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Disadvantaged Outperforming Advantaged Students in Saudi Arabia: Factors Explaining the Odd as a Guide for Educational Leaders

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Abstract: The relationship between students' academic achievement and socioeconomic status has been a topic of interest for decades. It is now well established in the research literature that students with high socioeconomic status are more likely to perform better academically than their counterparts. Despite this generally accepted claim, some schools with disadvantaged students outperform schools with advantaged students. In Saudi Arabia, for instance, TIMSS 2011 data for 8th-grade math students showed nine schools serving disadvantaged students with scores in the top 25th percentiles and eight schools serving advantaged students with scores in the bottom 25th percentiles. Yet, these two types of schools deviating from the literature have received less attention from the research community. The aim of this study, therefore, was to investigate factors explaining student achievement of these two types of schools, which defies findings from the literature. Analysis of the data revealed that teachers' major, professional development, collaborations, students' motivations, and students' perceptions of their schools, teachers, and ability to do well on the subject were the main significant differences between the two groups. Based on these findings, recommendations for future studies and policy are drawn.

Keywords: academic achievement, advantaged and disadvantaged students, student background, Saudi Arabia

1. INTRODUCTION

The relationship between academic achievement and students' socioeconomic status (SES) has been a topic of interest since Coleman's controversial report in the late 1960s. Coleman's (1966) report claimed that the effect of school resources on student academic achievement matters less in comparison to that of student economic backgrounds, which suggest that family backgrounds of students matter more than school resources. These findings were not what many had expected as it was assumed true that lack of school resources was the main reason poor and minority students perform poorly in school (Elite, 2016; Gomora & Long, 2007). Since the publication of this report, several empirical studies have examined the relationship between student academic achievement and family backgrounds to accept, reject, or argue the claim (Elite, 2016; Hanusheck, 1996; Heyneman & Loxley, 1983; Hong, 2012; White, 1982).

It is now well established in the research literature that students with high SES are more likely to perform better academically than their counterparts (APA, 2011; Caro, McDonald, &Williams, 2009; Perry & McConney, 2010, 2013; Sirin, 2005). Despite this generally accepted claim, some schools with disadvantaged and advantaged students are making exceptions; in other words, some schools serving disadvantaged students are achieving higher while some schools serving advantaged students are achieving lower.

In Saudi Arabia, for instance, the Trends in International Mathematics and Science Study (TIMSS) sampled, in 2011, 4,344 (1.2%) students in 153 (2.4%) schools out of the eligible population of eighth graders (370, 250 students from 6,395 schools). From TIMSS' categorization of schools based on student socioeconomic backgrounds, these schools can be divided into two main categories: (a) schools serving students from advantaged economic backgrounds and (b) schools serving students from disadvantaged economic backgrounds. Out of the 153 sampled schools in Saudi Arabia, students in nine schools (5.9%) serving disadvantaged students achieved in the top 25th percentiles while students in eight schools (5.2%) serving advantaged students achieved in the bottom 25th percentiles. These two types of schools making exceptions in academic achievement from the literature have received less attention from the research community; therefore, this study aimed to identify factors explaining student academic achievement of each group, which defies findings from the literature. It is essential for educational leaders to understand which factors cause

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students to excel in academic achievement despite the effects of socioeconomic status.

2. LITERATURE REVIEW

Many variables count for an individual student achievement. Some of these variables are home variables while others are school variables (Barry, 2006). One of the most widely used contextual variables in assessing factors affecting student academic achievement is socioeconomic status (SES) (Aljabri & Barry, 2017; Caro, McDonald, &Williams, 2009; Perry & McConney, 2013; Sirin, 2005; White, 1982). SES of an individual student can be defined in relation to his or her family hierarchical position within a society in terms of education, occupation, income, prestige, or power (Alkhtar & Niazi, 2011; APA, 2011; Caro, McDonald, & Williams, 2009). A student's family position in a society with respect to these variables is an important predictor of academic achievement. However, student academic achievement in the two groups of schools (serving advantaged and disadvantaged students) considered in this study did not support home input factors. This study, therefore, focused on variables related to school rather than home by investigating the differences between the two groups of schools using school-input variables at three levels: (a) the school-level (size and school functioning), (b) classroom-level (teachers and teaching practices), and (c) student-level (students' motivations to learn the subject and their perception about the school, teacher, and subject).

A. School-Level

Several factors contribute to student academic achievement; which are attributed to the school level. One of these factors is the school size (enrollment size in the school). It should be noted that scholars do not agree on a specific number that represents whether a school is small or large (Cotton, 1996; Lee & Smith, 1997; Overbay, 2003). Nevertheless, Cotton (1996) indicated that an effective size for an elementary school is about 300-400 students and for a middle school, an effective size is about 400-800. For Lee and Smith (1997), the optimal range of school enrollment that positively affects student achievement in reading and math is 500-1,000 students. As for Leithwood and Jantzi (2009), the optimal size for schools with disadvantaged students should be 300 students for elementary schools and 600 students for secondary schools.

Focusing on the relationship between school enrollment and student achievement, a study conducted in the state of Alaska in the United States supported that disadvantaged k-8 students achieve better in small schools and poorer in larger schools (Howley, 1996, Huang & Howley, 1993). A similar finding from a longitudinal analysis involving students in four U.S. states showed that student academic achievement in reading and math dropped when school size increased, and the effect is higher in higher grades (Elite & Kisida, 2016). An estimate of value-added study in math and reading from North Carolina in the United States revealed that on average, no causal relationship between student academic achievement and school size. The finding, however, indicated that when examined based on SES and learning disabilities, school size significantly affected disadvantaged more than advantaged students in these two subgroups (Gershenson & Langbein, 2015).

A Second factor that affects students' academic achievement is the school climate, which includes school safety and discipline. A school climate plays a vital role in student learning. Students who positively perceive their school climate as disciplined and safe are more likely to nurture mutual respect, get involved in the learning process, and feel less depressive (Cote-Lussier & Fitzpatrick, 2016; Maxwell, 2016). Gietz and McIntosh (2014) documented that the effects of school climate on student academic success in numeracy and literacy are significantly higher than the impact of poverty and school district. This view is supported by findings elsewhere, which claims that better learning environment leads to better student achievement and the relationship between the two is stronger (Jones & Shindler, 2016; Stewart, 2008).

A third factor that affects student achievement is school absenteeism. The impact of absenteeism on academic achievement as documented by Balfanz and Byrnes (2012) is twice greater for students from low-income families than their counterparts from high-income families. They argued that absenteeism increases the achievement gap and prevents students from graduating on time. This study suggested that the most effective strategy to get students out of poverty is to prevent them from being absent from schools. A study from Uganda backs this finding by stating that absenteeism harms not only students but also the school performance:

> To the students; it leads to poor academic performance, student drop out, graduating half-baked students, poor curriculum coverage and loss of interest in learning whist to the school; it affects the school image, lower the students' enrolment, transfer of students by parents, wastage of teachers' and administrators' time and affects the university/tertiary enrollment. However, the school administration faces challenges of; interruption of lessons, student being hostile/ belligerent to teachers, and parent defending their children whilst dealing with absenteeism students (Komakech, 2015, p.1).

In addition to the impact of student absenteeism on academic achievement, school directors recognized that teacher absenteeism is a leading problem in their schools as well. It is estimated that teacher absenteeism is about 8-10% and the negative impact of their absenteeism on academic achievement is higher in schools serving disadvantaged students (Brown & Arnell, 2012).

A fourth factor recognized as having a direct correlation with students' academic achievement is parental involvement. Students whose parents are more involved in their education achieve academically higher than their peers whose parents are less involved (Topor, Keane, Shelton, & Calkins, 2010, Wilder, 2014). No matter how parental involvement is assessed, the relationship between the two is positive. However, it is documented that when parental involvement is assessed based on parental expectations for academic achievement, the relationship is stronger; when assessed based on homework assistance, the relationship is weaker (Wilder, 2014). Studies supporting the positive link between student academic achievement, parental involvement, and educational expectations are not rare to find (Benner, Boyle, Sadler, & Youth, 2016; Fan & Chen, 2001), and the benefits of parental involvement are high for youth from disadvantaged economic backgrounds (Benner, Boyle, Sadler, & Youth, 2016). Considering parental involvement as the independent variable, and students' achievement in English language and math and integrated sciences as dependent variables, Fajoju, Aluede, and Ojugo (2016) concluded that the more parent participation, the higher the student performance in subjects.

The last factor examined at the school-level was school resources. The impact of this crucial factor on student achievement is strong, particularly in developing countries. Heyneman and Luxley (1983) documented that school resources explain the larger proportion of variance in student achievement between developed and developing countries. Several studies investigated the relationship between student achievement and school incentives to examine whether providing school resources make a difference in academic achievement. For instance, teacher incentive program was implemented in Kenya to find out whether providing incentives improves student achievement. The findings from Glewwe and Kremer' study (2010) showed that school that participated in the incentive program scored significantly higher on the criterion used to determine teacher awards than non-participating schools. However, the study discovered that the incentives did not yield any significance between participating and non-participating schools in terms of student dropout rate and pedagogical practices. The conclusion from the study is that teacher incentives may motivate potential teachers to enter the profession and that having a permanent incentive program may give teachers more motivation to invest in boosting learning in the long run.

A similar study conducted in Israel found significant gains in four out of five achievement measures (average test scores, drop out from grade nine to ten, credit units, and the number of science) but did not find any effect one measure (proportion of students who qualified for matriculation) (Lavy, 2002). The author further called for more school resources targeting teaching time, potential student-drop out, and weak students as an alternative to the program-based incentives.

Findings from Kenya and Israel are in contrast with findings from a study on New York City public schools in the United States and another in Mexico. For the New York City public schools, Fryer (2011) was categorical that teacher incentives do not increase student achievement, attendance, nor graduation or change of student and teacher behavior. Similar to Fryer's findings, Vivanco (2013) reached the same conclusion in his study in Mexico. For him, the relationship between an award and student achievement is null in general and negative for indigenous schools. Some explanations for the non-significance are that the incentives were not enough to change old behaviors or not enough time for implementers to adjust their behaviors for the program to show a positive impact on achievement. He further argued that incentives harmed student performance, particularly in indigenous schools. In his arguments for indigenous schools, he supports that these schools are the most disadvantaged schools in terms of teacher education level (middle-school), student SES, language, infrastructure, and location (remote). It is possible, he concluded, that teachers in these remote communities did not receive the anticipated monetary incentives; which demoralized them and possibly reduced their motivation levels.

B. Classroom-Level

Whenever classroom factors that affect student achievement in the classroom are examined, teachers and their teaching practices are some of the factors widely cited. Wenglinsky (2002) documented in his study the link between classroom practices and student achievement that the effects of classroom practices in combination with teacher characteristics are comparable to the effects of family background. It is asserted that more than one-third of the variations in student achievement across schools are related to classroom-level factors such as class size, teaching practice, and teachers (Andere, 2015; Leithwood, Harris, Day, Sammons, & Hopkins, 2008). Hong (2012), in his regression analyses, showed a strong relationship between teachers' characteristics and student academic achievement in math and science across developing countries.

Scholars with similar arguments agreed that teachers make a difference (Sanders, Wright, & Horn, 1997; Vandevoort & Berliner, 2004). To Woessmann (2016), the differences in students' achievement across countries are explained by the differences in teacher quality and instructional time, not by expenditures and class size. He further argued that what count is not the amount of input that school systems received but how the input is transformed into outcomes. Stressing the importance of teacher quality, Darling-Hammond (2000) argued that the key to improving student performance is to invest in teacher quality. She made it clear that when poverty and language are controlled, teacher preparation and

certification are the factors that improve student achievement the most in reading and math. Her argument for policy is to adopt teacher education, licensing, hiring, and professional development to strengthen qualifications and capacities teachers need to bring to their work. She and her Styles supported that improving teacher quality yield more benefits than class size and composition (Darling-Hammond & Syles, 2003).

The merits of teachers' education and experience are undisputed; however, Buddin and Zamarro (2010) argued against relying only on traditional measures such as education, experience, and scores on licensures to reward teachers as these measures are not associated with their abilities to improve student academic achievement. For them, alternative measures such as incentive programs to reward teachers for their performance might motivate them better and increase their student achievement.

As for the effects of professional development programs on teachers' knowledge, practice, and efficacy, Ingvarson, Meiers, and Beavis (2005) suggested programs that provide opportunities to focus on what students were learning and the challenges they might face in learning the subject matter were highly rated by teachers. Teachers appreciated professional development programs that provide them with opportunities to reflect on their practices, move away from old practice to gain new knowledge and feedback from colleagues, and work collaboratively. Supporting the teacher collaboration part, Killion (2015) stated that teacher collaboration plays a vital role in student academic achievement. It raises not only student achievement but also benefits teachers individually and as a group.

Another classroom factor of student achievement that has been documented in the literature is teacher job satisfaction. A comparative analysis among ten countries on the relationship between teachers' salaries and student achievement showed that teachers' income has a positive impact on student achievement. The study uncovered that the teaching profession is more popular as incomes increase and the possibility of attracting more motivated and skilled individuals is very high (Lukas & Samardzic, 2014). As income is not the only factor that determines job satisfaction, it has been shown that school culture and accountability predict more student academic achievement than job satisfaction (Hatchett, 2010). Iqbal, Asif, Farooqui, and Ali (2016) justified student achievement, in their study, based on teacher satisfaction with the type of supervision provided---not based on salary, as many participants were dissatisfied with their salary.

C. Student-Level

Studies showing the relationship between student motivation to learn and academic achievement are not hard to find. Analyzing South Korean student academic achievement in math, Daniel-House and Telese (2016) found that students who held a positive view of their ability in math scored higher than those who expressed negative views in their ability to do well in math. The study further claimed that students' belief and engagement in school lessons were significantly correlated with their test scores. This finding is corroborated by Huang (2015), who tried to find out if persistence and learning time

could lead students to reduce the achievement gap caused by SES. The author showed that both increase learning time and student persistent were associated with student achievement. However, he argued that for learning and persistence to make a difference in offsetting the achievement gap caused by SES, schools must provide disadvantaged students with learning opportunities and extra classes.

In supporting the role student motivation play in improving learning, Williams and Williams (2011) said motivated students are more likely than others to participate in the learning process by asking questions, paying attention, and being excited. A student's motivation must be regarded as a combination of the student, teacher, content, method/ process, and the environment. It is evidenced that self-regulatory motivation strategies are predicted by how students view the value and utility of school content, tasks, self-efficacy expectations, and achievement goals (Paulino, Sa, & Silva, 2016). Afzal, Ali, Khan, and Hamid (2010) contend that the reciprocal relationship between motivation and performance is that the more a student is motivated, the better his or her performance and vice versa.

Studies on the relationship between student's motivation and their achievement documented two types of motivations--extrinsic and intrinsic. Educators particularly classroom teachers must be aware of these types of motivations and how to use them for the benefits of their students. Students with extrinsic motivations see achievement (test scores) as a mean to secure admission to advance to higher education, which gives them an opportunity to get a good job in their future careers. For these students, constant positive feedback and praise to support their beliefs that they can do well are essential. As for students with intrinsic motivation, it is essential for teachers to make the subject enjoyable, create a conducive learning environment, promote student cohesion, and use cooperative learning strategies (Jen &Yong, 2013). Since both types of motivation improve student academic achievement, it is essential to adopt strategies that consider, as described by Ayub (2010), what students see as rewards and constraints (extrinsic) and what lead them to know, experience simulation, and accomplish things (intrinsic).

3. METHOD

To examine factors leading schools with disadvantaged students to achieve in the top 25th percentiles and schools with advantaged students to achieve in the bottom 25th percentiles, the researcher used the data collected in 2011 by TIMSS. These data include, among others, student socioeconomic status, and school and home resources. However, this study focused on school input as schools with disadvantaged students achieved at the top and schools with advantaged students achieved at the bottom.

A. Study Sample

The sample consisted of schools with disadvantaged and advantaged students in Saudi Arabia. In 2011, out of the eligible eight-grade population (370,250 students from 6,395 schools), 4,344 students (1.2%) in 153 schools (2.4%) were sampled in the country. Out of the 153 participating schools (2.4%), nine schools serving disadvantaged students achieved in the top 25th percentiles (5.9%), while eight schools serving advantaged students achieved in the lower 25th percentiles (5.2%). Participating schools were asked to report the composition of their student population by indicating the percentage of students from economically disadvantaged homes and students from affluent economic backgrounds. Based on these data participants schools were divided into three categories— school serving economically disadvantaged students; school serving neither disadvantaged nor advantaged students; and school serving advantaged students. The interest groups in this study were schools whose achievements deviated from the literature. In other words, students from affluent economic backgrounds achieved lower while those from disadvantaged background achieved higher. The rationale for examining these two groups of schools is to uncover factors leading schools with disadvantaged students to achieve higher and schools with advantaged students to achieve lower.

B. Measuring Student Academic Achievement

Student academic achievement can be measured in many ways. Some of these measures can be student academic achievement (test scores), graduation rate, attendance rate, participation in college, or wages after graduation. For this study, however, student achievement is measured in terms of student test scores assessed by TIMSS 2011. At the time of the data analysis for this study, TIMSS 2011 assessment was the latest study available from TIMSS.

C. Data Analysis

To analyze the data, the researcher used the SPSS, version 24, in conjunction with the International Database Analyzer (IEA, 2014) software. The data were merged using the IEA (IEA 2014) software. The merging consisted of downloading the IDB Analyzer software, which has two options— "merge module" and "analysis module" for SPSS and SAS files. In the merge module option, researchers have the option to merge student achievement file with the school, math teacher, and student background data files. The combined data are automatically converted into SPSS or SAS files (Foy & Stanco, 2013).

To analyze the merged data, the researcher used two types of variables—dependent and independent variables. The dependent variable consisted of TIMSS 2011 eighth-grade student math achievement (test score). TIMSS reported student achievement scores (cognitive test) through five plausible values (a representation of a range of abilities a student might have). The final score of student achievement is coded as "BSMMAT01-05" and included in the TIMSS international database free of use. The researcher used this score as the dependent variable in the analysis. As for the independent variables, the researcher used variables at the school-level (school size, safety and discipline, and instructional resources), classroom-level (teacher characteristics, teaching practice, professional development, job satisfaction), and student-level (students' motivation to learn, perceptions about their school, teacher, and subject).

To find out whether there were any significant differences between the two groups (disadvantaged students with scores in the top 25th percentiles and advantaged students with scores in the bottom 25th percentiles), the researcher used the independent sample t-test (the same result can be achieved with one-way ANOVA). The Levine's test for equality of variances was used to test the assumption of homogeneity of variances. Also, the Cohen's d was used to compute the size effect whenever a variable revealed a significant difference between the two groups.

4. RESULTS

Analysis of the data between the two groups of schools (serving advantaged and disadvantaged students) at each level (school, classroom, and students) are presented below.

A. At the School-Level

The independent samples t-test did not yield any significant differences between the two groups as shown in Table 1

Table 1: Independent Samples t-test at the School-Level for Differences Between the Two Groups

		Levene's Test of Variances		t-test for Equality of Means						
									95% Confi. Inter. of the Diff.	Size effect Cohen's d
		F	Sig.	t	df	Sig. (2-tail)	Mean Diff.	Std. Error Diff.	Lo.	Up.
Total St. in Sch.	Eq.var. ass.	.13	.73	-1.13	15	.28	-85.42	75.67	-246.69	75.86	---
Total st.in 8th g.	Eq.var. ass.	.00	.96	-1.31	15	.21	-32.24	24.58	-84.63	20.16	---
Total. st.per cl.	Eq.var. ass.	.50	.49	.39	15	.70	1.81	4.61	-8.03	11.64	---
Sch. disc & Saf.	Eq.var. ass.	.49	.50	.27	15	.79	.11	.41	-.77	.99	---
Sch. Absen.	Eq.var. ass.	.27	.61	-1.10	14	.29	-.49	.45	-1.45	.47	---
Teachers' abs.	Eq.var. ass.	.50	.49	.77	15	.45	.40	.52	-.71	1.52	---
Parental invol.	Eq.var. ass.	.01	.91	-1.17	15	.26	-.56	.47	-1.56	.45	---
In. aff. math res.	Eq.var. ass.	.00	.98	-.59	15	.57	-.13	.21	-.58	.33	---
Inc.for Math tea.	Eq.v.not ass.	---	---	2.00	14	.07	.43	.22	-.03	.89	.96
Incen. for others	Eq.var. ass	1.40	.26	1.05	14	.31	.27	.26	-.28	.82	---

The only variable that came close to being significant at the school-level is the use of incentive for math teachers, t (14) = 2.00, p= .07. The effect size of this variable as measured by Cohen's d is .96 considered a very large effect size between the two groups.

B. At the Classroom-Level

Table 2: Independent Samples t-test at the Classroom-Level for Differences Between the two Groups

		Levene's Test of Variances		t-test for Equality of Means							
									95% Confi. Inter. of the Diff.		Size effect Cohen's d
		F	Sig.	t	df.	Sig. (2-tail)	Mean Diff.	Std. Error Diff.	Lo.	Up.	
Age of teacher.	Eq.var.ass.	1.94	.18	-1.37	15	.19	-.58	.43	-1.49	.32	---
Teaching Exp.	Eq.var.ass.	.40	.54	-.72	14	.49	-3.00	4.19	-11.99	5.99	---
Majored. in Math	Eq.v.not ass.	---		-1.82	14	.09	-.41	.23	-.90	.07	---
Maj.in Ed.&Math	Eq.var.ass.	.69	.42	3.10	14	.01	1.02	.33	.31	1.72	.62
Prof.dev.Math cont.	Eq.v.not ass.	---	---	-2.00	8	.08	-.33	.17	-.72	.05	---
Prof dev. Math ped.	Eq.v.not ass.	---	---	-3.16	8	.01	-.56	.18	-.96	-.15	1.49
Tea. Disc. Concept.	Eq.var.ass.	.84	.37	-2.72	14	.02	-1.17	.43	-2.10	-.25	1.39
Tea.collab.	Eq.var.ass.	2.83	.11	-2.61	14	.02	-1.10	.42	-2.00	-.19	1.37
Job satisfac.	Eq.var.ass.	1.84	.19	.65	15	.53	.25	.39	-.57	1.07	---

As shown in Table 2, four variables out of the nine analyzed for differences between the two groups of schools showed significant differences between the two groups while the other remaining five variables did not yield any significance.

The four variables showing significant differences between the two groups are (a) teacher majored in Education and Math, t (14) = 3.10, p=0.01; (b) teacher professional development in math pedagogy, t (8) = -3.16, p = .01; (c) teachers discuss math concepts, t (14) = -2.72, p= .02; and (d) teacher collaboration to improve teaching, t (13.9) = 2.59, p = 0.02. The remaining five out of the nine variables at the classroom level that did not show significant differences between the two groups are (a) the age of the teacher, t (15) = -.1.37, p= .19; (b); years of teaching, t (14) = -.72, p=-.49; (c) math as major area of study, t (15) = -.1.82, p= .09; (d) professional development in math content, t (8) = -2.00, p= .08; and (e) job satisfaction, t (15) = .65, p= .53.

C. At the Student-Level

Table 3: Independent Samples t-test at the Student-Level for Differences Between the two Groups

		Levene's Test of Variances		t-test for Equality of Means							
									95% Conf. Inter. of the Diff.		Size effect Cohen's d
		F	Sig.	t	df	Sig. (2 tail)	Mean Diff.	Std. Error Diff.	Lo	Up	
Agree to be in school	Eq.var.ass	1.06	.32	2.35	15	.03	.30	.13	.03	.57	1.12
Feel safe in school	Eq.var.ass	2.19	.16	2.29	15	.04	.25	.11	.02	.49	1.12
Wish have not to study math	Eq.var.ass	.03	.86	-3.63	15	.00	-.51	.14	-.82	-.21	1.76
Like math	Eq.var.ass	.99	.33	3.08	15	.01	.47	.15	.14	.80	1.50
Teacher expect me to do well	Eq.var.ass	3.91	.07	2.81	15	.01	.28	.10	.07	.49	1.34
Teacher easy to understand	Eq.v.not.ass.	---	---	2.25	10	.05	.31	.14	.00	.61	1.11
Math is difficult	Eq.var.ass	.27	.61	-2.37	15	.03	-.40	.17	-.76	-.04	1.14
Math not my strength	Eq.var.ass	1.01	.33	-3.58	15	.00	-.62	.17	-.99	-.25	1.75
I can do well in math	Eq.var.ass	.14	.71	2.49	15	.03	.30	.12	.04	.55	1.20
Need math to learn other things	Eq.var.ass	.22	.64	4.70	15	.00	.35	.07	.19	.51	2.31

Results in Table 3 showed that there are significant differences between students in the two groups in all variables tested at the student-level. The variables showing significant relationship are listed per their order of significance. The first level of significance is the student's agreement in terms of "I need math to learn other things" t (15) = 4.70; p = .00; "I wish have not to study math" t (15) = -3.63, p = .00; and "math is not my

strength" t (15) = -3.58, p = .00. The next level of significance is the student's agreement with respect to "I like math" t (15) = 3.08, p = .01; and "teacher expects students to do well" t (15) = 2.81, p = .01. The third level of significance is student's agreement with respect to "I can do well in math" t (15) = 2.49, p = .03; "math is more difficult" t (15) = -2.37, p = .03; and "being in school" t (15) = 2.35, p = .03. The last level of significance is student's agreement with respect to "being safe in school" t (15) = 2.29, p = .04; and "teachers are easy to understand" t (9.94) = 2.25, p = .05.

5. Discussion and Conclusion

The purpose of this study was to investigate factors leading schools that serve disadvantaged students to achieve in the top 25th percentile and schools that serve advantaged students to achieve in the bottom 25th percentile. To achieve this aim, the researcher used an independent sample t-test to analyze the explanatory factors at the school, classroom, and student levels.

At the school level, all the variables examined yielded no significant differences that could be used as explanatory factors that led disadvantaged students to achieve in the top 25th percentiles and advantaged students to achieve in the bottom 25th percentiles. This finding is in contrast with findings in earlier studies, which supported that disadvantaged students achieve higher in small schools and poorer in larger schools (Egalite & Kisida, 2016; Gershenson & Langbein, 2015; Howley, 1996; Huang & Howley, 1993; Lee & Smith, 1997). Previous findings also support that absenteeism harms student achievement (Balfnz &Byrnes, 2012; Brown & Arnell, 2012; Komkech, 2015), school safety and discipline boost student achievement (Cote-Lussier & Fitzpatrick, 2016; Gietz&McIntosh, 2014; Jones &Shindler; 2016; Maxwell, 2016; Stewart, 2008). Further, parental involvement contributes to school achievement (Benner, Boyle, Sadler, &Youth, 2016; Fan &Chen, 2001; Topor, Keane, Shelton, & Calkins, 2010), and resources explain a larger proportion of variance in achievement for developing countries (Heyneman & Luxley, 1983).

On the use of incentives in the schools, two types of incentives were examined—(a) incentives related to recruiting and maintaining teachers (other) and (b) incentives provided to math teachers (incentives to teach math). Finding related to hiring and maintaining teachers did not produce any significance as supported by previous studies (Fryer, 2011; Vivanco; 2013). However, incentives provided to math teachers is the only variable at the school level that came close to being significant, and this finding is supported by previous studies (Glewwe &Kremer, 2010; Lavy, 2002), which suggested that teacher-incentives do contribute to student achievement.

The interpretation of the findings at the school-level is that the student enrollment means size, at both levels, was small and similar between the two groups (less than 388 students for school size; less than 96 students for eighth-grade cohort, and less than 28 students per class). Enrollment in both schools serving advantaged and disadvantaged students in Saudi Arabia is smaller than the recognized standard size of a small school, which ranges between 400 and 1000 students (Cotton, 1996; Lee & Smith, 1997; Leithwood & Jantzi, 2009). Data from both types of schools indicate that school directors share similar views of their schools concerning absenteeism, safety and discipline, and parental involvement. The explanation for not finding significance on the use of incentives to recruit and maintain teachers is that public school leaders play no role in recruiting teachers as they are both employees of the same educational authority. Job assignment to a school for both groups is decided by the same educational authority. The variable that came very close to making a difference between the two groups at the school level is the use of incentives for math teachers, t (14) = 2.00, p= .07 ($p \geqslant \alpha = 0.05$). The justification is that incentives in a school serving disadvantaged students have more effect in improving student achievement than incentives in schools serving advantaged students.

At the classroom-level, the variables analyzed for differences resulted in two categories—one showed strong positive significant differences and the other showed no significance at all. In this study, teachers' age, experience, job satisfaction, major (math only), and professional development (math content only) turned to be non-significant. This finding is in correlation with Zamarro's finding (2010) on teachers' qualifications, which suggested the use of alternative measures for teachers to improve student achievement rather than relying on qualifications. In previous studies, job satisfaction also was found to not be a predictor of student achievement (Hatchett, 2010; Iqbal, Asif, Farooqui, & Ali, 2016). One possible interpretation for the non-significance of these factors is that teachers of both groups of schools are the product of the same education system with same benefits; therefore, they have similar characteristics and feeling about their jobs.

The variables distinguishing teachers in these two groups of schools are those who majored in math only and those who majored in math and education. Additionally, those who have received professional development in math pedagogy, collaborated, and discussed math concepts showed positive significance on their student academic achievement than those who have not. This finding confirms the notion that having education and qualification is essential to exercise the teaching function but not enough to guarantee success in the classroom. What is equally important is knowing how to transfer the knowledge to learners (i.e., the pedagogy).

The last step of analyses focused on student-level. At this level, all variables examined showed significant differences between the two groups. Students from disadvantaged schools expressed better feelings about

their schools, teachers, and the subject of math than students from advantaged schools. Students from disadvantaged schools also exhibited better confidence in their ability in math subject than students from advantaged schools. In addition to these intrinsic motivations, students from disadvantaged schools indicated that they need math to learn other subjects to enter university (extrinsic motivations). This finding is in correlation with many previous studies; which suggested that students who believed in their ability to do well, have positive view of their schools, teachers, subjects, and have goals for future education and careers achieve higher than those who do not (Ayub, 2010; Daniel House & Telese, 2016; Huang, 2015; Paulio, Sa, & Silva, 2016; Williams & Williams; 2011). The possible interpretation of disadvantaged students' higher achievement is that they are more motivated (intrinsic and extrinsic), have a favorable view of their schools, teachers, subjects, and their teachers possessed the teaching pedagogy, worked collaboratively and discussed math concepts.

This study could be concluded by saying that what went to inside the classroom showed to be the significant factors on why schools serving disadvantaged students outperformed schools serving advantaged students in these two groups of schools. These factors, as stated before, are the teachers' major in math and education, professional development in math pedagogy, collaborations, student motivations (intrinsic and extrinsic), perceptions of their schools, teachers, subjects, and ability to do well in math.

6. Recommendations for Future Studies and Policy

Recommendations for future studies are based on two limitations noted in this study. The first one is the lack of longitudinal data in Saudi Arabia to allow estimation of individual change over time. Every four years, within a country, schools and students are randomly selected by TIMSS to participate in the assessment. However, schools and students in previous assessments may not get a chance to participate the next assessment; which make estimation of progress over time at the school and student levels difficult. The second limitation is that the data used for analysis in this study are based on a survey questionnaire; which has its own limitation in term of knowing what is going on inside a school or classroom.

To validate findings from this study, it is recommended to conduct a follow-up qualitative research using observations, interviews, and document analysis to find out if what is taking place inside the schools corroborates findings from the data collected through the questionnaire. If validity is confirmed, then the following short and long-term policy is recommended.

Based on findings from this study, the researcher recommends to educational leaders a short-term policy and a long-term policy to improve student academic achievement. For the short-term policy, the focus is on improving the actual school achievement by providing teachers with professional development in math pedagogy. In this professional development, teachers are trained on how to transfer their knowledge to learners using a combination of intrinsic and extrinsic factors. Intrinsic factors that encourage students to learn include making the subject enjoyable to them by adapting the subject contents to students' realities such as simulations of sports, TV shows, interest groups, etc. Extrinsic factors that encourage students to learn include connecting learning to students' aspirations such as admission to higher education, desire in society and future career, etc. The training also must include teacher collaboration on subject contents. Teachers teaching the same subject prepare lesson plans together and visit each other in class to provide feedback for improvement. The researcher strongly believes that student motivations to learn and learning/teaching practices are the driving forces why students excel in their studies even if they are coming from disadvantaged backgrounds. Educators, particularly classroom teachers, must be aware of and know how to use these types of motivations and teaching/learning practices for the benefits of their students.

For the long-term policy, the focus is on selecting the best candidates for the teaching profession (preferably just after high school graduation). Then, enroll them in a four-year college degree in a specific subject (math, science, humanities) to ensure that they receive the competencies needed to be a teacher in a specific subject. Following the successful completion of the four-year degree (bachelor's degree), the candidates, then, go for a two-year master's degree in math and science education or humanity education with a specialization, for instance, in math education, chemistry education, history education, foreign language education or religious education. This master program (preferably from the department of learning and instruction) can be designed to offer, for example, two tracks—one track in humanity education and one track in math and science education. Based on a student subject interest, he or she can join one of the two tracks.

The first year of the master program might consist of six core courses on how to teach subjects. For the math and science education track, the program might consider one math course, one science course, one action research course, one leadership course (from the department of leadership and administration), one technology course (from the department of technology), and one special education course (department of special education). For the humanity education, the program might consider one social science course, one religious course, one foreign language course, one action research course, one leadership course (from department of leadership and administration), one technology course (from department

of technology), and one special education course (department of special education).

In the second year, the program might consist of two parts—the application of the action research course (taught in year one) and an internship (full time) in a school with an experienced teacher in the student subject of specialization. For the application of the action research course, a student will identify an issue in the assigned school (for instance, absenteeism, parent-teacher relations, teacher collaboration, student poor achievement, homework assignment, disciplines, technology, learning materials, etc.), develop a complete master project paper integrating theories and practice to propose a practical solution to the issue. The master project must be designed under the guidance of the action research course supervisor.

For the internship (this is a one-year internship in which student works as a full-time teacher), in the first semester, the student will observe teaching and learning in action, take notes, assist the principal teacher in daily activities, and be involved in school activities such as teacher meetings, school-parent meetings, and so on. In the second semester, the student will take a practical teaching role under the observation of the principal teacher who provides feedback on every lesson taught by the student including subject contents, lesson plans, lesson preparation, assessments, and interaction with students. The student subject supervisor from the education college must visit the student in his or her internship school at least once in every two months to observe the student for feedback and discuss with teacher supervisor from the assigned school about the evolution of the student in the internship.

As a requirement for the completion of this master program, one might set criteria such as 40% for the first-year courses, 40% for the full-year internship, 10% for the master project paper, and 10% for student's portfolio (containing all student's activities during the entire master's program, organized in an efficient way). During the internship year, the students would be provided with stipends to cover transportation, basic teaching supplies, and lunch (as the work required to the students is identical to a full-time teacher) would help them successfully complete the program with less financial burdens.

For such a policy to succeed in attracting the best candidates to the teaching profession and who will remain in the profession and devote their lives to educating future generations, the researcher strongly believes that salaries and long-term benefits must be very competitive in comparison to any other sectors within a country.

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