EDUCATIONAL INDICATORS AND NATIONAL DEVELOPMENT IN SAUDI ARABIA

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Abstract

This study examines the impact of socioeconomic status and school resource indicators on 8th grade math and science achievement in the Kingdom of Saudi Arabia. The analyses reported here show that the Kingdom's national averages in most of these areas in 2003 fell below that of peer nations both in the region and globally, which gives Saudi educational policymakers several clear targets for educational reform and improvement. The value and importance of internationally comparative assessments like TIMSS is also discussed with reference to the Saudi case, in particular.

Keywords: Saudi Arabia, achievement, socioeconomic status, school resources, opportunity to learn, education policy, TIMSS 2003

Introduction

Recently, the Western media has been enamored by the Saudi Arabian higher education initiative (Krieger, 2007), but little international attention has yet focused on the development efforts directed towards the primary and secondary education systems in the Kingdom of Saudi Arabia.

The importance of the Kingdom as the cornerstone of the Gulf region cannot be overlooked in areas of international politics and economics, yet the Kingdom's education system has been largely ignored both abroad and in Saudi Arabia itself. One indicator of a need for Saudi educational policymakers to think carefully about the direction the Kingdom of Saudi Arabia's educational system is headed is the fact that Saudi Arabia scored among the lowest among all participating nations on the achievement sections of the 2003 Trends in International Mathematics and Science Study (TIMSS). Some of the most standard correlates with mathematics achievement are socioeconomic status (Baker, Goesling, & LeTendre, 2002) and school resources (Redfield, 2001). And, the importance of education to national development is well-known, especially since the advent of modern mass schooling (Becker, 1975; Fuller & Rubinson, 1992; Schultz, 1982). Therefore, the comparatively low performance by Saudi students given the importance and pace of national development in Saudi Arabia is a concern for educational policymakers and national development experts in the Kingdom.

This study investigates the role that schooling plays in the social and economic development of the Kingdom of Saudi Arabia both historically and in light of new evidence from the Trends in International Mathematics and Science Study conducted in 2003. The purpose of this study is to (1) provide an overview of the development of mass education in Saudi Arabia, (2) highlight the contribution modern mass schooling has made towards national development in Saudi Arabia, (3) measure students' reported socioeconomic status and reported available school resources in Saudi Arabia, (4) estimate the impact that these variables have on math and science achievement in Saudi Arabia, and (5) compare Saudi levels on these indicators between groups within Saudi Arabia and with other countries in the region and the world.

This is one of the first studies to use TIMSS data to look specifically at education in the Kingdom of Saudi Arabia, and one of the few to focus on education in the Saudi national

education system in general. Much has been speculated and sensationalized about Saudi higher education and the recent initiatives towards developing it, but this study is the first to look at what happens across Saudi Arabia in the national school system using an internationally comparable, nationally-representative sample. This study is also significant because as the release of the TIMSS 2007 results draws closer, it is important to have a benchmark of key indicators of achievement, resources, society, and opportunity for the Saudi national education system from the TIMSS 2003 data. Otherwise, comparisons and estimates of growth (or decline) will be difficult to conduct. As one of the few studies to ever use the TIMSS data to examine schooling in the Kingdom, the results reported in this study can serve as a reference point from which further analysis of TIMSS data on Saudi Arabia develops.

Modern Mass Schooling and National Development in Saudi Arabia

A formal, organized system of education in Saudi Arabia did not exist until 1925. Before that time, there was a traditional educational system on the Arabian Peninsula called *kuttab* where students went to learn to read and write Arabic and memorize the *Qur'an* (Thomas, 1968, p.42). At first, these schools were open to boys only. Later, *kuttabs* were "open to girls at the lower levels" (Lipsky, 1959, p.278). Characteristically, *kuttab* schools were located either in the mosque or in the teacher's house, and most often the teacher was the mosque's *Imam*. *Kuttab* schools were located throughout most of the Arabian Peninsula with the exception of the western and eastern parts, which were still ruled by the Ottoman Empire during the 19th century. In addition to Arabic and the *Qur'an*, curriculum in *kuttab* schools sometimes included foreign language and simple mathematics (Al Salloom, 1996; Metz, 1993).

In spite of the existence and spread of kuttab, illiteracy was still widespread in most of the Arabian Peninsula in the early 20th century. The *kuttab* system was officially replaced in 1925 when the first government-operated schools were established in Saudi Arabia. In that same year, King Abdul-Aziz established the first formally organized educational center called the "Directorate of Education." At the time, the Ministry of the Interior oversaw the Directorate of Education because there were not enough qualified and educated people to establish a separate department. In fact, due to the size of Saudi Arabia and its lack of financial resources at the time, assistance was sought from Egypt, not only as supplemental aids for teaching, but also to help subsidize curriculum and organize the Saudi educational system. Because the Egyptian educational model followed in the footsteps of the English educational model of the day, the Saudi educational system indirectly modeled itself upon the English educational system (Al Salloom, 1996; Lipsky, 1959).

As public, government-sponsored schools in Saudi Arabia began to expand and because of the high demand for teachers in a rapidly expanding educational system, most teachers in Saudi Arabian schools were not adequately qualified. An "unqualified" teacher might not hold a teaching certificate, but could read and write or had possibly completed elementary school. In 1928, the Saudi Directorate of Education established the first Saudi Teacher Institution to meet the increasing need for teachers in schools. In 1935, King Abdul-Aziz also decided to send Saudi students to study in Egypt. By 1951, there were 169 Saudi students studying in Egypt to become teachers. In addition, because of the shortage of trained Saudi teachers, Egyptian assistance was requested from three sources: (1) Egypt's Ministry of Education; (2) the General Directorate of the Al-Azhar Institution, which is an Islamic institution in Egypt; and (3) through personal contacts (Alromi, 2001).

Further complicating matters was the lack of a national curriculum at the beginning of the King Abdul-Aziz era. The "first curriculum implemented in the Saudi era was in 1925, and was created by Mohammed Al-Gussab" who was Syrian. The curriculum planning process changed twice—in 1932 and 1935—primarily to focus on the religious and Arabic language curricula

and the addition of health education and moral development curricula.

As the Saudi Arabian educational system expanded, so did the awareness of illiteracy in Saudi Arabia. For example, according to UNESCO estimates in 1950, more than 90 percent of the Saudi Arabian population at that time was illiterate. Reducing illiteracy was only one issue causing the Saudi government to awaken and make education one of its most important goals. Some of the other factors included the need to build and develop the country's human resources and to modernize the economy—both of which, it was believed, required educating youth in labor market-specific skills (Wiseman & Alromi, 2007). This led to a new era in Saudi education in 1953, when the General Directorate of Education became the Ministry of Education, taking full responsibility for the primary, intermediate, and secondary male educational system.

As a result of full government sponsorship and governance over education in Saudi Arabia in the 1950s and to encourage students all over the country to enroll in and attend school, the government made education free and gave monthly allowances to students who came from needy families. In addition, transportation and textbooks were provided free to all students. At the level of higher education, living accommodations for all students were free and the government granted monthly allowances of about $250 per month to all university students. As many students as were able took full advantage of these opportunities resulting in rapid growth in both university enrollment and attainment in Saudi Arabia.

Expansion of Education in the Kingdom

As Saudi Arabia expanded and institutionalized a mass schooling system, it did so for many specific purposes. As in other nations, the general purpose of education in Saudi Arabia is to satisfy the needs of the society. Additionally, the purposes and goals of education in any country represent the cultural values, beliefs, and ideology of its citizens.

With this in mind, the official educational purpose of the Saudi education system was and still is to provide a continuation of its Islamic educational heritage. Fundamentally, the Kingdom of Saudi Arabia's political, social, and economic rules are based on Islam. This provides a dilemma for an educational system that is also under pressure to contribute to the economic development of the nation. The initial goal of the Ministry's education system was to provide a fundamental education for the largest number of Saudi students, with a strong emphasis on religious learning. As Saudi Arabia's economic growth has continued, the goals and structure of the education system in general—and secondary education in particular—have changed. The curriculum has also expanded several times, largely because of rapid changes in the nation's social and economic circumstances.

In its infancy, the Saudi education system was charged with three general purposes (Al-Baadi, 1994): (1) to provide a basic education for all Saudis; (2) to teach students basic Islamic principles; and (3) to prepare students for work in different fields. In response, the Saudi Ministry of Education developed five-year progress plans to advance the Saudi education system by building new schools as well as improving the existing schools. As the various educational needs were identified, one result was that there are three types of secondary education available in Saudi Arabia: *Qur'an*ic schools, regular (general) secondary schools, and vocational/trade schools. The origin, purpose, and characteristics of vocational and trade schools in Saudi Arabia differ significantly from that of *Qur'an*ic and regular secondary schools.

Although all educational levels in Saudi Arabia concentrate on teaching Islamic principles, the *Qur'an*ic school offers specific concentration on Islamic studies to prepare students for a specialty in Islamic law. The first *Qur'an*ic high school in Saudi Arabia opened in 1977. The

popularity of these schools and the way they replace certain curricula that is more labor market-specific with Islamic curricula makes them important to consider in this discussion. For example, Al Salloom (1996, p.43) reports that "*Qur'an*ic secondary schools replace the science requirements found in the regular secondary curriculum with religious subjects." Since science (along with math) is generally considered to be one of the more important content areas in the labor market preparation of youth, this replacement of science with religion is significant.

Regular (or general) high school students follow a general curriculum in their first year. Then, each student specializes in either liberal arts or science for the next two years. The general high school curriculum has changed several times over the years as educational policymakers and curriculum planners have attempted to address individual students' and national needs. From the beginning, general high schools were established with labor market preparation in mind. Specifically, these schools were established to prepare students for 'real life' by affording them the knowledge and skills they need for employment, to meet the needs of both individuals and groups in society, to allow students to select the courses and activities they need, and to offer students access to an academic advisor to guide and help them during their studies (Alsunbul, Alkhateeb, Metwalli, and Abduljawwad, 1995). This general high school academic plan has been widely debated and occasionally changed—each time with an eye on the perceived need to prepare youth for the 'modern' labor market.

Schooling as a National Project in a Global Context

Schooling's power to aid in the development of nations is indirect (Wiseman & Alromi, 2007). It is channeled through individual people. The power of schooling, therefore, comes from the aggregated effect or mass element of schooling. Because so many individuals are educated together with roughly the same curriculum, the influence of mass schooling is tremendously influential. In the early stages of educational development in any nation, there are often only a few or a select group that are literate. This means that only these select few can read books and newspapers, follow written instructions on the job, and communicate via post, e-mail, or internet. But as mass schooling expands to include entire cohorts of youth, and entire generations become literate then what was once limited to a select few is now available to everyone. The impact is dramatic.

As one of the fastest growing and universally accepted social institutions in the world, schooling has become a human right and, as such, a key to understanding the development of youth beyond the simple corollaries of education level and available resources (Chabbott, 2003). Research related to the development of youth through schooling falls into three basic categories: (1) the conditions of the development of youth, (2) the transmission of identity, values, and ideological convictions to youth, and (3) schools as development institutions themselves. Many nations, especially developed, post-industrial nations, have begun to recognize the importance of schooling as a means to provide social mobility for citizens within a nation while establishing national dominance, or at least competitiveness, on the world scene (B. Anderson, 1996; Boudon, 1977; Carnoy and Werthein, 1977; LeTendre and Baker, 1999; Schofer, Ramirez, and Meyer, 2000). This has historically encouraged policymakers and other "rational" thinkers to make the effort to reform and develop their nations' school system in order to establish a place in the dominant world order (P. J. DiMaggio and Powell, 1983; Floud and Halsey, 1961).

There are others who focus on the staunch persistence of traditional cultural values and ethnic identity at the local level even when national school systems are cloaking themselves in the legitimacy of internationally-institutionalized schooling models based on economic and political growth (G. D. Spindler, 1987). Arab and Islamic societies have come under particular scrutiny because of their cultural and ideological differences in an otherwise increasingly

"Western" institutionalization of cultural values and ideology in school programs and processes (Behal, 2002; "From Defender of the Faith to Terrorist", 2002; Haidar, 2002). Research on the conditions of the development of youth suggests that what youth know and do are related to the influence of government-regulated institutions like schools, but that other less-regulated institutions like families or cultural and religious groups contextualize youth development through schools (Boli, 1992; Paulsen, 1991; Slomczynski and Shabad, 1997; Youniss, McLellan, and Yates, 1997). While the impact of these informal and typically unregulated institutions is important and significant, how can other more formal and organized institutions affect the social, political, and economic development of youth? Research suggests that youth are largely influenced by the dominant social institutions in their lives (Flanagan and Faison, 2001; Flanagan et al., 1999; Youniss et al., 2002; Youniss, McLellan, and Yates, 1997), and one of the most prevalent of these social institutions in the lives of youths around the world is the school (Chabbott and Ramirez, 2000). But, schools themselves derive their policies, values, and curriculum from external as well as internal sources.

The intent to develop youth into social, political, and economic citizens has historically been a part of formal public schooling (Bellah, Madsen, Sullivan, Swidler, and Tipton, 1995; Mann, 1986; Ramirez and Boli, 1987; D. Tyack and Cuban, 1995; D. B. Tyack, 1974; Walters, James, and McCammon, 1997). Over time, however, as educational and technological needs have changed and as democratic states have increasingly replaced authoritarian regimes, the emphasis placed on these needs has shifted. During the 20th century, countries everywhere made large investments in public education to expand and increase the human capital of their citizens (Psacharopoulos, 1994; Schultz, 1961, 1982). The rationale behind this emphasis on human capital, in particular, was to make youths more economically productive by making schooling accessible to every youth and increasing their levels of educational attainment (Becker, 1975, 1993; Griliches, 1996). However, an increase in the accessibility of education or in youth's educational attainment alone has ensured neither future economic productivity, social literacy, nor productive citizenship (Carnoy and Levin, 1985).

Predominantly Arab or Islamic nation-states pose a unique challenge to the use of schooling as a national project because of the unique challenge in balancing social, political, and economic development issues. Much of the research relevant to schooling for development in these regions has focused either on the status of women (Abu Nasr, Khoury, and Azzam, 1985; El-Sanabary, 1989; Peterson, 1989) or the penetration of Islamic principles into schooling (Shorish, 1988; Talbani, 1996). These studies paint a picture of an institutional context of schooling characterized by a refusal to compromise traditional cultural values, but at the same time a unique and adaptive responsiveness to global trends in school policies, programs, and curricula.

Unfortunately, few studies have provided frameworks upon which analyses can develop that estimate "the effects of civil society" on national development goals in the rapidly-developing Arab-Islamic nation-states (Mazawi, 1999, p.332). For example, Mazrui (1997, p.118) suggests, "Westerners tend to think of Islamic societies as backward-looking, oppressed by religion, and inhumanely governed." Saudi Arabia is a country that has not often been the focus of social science research, and although a wealthy nation, still demonstrates some of the structural characteristics of a developing nation (Metz, 1993; Sara, 1981). However, Saudi Arabia provides a unique opportunity for analysis of schooling in non-Western systems because of its often open refusal to adopt Western culture and ideology (Al-Sharideh, 1999; Prokop, 2003). The refusal of Western, and specifically American, social and cultural influences has been attributed to the strong influence of the Islamic national religion on the development of youth through state institutions such as schools, even though Saudi Arabia and other Islamic Arab nations are incorporated into much of the Western-dominated global economic and political community (Al-Baadi, 1994; MacFarquhar, 2001; Massialas and Jarrar,

1987; Metz, 1993; Obeid, 1994; Wynn, 1997).

While the data analyzed and results presented here do not provide answers to all of the issues and challenges currently facing education in the Middle East and in Saudi Arabia, in particular, this is a first step in the larger trend in secondary analysis of the educational system of Saudi Arabia.

Methodology and Data Sources

Empirical, cross-nationally comparative data for this study come from the Trends in International Mathematics and Science Study (TIMSS) administered in 2003 (Mullis, Martin, Gonzalez, & Chrostowski, 2004a, 2004b). TIMSS 2003 contains data from 48 countries including approximately 500,000 students from around the world. Of these 48 countries, 46 have available data for the variables used in this study. We focus specifically on 8th grade students and their schooling. In Saudi Arabia, approximately 4000 students as well as their classroom teachers and school principals/administrators reported data.

To measure the relationship between academic achievement, socioeconomic status and school resources, we focus on several measures at the individual and school level within Saudi Arabia. While we do not suggest that academic achievement is a proxy for national development, it is often interpreted this way among education policymakers. As a result, the outcome variable in our analyses is either math or science achievement scores. Math and science achievement scores are measured using the five plausible values for each subject. To measure students' reported socioeconomic status and available school resources in Saudi Arabia and elsewhere we use the following variables from the TIMSS 2003 data:

Student-Level Characteristics (Level 1)

Gender: Student-reported sex (0=boy, 1=girl).

No Books: The proportion of students reporting that they have none or very few books in their homes (1=no/very few books, 0=more books).

Parent Origin: Student-reported measure of whether their parents were born in the country (0=no, 1=one parent only, 2=both parents).

Parent Education: Student-reported measure of parents' highest level of education attained (1=university equivalent, 2=post-secondary, 3=upper secondary, 4=lower secondary, 5=primary only).

School-Level Resources & Context (Level 2)

Math Resources: Derived index of available school resources for math instruction (1=low, 2=medium, 3=high).

Science Resources: Derived index of available school resources for science instruction (1=low, 2=medium, 3=high).

The descriptive statistics for these variables are given in Table 1 below.

[Insert Table 1 here.]

The descriptive comparative analyses show us that 8th graders in the Kingdom of Saudi Arabia have relatively low socioeconomic status, school resources, and opportunity to learn compared

to their regional peers and internationally. This suggests that part of the explanation for Saudi Arabian students' relatively low academic performance may be a result of social or demographic factors (i.e., socioeconomic status), structural factors (i.e., school resources), and opportunity factors (i.e., opportunity to learn). When these indicators are examined for boys' versus girls' schools, the differences are largely not statistically significant, which suggests that there was relatively even development of the Saudi school system as of 2003. However, these findings also suggest that the overall conditions in society may not have caught up yet with the relatively recent status of Saudi Arabia as a political and economic global power. The regression analysis gives more detailed insight into the impact that each of the indicators described above has on achievement in Saudi Arabia.

To estimate the impact that these variables have on math and science achievement in Saudi Arabia, we conducted the following regression:

$$Y = a + b_1(\text{sex}) + b_2(\text{parented}) + b_3(\text{books}) + b_4(\text{parentborn}) + b_5(\text{resources}),$$

where Y is individual student math achievement in the first model and science achievement in the second model.

Because the TIMSS 2003 data provides us with multiple levels of nested data, it is especially appropriate to estimate the effects of variables on outcomes in a way that takes into account contextualized variation. One way to do this is with multilevel regression models. Thus, in addition to the linear regression equation above, we also ran a two-level model for the Saudi Arabian data using HLM where the socioeconomic status variables were included at the student level and resource variables were included at the school level (Bryk & Raudenbush, 1992).

The basic multilevel model can be represented as follows:

Level-1 Model (Student Characteristics)

$$Y = B0 + B1*(\text{parented}) + B2*(\text{books}) + B3*(\text{parentborn}) + B4*(\text{gender}) + R$$

Level-2 Model (School Resources & Context)

$$B0 = G00 + G01*(\text{resources}) + G02*(\text{achievementavg}) + U0$$

$$B1 = G10$$

$$B2 = G20$$

$$B3 = G30$$

$$B4 = G40$$

where B and G are the predicted coefficients; the predictor variables are in parentheses at each level; and R and U represent error terms.

Findings and Discussion

When looking at the average school achievement for schools across Saudi Arabia participating in TIMSS 2003, there is a clear distinction between the highest 10 performing schools and the lowest 10 performing schools. The highest performing schools' average math score ranges from 429-387. Whereas the lowest performing schools average math score ranges from 274-210. For science achievement the 10 highest performing range from 498-444 and the lowest 10 range

from 345-283. Of these 10 highest and lowest in math and science achievement, Table 2 shows the five schools that were the highest performing in both math and science and the five that were the lowest performing in both subjects. These five highest and five lowest schools serve as indicators of the characteristics of students, teachers, and schools that associate with high and low performance.

[Insert Table 2 here.]

If we consider the three main categories of social differentiation (race/ethnicity, gender, and socioeconomic status), the following distinctions apply. First, as Table 3 shows, all of the top and lowest performing schools are all-boy schools except for one of the highest performing schools, which is all-girl. This suggests that girls' schools are more balanced in terms of performance than boys' schools, which fall across a broader range.

The second indicator is a proxy for race/ethnicity. Prior studies have used language as an indicator of students race or ethnicity because students who do not speak the language of the test at home typically come from a minority racial or ethnic background. Saudi Arabia, however, is the only country participating in TIMSS 2003 where 100% of students speak the language of the test at home. Instead of language, we use a student-reported indicator of whether or not their parents were born in the country. T-test results show that there is not a significant difference between high and low performing schools for this indicator of parent origin, although students at the lowest performing schools were more likely to have both parents born in Saudi Arabia than at the highest performing schools.

Finally, we have an indicator of socioeconomic status (SES) for these highest and lowest performing schools. Previous studies using TIMSS data have used a student-reported indicator of the number of books students have in their homes as a proxy for SES. In the five highest and lowest performing Saudi Arabian schools, the lower performing schools have more students reporting fewer books in their homes on average than the highest performing schools.

[Insert Table 3 here.]

We can expand our analyses to look at the level of association between these indicators across all students in Saudi Arabia to see if there is a particular association between achievement and resources. We can also add additional school-reported indicators of school resources for math and science instruction. Table 4 shows the correlations for each of these indicators across all Saudi students participating in TIMSS 2003. In particular, student sex, parents' education level, number of books in the home, and parents' origin are the indicators associating most strongly (and $p<.05$) with both the math and science achievement scores. Students' sex has an opposite association with math and science achievement. The results indicate that being female is associated with a slight reduction in math score, whereas being female is associated with a slightly stronger increase in science score. This suggests that either girls only schools or the culture of education for girls somehow supports girls performance in science at the 8^{th} grade level. Parents highest education level is associated with both math and science score. This suggests that the less educated a students' parents are, the lower the students' test scores are likely to be. The SES (books in the home) indicator behaves as expected; fewer books in the home are associated with lower math and science achievement. Finally, the indicator of parents' origin (born in country) is negatively associated with both math and science achievement. Suggesting that the more a students' parents are born in Saudi Arabia, the lower their achievement scores will be. Neither of the school resources indicators associated with the achievement scores.

[Insert Table 4 here.]

We also conducted ordinary linear regression to estimate the effects of these predictor variables on both math and science achievement while controlling for the others. As Table 5 shows, when student sex, parent education, books in home, parent origin, and school resources were used to estimate our dependent variable, math achievement, there was only one statistically significant effect. Higher levels of parents' education had a positive effect on math achievement ($r = 11.058$, $p<.01$) and no books in the home had a negative effect ($r = -32.142$, $p<.05$), but all other predictor variables were not statistically significant. In the model fitted to science achievement, both student sex ($r = 43.109$, $p<.001$) and parents' highest education level ($r = 9.623$, $p<.01$) were statistically significant predictors. In both regression models, parents' education had an impact on achievement. This suggests that the more educated a students' parents are in Saudi Arabia, the more likely a student is to perform at high levels. However, we again see a strong positive effect of being female on science achievement, which again suggests that there is a special cultural, educational, or contextual characteristic of girls education or being female that provides girls with a science advantage over boys in Saudi Arabia.

[Insert Table 5 here.]

Finally, Table 6 shows the results of our two-level HLM models. In our model estimating the impact of these predictor variables on individual student math achievement, we find that the individual level predictors of gender ($B=-6.787$, $p<.001$), no or few books in the home ($B=-11.327$, $p<.001$), parents' education ($B=4.979$, $p<.001$), and parents born in the country ($B=-3.420$, $p<.05$) are all significant predictors of math achievement. At the school level, the school math average ($G=.904$, $p<.001$) and math resources ($G=1.809$, $p<.05$) also have a significant positive impact on the school mean math achievement. The results show that the less that parents are educated and the more they are born in the country, the lower students' math scores will be. These findings echo those found in the ordinary regression analyses described above. Books in the home also has the expected effect that fewer books in the home associate with lower levels of student achievement.

[Insert Table 6 here.]

When the dependent variable is individual student science achievement, the school-level contextual predictor for average science achievement at the school significantly impacts individual level achievement ($G=.918$, $p<.001$), but the available school resources for science instruction does not ($G=.850$, $p>.05$). At the individual level, gender ($B=-4.298$, $p<.01$), no or few books in the home ($B=-9.116$, $p<.001$), and parent education ($B=3.908$, $p<.001$) are significant predictors of individual student science achievement. But, unlike in the math model, parents born in the country is not a significant predictor of student science achievement ($B=-1.139$, $p<.05$). As in the previous model for math achievement, this model for science achievement suggests that being female in Saudi Arabia on average leads to a lower science achievement score, the fewer books in the home the lower the science achievement, and that higher education parents lead to higher science achievement among students. At the school level, the achievement context impacted average school student achievement positively.

Both of these HLM models suggest that the indicators of socioeconomic status in Saudi Arabia are significant predictors of student achievement in both math and science. The implications of this are important for Saudi Arabia.

Conclusion and Implications

Educational policymakers in the Kingdom can take several points away from this analysis to help in planning and developing the educational system. But, the real value of this study is as a benchmarking tool to gauge progress on further nationally and international comparative

achievement tests. First, while the Saudi achievement scores are low compared to other countries' scores, and while the individual and school resources are low comparatively as well, there are other nations participating in TIMSS 2003 with higher national achievement means that are below Saudi Arabia in all of the indicator categories. This means that there are unique characteristics of the Saudi system that deserve attention. Policymakers would be wise to think about the culture of schooling that has developed in Saudi Arabia and discuss ways that the importance and value of education can become the core of school culture in the Kingdom. These results also suggest that perhaps primary and secondary education deserve the same sort of financial, political, and policy focus as higher education. It will indeed be difficult to become the educational center of the Middle East without a strong foundation of primary and secondary education and students from within Saudi Arabia itself.

Table 1. Descriptive statistics for all variables (TIMSS 2003).

Variable	Saudi Arabia Mean	Arab Nation Mean[1]	International Mean
Student-Level Characteristics (Level 1)			
Math Ach	334.46	401.1	465.44
	(75.34)[2]	(87.23)	(112.84)
Science Ach	398.51	426.17	471.44
	(71.81)	(88.08)	(112.74)
Female	0.44	0.50	0.50
	(.50)	(.49)	(.49)
No Books	0.23	0.25	0.18
	(.42)	(.42)	(.36)
Language	1.00	0.57	0.68
	(0.00)	(.39)	(.37)
Parent Educ	2.53	2.79	3.34
	(1.64)	(1.46)	(1.18)
Parent Origin	1.74	1.77	1.77
	(.62)	(.56)	(.57)
School-Level Resources (Level 2)			
Math Resources	1.98	2.07	2.19
	(.53)	(.58)	(.59)
Science Resources	1.94	2.06	2.17
	(.57)	(.60)	(.60)

[1] Arab nations participating in TIMSS 2003 are: Bahrain, Egypt, Jordan, Lebanon, Morocco, Palestinian National Authority, Saudi Arabia, Syria, and Tunisia.

[2] Standard deviations in parentheses.

Table 2. Highest and Lowest Performing Schools in BOTH 8th Grade Math and Science Achievement in Saudi Arabia (TIMSS 2003).

Highest Performing Schools				
	8th Grade Math Score		8th Grade Science Score	
School ID	Mean Score	Std. Deviation	Mean Score	Std. Deviation
158	419	55	495	49
61	429	91	464	70
81	412	60	469	59
15	410	74	450	64
9	401	78	444	81
Lowest Performing Schools				
	8th Grade Math Score		8th Grade Science Score	
School ID	Mean Score	Std. Deviation	Mean Score	Std. Deviation
80	273	105	327	82
27	267	52	344	68
78	265	70	320	57
45	255	72	319	85
73	210	82	283	69

Table 3. General Indicators of Gender, Race/Ethnicity, and SES for Highest and Lowest Performing Saudi Arabian Schools (TIMSS 2003).

High Performing Schools			Percentage of Students by Number of Books in the Home				
School ID	Gender	Speak Language of Test at Home	NONE OR VERY FEW (0-10 BOOKS)	ONE SHELF (11-25 BOOKS)	ONE BOOKCASE (26-100 BOOKS)	TWO BOOKCASES (101-200 BOOKS)	THREE OR MORE BOOKCESES (>200 BOOKS)
9	Girl	Always	6.5	29.0	35.5	9.7	19.4
15	Boy	Always	21.9	31.2	28.1	9.4	9.4
61	Boy	Always	7.7	15.4	26.9	26.9	23.1
81	Boy	Always	5.0	20.0	45.0	5.0	25.0
158	Boy	Always	18.2	36.4	27.3	9.1	9.1
Low Performing Schools			Percentage of Students by Number of Books in the Home				
School ID	Gender	Speak Language of Test at Home	NONE OR VERY FEW (0-10 BOOKS)	ONE SHELF (11-25 BOOKS)	ONE BOOKCASE (26-100 BOOKS)	TWO BOOKCASES (101-200 BOOKS)	THREE OR MORE BOOKCESES (>200 BOOKS)
27	Boy	Always	22.2	55.6	22.2	0	0
45	Boy	Always	41.4	31	20.7	6.9	0
73[a]	Boy	Always	44.4	33.3	16.7	0	5.6
78	Boy	Always	16.7	50	33.3	0	0
80	Boy	Always	27.8	33.3	11.1	16.7	11.1

[a] School 73 was the lowest performing in both math and science.

Table 4. Correlations between achievement and socioeconomic indicators (TIMSS 2003).

	1.	2.	3.	4.	5.	6.	7.
1. Gender	1	-.057**	.151**	.049**	-.088**	.269**	0.138
2. Math Ach	-.057**	1	.511**	-.253**	-.109**	0.047	0.025
3. Science Ach	.151**	.511**	1	-.196**	-.119**	0.142	0.112
4. Parent Origin	.049**	-.253**	-.196**	1	.169**	-0.135	-0.08
5. No Books	-.088**	-.109**	-.119**	.169**	1	-0.016	0.021
6. Math Res	.269**	0.047	0.142	-0.135	-0.016	1	.775**
7. Science Res	0.138	0.025	0.112	-0.08	0.021	.775**	1

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5. Regression estimates for socioeconomic status on math and science achievement in Saudi Arabia (TIMSS 2003).

	Dependent Variable	
	Math Ach	Science Ach
Gender	-8.269	43.109***
	(13.381)	(12.258)
No Books	-32.142*	-7.397
	(15.060)	(14.231)
Parent Educ	11.058**	9.623**
	(3.687)	(3.552)
Parent Origin	4.042	8.273
	(22.375)	(9.030)
Sch Resources	0.814	1.893
	(11.987)	(10.441)
Constant	320.423	345.722
	(33.549)	(29.625)
R2	0.117	0.158

*p<.05; **p<.01; ***p<.001

() standard errors in parentheses

Table 6. HLM of socioeconomic status on academic achievement in Saudi Arabia (TIMSS 2003).

	Dependent Variable	
	Math Ach	Science Ach
Student Level 1		
Gender	-6.787***	-4.298**
	(1.292)	(1.399)
No Books	-11.327***	-9.116***
	(2.740	(2.621)
Parent Educ	4.979***	3.908***
	(.741)	(.693)
Parent Origin	-3.420*	-1.139
	(1.648	(1.720)
School Level 2		
Sch Resources	1.809*	0.85
	(.759)	(.706)
Avg Ach	0.904***	0.918***
	(.022)	(.023)
Intercept	361.184	420.289
	(4.242)	(4.424)
Variance Components		
U0	0.447	0.402
R	65.297	4065.119
*p<.05; **p<.01; ***p<.001		
() standard errors in parentheses		

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