03	(0.1)	
Social Capital												
polcoop							3.3	(9.3)		0.20	(7.7)	
meetcoop							0.7	(6.0)		2.14	(4.9)	
talkcom							-0.5	(0.4)		-0.45	(0.4)	
talkpar							0.3	(0.4)		0.24	(0.3)	
Student-level Controls												
Dgirl										-17.03	(4.2)	***
Pedmax										10.57	(2.3)	***
Mommth										36.66	(3.5)	***
Djuku										25.65	(4.6)	***
Item3 (Study items)										9.95	(2.4)	***
SED										6.89	(0.8)	***
Level-1 Variance	11125.5			11126.3			11126.6			10035.4		
Variance Explained	n/a			0.0%			0.0%			9.8%		
Level-2 Variance	867.8			402.2			413.4			145.9		
Variance Explained	n/a			53.7%			52.4%			83.2%		

NOTES: + if $p < .10$, * if $p < .05$, ** if $p < .01$, *** if $p < .001$.
Prefix D indicates Dummy variables. * indicates omited categories.

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TABLE 4

U.S. 8th Graders

2-level HLM Estimates

Dependent Variable: Mathematics Achievement Score

School-level predictors

	Model 1			Model 2			Model 3			Model 4		
School-level	Coef.	Std		Coef.	Std		Coef.	Std		Coef.	Std	
INTERCEPT	491.9	(3.9)	***	507.7	(6.5)	***	488.9	(21.6)	***	486.50	(19.6)	***
Location												
Drural				-6.9	(9.4)		-5.6	(12.0)		1.48	(10.8)	
Durban				-18.0	(9.1)	*	-15.6	(9.8)		-10.47	(8.9)	
*Dsuburb												
Dlocmiss				-45.4	(12.9)	**	-42.6	(12.3)	**	-34.08	(11.2)	**
Technology												
Mshort							-2.1	(1.7)		-2.10	(1.6)	
Pmsboth							-0.4	(0.4)		-0.37	(0.3)	
Pyear5							0.4	(0.2)	*	0.35	(0.2)	*
Social Capital												
Dpolcoop							15.9	(8.6)	+	12.37	(7.8)	
Dmeetcoop							-1.2	(14.0)		2.28	(12.7)	
talkcom							0.2	(0.5)		0.18	(0.5)	
talkpar							-0.5	(0.3)	+	-0.62	(0.3)	*
Student-level Controls												
Dgirl										-1.72	(1.8)	
Pedmax										11.86	(1.1)	***
Mommth										53.49	(3.2)	***
Djuku (extra-lessons)										-15.93	(2.1)	***
Item3 (Study items)										3.59	(1.1)	**
SED										3.87	(0.4)	***
Level-1 Variance	4211.2			4210.7			4210.4			3894.5		
Variance Explained	n/a			0.0%			0.0%			7.5%		
Level-2 Variance	2447.3			2287.0			2232.3			1807.6		
Variance Explained	n/a			6.6%			8.8%			26.1%		

NOTES: + if p < .10, * if p < .05, ** if p < .01, *** if p < .001.
Prefix D indicates Dummy variables. * indicates omited categories.

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