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Is there a crisis for boys? Gender Differences in Student Achievement and Teacher Training
Characteristics in the Gulf Cooperation Council Countries

by

Emily Anderson

A Thesis
Presented to the Graduate and Research Committee
of Lehigh University
in Candidacy for the Degree of
Master of Arts
in
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Abstract

Gender differences in student achievement, and the inferred educational disadvantage of boys, is the context of the “crisis for boys” discourse in education. Ridge (2009, 2010) suggests that boys’ underachievement in the United Arab Emirates (UAE) may be related to the training characteristics of expatriate male teachers in boys’ schools. The UAE is a member of the Gulf Cooperation Council (GCC) countries which also includes Bahrain, Kuwait, Oman, Qatar, and Saudi Arabia. The supposed crisis for boys, related to the training characteristics of expatriate teachers from Egypt, Jordan and Syria, has only been discussed in the UAE and not in other GCC countries; however, the UAE shares similar economic, social and political characteristics with the other GCC countries (Wiseman, 2005) including the hiring of expatriate teachers in secondary science and other high-need areas in education. This study investigates whether or not gender differences in 8th grade students’ science achievement are associated with differences in teachers’ training in the GCC countries using data from the 2007 Trends in Mathematics and Science Study (TIMSS). Significant differences were found in male and female 8th grade teachers’ training characteristics across the countries of interest, but these differences were found to have no significant association with boys’ and girls’ science achievement.

Introduction and Problem Statement

Gender differences in student achievement have created an international ‘moral panic’ among education policy makers and politicians in recent years (Gorard, Rees & Salisbury, 2001). This moral panic is rooted in assumption that boys are educationally disadvantaged because girls’ academic achievement has increased and outpaced boys’ in certain cases. Gender differences in student achievement, and the inferred educational disadvantage of boys, is the context of the “crisis for boys” discourse in education.

Theories seeking to explain gender differences in achievement, and the so-called crisis for boys, have ranged from biological and cognitive differences between boys and girls, to the “feminization” of school culture, curriculum and instruction (Okopny, 2008; Smith, 2003). Only one researcher has identified teacher training as a potential contributor to the boys’ crisis (Ridge, 2009, 2010). Ridge suggests that gender differences in student achievement in the United Arab Emirates are the result of poor teacher quality in boys’ schools. The UAE a unique case because of the large number of expatriates from Egypt, Jordan and Syria employed as teachers in boys’ schools. Ridge suggests that male teachers trained outside the UAE may not be adequately prepared and that their training deficits have contributed to differences in boys’ and girls’ academic achievement.

The UAE is a member of the Gulf Cooperation Council (GCC), which also includes Bahrain, Kuwait, Oman, Qatar, and Saudi Arabia. The supposed crisis for boys, related to the training characteristics of male expatriate teachers from Egypt, Jordan and Syria, has only been discussed in the UAE and not in other GCC countries; however, the UAE shares similar economic, social and political characteristics with the other GCC countries (Wiseman, 2005), including the hiring

of expatriate teachers in secondary science and other high-need areas in education. If gender differences in student achievement are found to be associated with teachers' training characteristics in the UAE, it is possible that there may be similar relationship across the region. The problem this study investigates is whether or not gender differences in 8th grade students' science achievement are associated with differences in teachers' training in the GCC countries using data from the 2007 Trends in Mathematics and Science Study (TIMSS). If significant differences are observed, then the boys' crisis explained by differences in teachers' training characteristics may have credibility. If not, then the boys' crisis is not as extreme or evident as has been suggested.

Five of the six GCC countries, Bahrain, Kuwait, Oman, Qatar and Saudi Arabia participated in TIMSS 2007; Dubai, UAE participated as a benchmarking community. Egypt, Jordan and Syria are included as target comparison countries, and all three participated in TIMSS 2007. TIMSS reports country-level data for 4th and 8th grade students' achievement in mathematics and science and teacher training characteristics from 59 countries and 8 benchmarking communities (Olsen, Martin, & Mullis, 2008). Teacher training characteristics from all the GCC and target comparison countries are used to investigate differences in the ways teachers are trained.

Students' science achievement in 8th grade is used because cross-national evidence suggests that girls' achievement in science tends to drop once they enter secondary school. Focusing on science achievement as opposed to mathematics may "level the playing field" to more closely assess if gender differences are present because girls' achievement has increased over time, but levels out in secondary school. The purpose of this study is to investigate if there is a crisis for boys in the GCC by empirically measuring if gender differences in 8th grade students' science

achievement are associated with the training characteristics of teachers in boys' and girls' schools.

Literature Review

Questioning the crisis for boys: Conflicting perspectives on gender differences in student achievement

Gender differences in student achievement have drawn attention from education policy makers and politicians in recent years because girls' performance on cross-national standardized tests has increased while boys' performance has remained stagnant. International evidence indicates that girls are more likely to outperform boys in literacy and the humanities (Sadowsky, 2010). Gender differences are narrower in mathematics and science and in some cases boys still demonstrate an advantage in these subjects once they enter secondary school (Husain & Miller, 2007).

Research investigating whether a crisis for boys does exist, and factors influencing gender differences in student achievement, has been largely inconclusive. Because of this lack of consensus two conflicting perspectives have emerged in the crisis debate. The first is that increases in girls' academic achievement are the result of education policy and funding schemes to increase their access to schooling and educational outcomes. Girls' steady increase in achievement is evidence that these policies have been successful, and have also had a "spillover effect", increasing girls' access to tertiary education and historically male-dominated professional fields (Ramirez & Wotipka, 2001). In this regard, education policy reforms to increase girls' access and achievement in schooling have been successful. However, because gender differences in student achievement have become more significant over time, the discourse

has shifted from girls being disadvantaged – lacking access and lower achievement - to boys being disadvantaged – marginalized by biased curriculum, instruction and assessment. This shift is important because it assumes that because girls’ achievement levels have increased, and that boys’ achievement has remained stagnant or only marginally increased, that boys are educationally disadvantaged. Rather than celebrating the successes of education policies targeted to increase girls’ achievement and schooling access, these victories have been silenced through the boys’ crisis rhetoric (Smith, 2003).

The counter-perspective which supports the boys’ crisis argument is that gender egalitarianism and shifting gender norms have feminized the schooling experience causing boys to be educationally disadvantaged. Smith (2003) discusses three dominant narratives in the crisis literature that seek to explain gender differences in student achievement: the conflict of masculinity in society, curriculum and assessment of student learning, and teacher-student classroom interactions. Her synthesis of the boys’ crisis literature suggests that boys’ underachievement gives way to assumptions that males will “lose ground” to females in the workforce as a result of their lower performance in school (p. 284). Weaver-Hightower (2003) connects the crisis (or “boy turn”) with a larger crisis of masculinity. The crisis of masculinity - shifting gender norms in work and family life - has accelerated the moral panic and crisis arguments internationally. This has led education policy makers, politicians and parents to sound the alarm for education policy reform to support “boy-friendly” instruction, curriculum and assessment to increase boys’ achievement and schooling outcomes (Sadlowky, 2010; Mills & Lingard, 1997).

The boy's crisis suggests that the conflict of masculinity may also influence boys' behavior in school and their achievement in specific curricular areas and learning activities (Orr, 2011). Selected literature suggests that boys' underachievement in language arts and the humanities may be a reflection of the ways boys attempt to signal their masculinity in schooling in response to gendered assumptions about the feminization of curricula (Smith, 2003; Ridgeway & Correll, 2004). Theories explaining differences in boys' and girls' achievement in literacy and mathematics suggest that these differences may be due to perceptions of reading being "girls' work" and science and mathematics being within the male domain (Cappon, 2011). These findings were also reflected in the OECD (2009) report, *Equally Prepared for Life?: How 15 year old girls and boys perform in school*, which suggests that in order to increase boys' literacy skills, policies should be developed to increase their motivation to read and that boys require additional support of teachers, parents, and their communities to develop these skills.

Broadly constructing the crisis for boys, assumes that all boys require the same types of intervention or support to increase their achievement rates. Rather than presenting the crisis in this way, it is important to identify *which* boys may be in need of specific interventions. The literature reviewed here is largely inconclusive on whether gender differences in student achievement actually disadvantage boys in school or once they leave school. Though variation does exist, gender differences in student achievement may be influenced by other economic, political and social conditions that affect their academic outcomes (Cappon, 2011; Perkins-Gough, 2006).

Gender differences in student achievement in the GCC

This study uses data from the 2007 Trends in International Mathematics and Science Study (TIMSS). Bahrain, Kuwait, Oman, Qatar, and Saudi Arabia participated in TIMSS 2007, and Dubai, UAE participated as a benchmarking community. Egypt, Jordan, and Syria participated in TIMSS 2007 and student achievement data is included to highlight how boys and girls in these countries performed on TIMSS as comparison cases. These countries are included because of the prevalence of teachers from these countries teaching in schools across the GCC. So, if boys' scores are lower in these countries as well, their performance could be associated with ways their teachers are trained.

Boys' and girls' mean 8th grade science achievement scores in TIMSS 2007 paint an interesting picture of gender difference in and across the GCC and target comparison countries. Table 1 reports girls' and boys' mean science achievement scores, standard deviations, and gender difference in mean science achievement (girls' mean science achievement - boys' mean science achievement) for each GCC and target comparison country (Martin, et al, 2008; Gonzales, et al, 2008).

Table 1. Girls' and Boys' Mean Science Achievement Scores for GCC and Target Comparison Countries¹

Country	8 th Grade Girls		8 th Grade Boys		Gender Difference	p
	Mean	Standard Deviation	Mean	Standard Deviation		
Bahrain	499 (1.9)	64 (1.5)	436 (2.6)	62 (1.0)	63	*
Kuwait	441 (3.4)	78 (1.2)	391 (4.2)	94 (2.2)	50	*
Oman	452 (3.6)	83 (2.0)	391 (4.6)	98 (2.1)	61	*
Qatar	354 (2.3)	110 (1.9)	284 (2.3)	113 (1.6)	70	*
Saudi Arabia	426 (2.9)	70 (1.5)	383 (3.9)	79 (3.0)	43	*
Dubai, UAE	495 (5.1)	88 (2.5)	483 (6.1)	99 (2.8)	12	-
Egypt	417 (4.8)	97 (2.0)	400 (4.6)	101 (2.1)	17	*
Jordan	499 (5.8)	90 (2.2)	466 (5.5)	102 (2.5)	33	*
Syrian Arab Republic	448 (3.3)	73 (1.9)	457 (4.2)	76 (2.2)	-9	*

¹ Martin, et al, 2008; Gonzales, et al, 2008

Significance levels for gender difference not reported for Dubai, UAE.

p<.05 (*), p< .01 (**), p< .001 (***)

Standard errors reported in parentheses

Girls demonstrate a statistically significant advantage in 8th grade science achievement in all GCC countries ($p<.05$); significance levels were not reported in Dubai, UAE but girls outperform boys in 8th grade science by an average of 12 points. Girls outperformed boys in two out of three target comparison countries (Egypt and Jordan), but boys present a statistically significant advantage in Syria ($p<.05$). This is significant because if boys' underperformance is found to associate with teachers' training characteristics, there may be evidence to confirm that the crisis in fact exists, and is negatively affecting boys across the region.

Boys' and girls' performance in large-scale international testing: Highlights from TIMSS and PISA

Cross-national studies investigating gender differences in student achievement suggests girls outperform boys on standardized tests, persist through primary and secondary school, and have a generally more positive schooling experience compared with their male peers (Cappon, 2011).

Boys are more likely to drop out of school than girls, but remain in school longer or at par with girls in nations with vocational and technical secondary opportunities. Gender differences in students' schooling experiences, achievement and outcomes are all discussed as part of the boys' crisis; however, differences in achievement, as measured by national and international standardized tests, have become a focal point for policy reform.

This study uses data from the 2007 Trends in International Mathematics and Science Study but there is also a wealth of data on student achievement from the Programme for International Student Assessment (PISA) which measures 15 year old students' literacy, mathematics and science learning in 65 countries (PISA, 2012). PISA 2006 is included in this discussion because it assess students' science skills and knowledge (OECD, 2011), and provides comparative evidence to supplement this study's analysis of students' science achievement using TIMSS.

Qatar and Dubai were the only GCC countries that participated in PISA 2009. Qatar participated in the 2009 cycle. Dubai conducted the assessment in 2010. Recently published reports on a study conducted by the Australian Council for Educational Research for the UAE Ministry of Education, identified gender differences in student achievement in literacy, mathematics and science (*The National*, 2012). Girls outperformed boys on all sections of the exam in Dubai. The greatest difference in students' achievement was in the scientific literacy scale, in which girls outscored boys by 31 points. Differences were less pronounced in mathematics, where girls averaged a 6 point advantage compared with boys.

Dubai's performance in PISA 2009 mirrors Qatar's performance in the 2006 cycle. PISA 2006 highlighted significant gender differences in two of the three scales used to assess students' science learning. Cross-nationally, girls outperformed boys in identifying science issues and

knowledge about science scales, but not in the physical systems scales (OECD, 2009). In Qatar, girls outperformed on average 37 points higher than boys in the “identifying science issues” scale. Significant differences in student achievement by gender and national status, an indicator of whether or not students or their parents were born in the country in which they attend school, were observed in Qatar and other countries with high immigrant/expatriate populations. Qatar reported having over 10 percent of their total student population as being non-Qatari, and within this group, males reported an advantage over females by an average of 16 points (p. 40). Across all OECD countries there was a small but significant advantage for males in their perceptions of learning science as preparation for entering careers in science. However, females reported an advantage over males in this question scheme in Qatar. This was the largest gender difference observed of any partner countries participating in PISA 2006.

PISA 2006 included, for the first time, indicators to assess students’ self-efficacy and expectations in learning science. Analyses of these indicators performed by the OECD found no significant gender difference in student’s motivation in learning science, or expectations related to how science knowledge would benefit their transition to post-secondary education or careers with few exceptions. A gender difference was identified favoring male students in the “index of future motivation to learn science” in Qatar. The opposite effect was found in the analysis of students’ “knowledge of science and science-related careers”.

Dubai’s performance in PISA 2009 and Qatar’s performance in PISA 2009 and 2006 are interesting profiles of students’ science knowledge in two GCC countries. For example, girls presented an advantage over boys in the items discussed here with the exception of girls’ future motivation to learn science in PISA 2006. Overall, girls seem to associate doing well in science

with their future goals; however, the opportunity structure limits their ability to effectively transfer what they know and can do in the labor market. This may explain why girls report lower motivation in learning science after secondary school despite their knowledge of science-related careers. Despite boys' lower achievement in science overall, these findings suggest that they still seem to recognize their own advantage in science-related fields after leaving secondary school.

Shafiq (2011) identifies that girls are more likely to perform higher than boys in literacy assessments and boys are more likely to perform higher in mathematics and science. No significant differences in student achievement were found in Muslim and non-Muslim countries when gender is controlled. This study investigated student achievement controlling for gender and socioeconomic background effects, but acknowledged that specific cultural beliefs were not reflected in the analysis. Further, he found that single-sex schooling does not universally benefit female or male students in all countries. This is particularly important when considering that secondary schooling across the GCC and target comparison countries is typically single-sex and benefits of single-sex schooling reported by the OECD may reflect the uniqueness of these school-types in the countries studied and not in countries where single-sex schools are the norm (Baker, Goesling & LeTendre, 1995).

Economic, political and social characteristics of GCC countries

In order to understand why girls perform higher in science than boys across the GCC and target comparison countries, it is important to discuss the social, political and economic characteristics of these countries, and how these may factors influence students' schooling experiences and outcomes. Wiseman (2005) discusses the shared social, economic, and political characteristics of the GCC countries as the "Gulf State Phenomenon". These shared characteristics include a

strong religious ideology, rapid economic change, and developing social infrastructures. These factors greatly influence how schooling “works” in these countries because of educational policy borrowing across the region. Knowing that the GCC shares similar economic, political and social characteristics is important, but it is also necessary to acknowledge how gender segregation has historically impacted individuals’ economic and social opportunities across the GCC. This discussion provides contextual background to explain how individuals’ schooling outcomes are shaped by socially constructed gender norms in and out of school.

Gender and educational opportunity in the GCC countries

Gender segregation and patriarchal cultural expectations in the GCC construct educational and labor opportunities for men and women in the region. Historically, women’s education was historically limited to improving family life, and not to pursue employment outside the home. In some cases, employment was restricted by law. Gender segregation and the resulting differences in students’ educational access and outcomes in the GCC are often linked with influence of Islam in these countries. Linking these differences to Islam does not account for the different ways Islamic traditions are diffused through social, political and economic sectors in these countries, or across the region as a whole.

The education of women in Islamic countries was historically restricted to the inculcation of traditional Islamic values and customs, and women’s roles in the family. Girls were not allowed to attend Islamic schools during the early Islamic period, and their education was restricted to home instruction. Western schooling models were introduced in the 19th century which included schools for girls. However, these schooling models were not introduced the same in all GCC countries, nor did they provide for or promote girls’ education in all cases. Islamic law does not

restrict girls' access to education, but it does require women and girls to dress and behave modestly and to limit their interactions with men to whom they are not directly related (El-Sanabary, 1994, p. 6761). For example, in Saudi Arabia, girls' education was not publically funded or provided until 1960. Until 1960, Saudi families with the financial means and incentive to formally educate their daughters could do so only by sending them to private schools. Many of these legal restrictions have changed, and women GCC nationals are guaranteed employment protections through national labor policies. Exceptions do still exist, and in the case of Saudi Arabia, women are legally restricted from working, or socializing, with men outside their immediate family (Kapiszewski, 2001, p. 104). Government policies also restrict females' access to full employment in the UAE because married women are required to have permission from their husbands in order to work outside the home (World Bank, 2011).

Women make up the majority in enrollment in post secondary education in the majority of OECD countries, but in the UAE, they are more likely to enroll in programs that are historically "feminine", including teaching and the humanities (Kirk & Napier, 2009). Thus, women's higher education enrollment has not necessarily advanced their employment or economic opportunities in all cases and disparities continue to exist in science and technical fields (Hanson, Schaub & Baker, 1996). For example, in the UAE men expected to be the primary wage earner for their families and married working women are not typically the sole wage earners (Ridge, 2010). This practice has roots in Islamic tradition. Though historically Muslim women worked outside the home, women's work became socially stigmatized through modern interpretations of Islamic traditions (Kapiszewski, 2001). This stigma resulted from social assumptions about a husband's inability to financially provide for his family. In effect, a women's work outside the home signaled her family's financial status and need for her to contribute to the household income.

As a result of de facto and legal gender segregation in the GCC males are more likely to seek employment in higher earning fields that require a lower-level of education including positions in the military, police, and other government ministries. The UAE is a compelling example of the ways de facto, or institutionalized gender segregation, affects schooling outcomes and labor market opportunity for men and women. Emirati men earn on average four times more compared with women and have greater access and employment in technical and managerial positions. Emirati women are more likely to be employed in administrative positions or within the education sector as teachers (Assad, 2008). Though gender parity in schooling is assessed at 99 percent in the UAE, women still lack access to and full employment in technical and administrative positions and that this may be due to the perception that their employment in these sectors may conflict with their traditional family roles (Assad, 2008). This suggests that men have greater employment and income opportunities than women regardless of their level of education or training (Cappon, 2011), and that educational opportunities for women and girls often reproduce gendered expectations for women's work and family life (Shukri, 1999).

Schooling Characteristics in the GCC Countries

The GCC countries' common economic, political and social characteristics have shaped education development, discourse, and reform across the region. Girls' access to formal schooling evolved differently and at a slower pace compared with boys'. Education policies in these countries have increased girls' access to formal schooling in recent years, but access to school is only part of the larger discourse surrounding gender equity to, in, and through formal schooling.

In order to understand differences in boys' and girls' access to formal education, this section provides a historical overview of the expansion of formal schooling in each GCC country. The expansion of formal schooling for boys and girls also necessitated the expansion of teacher education programs throughout the region. Because the expansion of formal schooling and teacher education programs are so closely linked, contextual background information on teacher education policy and reform is also discussed. This background is essential to this study's investigation of whether gender differences in student achievement may be associated with the ways children are schooled because of the training their teachers receive.

Bahrain

Bahrain became independent from Britain in 1971, but it has been ruled by the Al-Khalifa family since the 1700s. After its independence the country began developing social infrastructures to support its economic and political development. This required the importation of expatriate labor in all public and private sectors because of limited number of qualified Bahraini nationals to fill these positions. (Ali, 1994). Formal education was introduced in Bahrain in 1919. The first primary school was established for boys only and was funded by public and private sources. The curriculum was borrowed from other Arab nations. A similar primary school for girls was established in 1928. These schools were ultimately taken over by the government in 1952. The first secondary school was established for boys only in 1939, and this was followed by the establishment of the first secondary school for girls in 1952.

Formal schooling begins in Bahrain with Kindergarten for 4 and 5 year old students, and is followed by primary school. Students enter 1st grade at 6 years old and persist until age 11/12 (six years of study). Students enter intermediate school at approximately age 12, and enter

secondary school at age 15 (three years of study). Secondary school lasts three years and students exit at approximately 17 years of age. Public education is free and the government subsidizes related education costs including transportation and book fees (Ali, 1994). Schooling is compulsory for children ages 6 -14, from Grade 1 through lower secondary school.

There are three different school types in Bahrain: state schools, national school and foreign private schools. State schools are financed by the government and free for Bahraini nationals and are gender segregated at the primary, intermediate and secondary levels (UNESCO-IBE, 2010). National private schools are coeducational, but must follow the official national curriculum and charge enrollment fees. Foreign private schools can set their own curriculum and are privately owned and operated. These schools also charge enrollment fees.

Because of the reliance on male expatriate teachers, nationals are incentivized to pursue higher education through government scholarships and subsidies. Teacher education programs have focused on increasing standards for pre-service teachers, to ultimately improve the status of teaching and learning in the country. Secondary science teachers must hold a degree in science and certificate and postgraduate diploma in education. Until 2005, the Ministry of Education required teachers to complete their postgraduate diploma from the University of Bahrain. This program was dismantled in 2005 and since then the Ministry of Education has sent prospective teachers to Jordan and other Arab countries to receive their pre-service training (Al-Awahdi, 2008). The Ministry of Education is currently creating a new system of teacher education in the country to recruit and train Bahraini nationals to enter teaching. This serves two purposes: (1) it supports national development capacity by creating infrastructure to increase higher education

and labor market opportunities for nationals, and; (2) it will ultimately reduce dependence on expatriates in high demand educational fields like science and mathematics.

The Ministry of Education established a new teacher training program in 2007 to incentivize Bahraini nationals to become teachers by providing full scholarships with the condition that program completers commit to teaching in state-run schools once they complete the program. The Directorate of Training and Professional Development was established by the Ministry as part of the country's teacher education reform policies, and this body is charged with establishing a teacher evaluation framework to assess teaching effectiveness (UNESCO-IBE, 2010).

Kuwait

Kuwait has been ruled by the Sabah family since the middle 18th century. In 1899 a Protection Treaty was signed by the Sheikh of Kuwait with the United Kingdom through which the Kuwaiti government agreed not to lease land to any foreign country in exchange for military protection. The United Kingdom reserved the exclusive right to lease land from Kuwait and provide economic aid and military protection against any potential foreign invasion. The Protection Treaty remained intact until 1962 when Kuwait was declared an independent state. A new constitution was formed establishing a democratic system of government and securing the Sabah family's succession to the throne. The new constitution established the framework for national education including compulsory primary education in Kuwait; however, general education was legally provided for until 1987. The general education law outlined the relationship between the education of Kuwait nationals with the development of the nation and the Arab region. For

example, the general education law provides for the implementation of Islamic principles through schooling (Hussain, 1994).

The Kuwaiti education system is structured by four years of primary school, four years of intermediate school, and four years of secondary education. Primary education is often preceded by two years of pre-primary education but pre-primary schooling is not compulsory. Students enter the pre-primary stage at age 4/5 and transition to primary school at age 6/7. They move to intermediate school at age 11, then on to secondary school at age 14. Schooling is compulsory for students aged 6 – 14 (Al-Qattan, 2008).

The majority of Kuwait's population identifies as non-nationals, but 60 percent of children enrolled in the government schools identify as Kuwait. So, despite the prevalence of expatriates within the country's population, the majority of students enrolled in government schooling are in fact Kuwait nationals. Public education is free for Kuwait nationals and children of GCC nationals working in the country. Government schools are single-sex at the intermediate (lower secondary) level (UNESCO-IBE, 2010); however, publically available data from the Ministry of Education and disseminated literature does not confirm whether or not government schools at the primary and secondary level schooling are single-sex.

Historically, teacher education in Kuwait has been post-secondary vocational education. Students could enter the Teacher Training Institute after completing secondary education and passing the Secondary School Certificate Examination. After the Gulf War, the Ministry of Education partnered with teacher education programs including the teachers' college at Kuwait University and the Public Authority for Applied Teacher Education and Training (PAAET) to create a policy framework to incentivize Kuwaiti nationals into teaching to reduce dependence on foreign

teachers and increase capacity to develop teachers within the country (Hussain, 1994). As part of these requirements, teachers must hold a minimum of a university degree, and must complete a 1-year probationary period before entering the field. This probationary period is completed after a pre-service teacher completes their initial coursework which includes science pedagogy, education, and psychology (Al-Qattan, 2008)

Oman

Similarly to other GCC countries, Oman has historically faced national labor shortages in all economic sectors. The first type of education Omani boys and girls accessed was *kuttab*, recitation of Koran verses and basic numeracy and literacy skills. Formal non-religious schooling was not established until 1940 and it was restricted to males only. The current education system is structured by six years of primary schooling, three years of pre-preparatory, and three years of secondary schooling. At the secondary level, students can choose to attend vocational or technical program or Islamic education program instead of academically-oriented programs. Students enter primary school at age 6 and persist until age 11. At age 11, they enter preparatory school and transition to secondary school at age 14. Students end their secondary school experience at age 17. All government schools in Oman are single-sex (Al-Shanfari, 1994; Ministry of Education, Sultanate of Oman, 2008). Schooling is not compulsory in Oman. This is significant because Oman is the only country or benchmarking community participant in TIMSS 2007 that does not require children to attend primary school, intermediate, or secondary school (Mullis, et al, 2008).

The first teacher education program was founded in 1976 (Al-Maskari & Siler, 2008). Before this time, teachers were trained at the secondary school level and this training was restricted to

males. Teacher education was reformed in 1984 and required that teachers complete a two-years of post secondary study at the Intermediate College. These programs were open to both males and females, but pre-service teachers were educated in gender segregated facilities (Al-Shanfari, 1994). Like its GCC counterparts, Oman has been historically dependent on expatriate labor in all sectors of education. Efforts to nationalize the Ministry of Education and teaching force began with the establishment of teacher education programs in Oman in the 1970s. These programs were largely successful, and doubled the numbers of Omani national teachers and school administrators between 1990 and 2000. Currently, approximately 80 percent of teachers and nearly all administrators are Omani (Al-Maskari & Siler, 2008).

Qatar

The development of formal education in the Qatar began in 1956 with the Declaration of the Generalization of Education. Qatar gained independence from its status as a British protectorate in 1971, during which time they were prohibited from leasing land to any foreign country. In 1982 a general education framework was developed through a partnership between the Qatari Ministry of Education and UNESCO. This framework outlined the goals of the formal education system in the country and included the inclusion of Islamic doctrine and the Arabic language, as well developing students to be Qatari nationals and foster appreciation for their national culture and the shared values of Arab nations (Al-Subaie, 1994).

Education is free and open to all Qatari nationals, and for children of expatriates employed in the public sector (Nagi, 2008). The formal education system begins at preschool for students aged 4 and 5. Primary school begins at age six and lasts for 6 years. Preparatory school begins at age 12 and lasts 3 years. Students can choose to enter general preparatory schools or religious schools.

Secondary school begins at age 15 and lasts three years. Students may choose the type of school they attend and these include religious, vocational or general school types. Only primary schooling is compulsory and all government schools are single sex (UNESCO-IBE, 2010).

In 2004 the Qatari Ministry of Education and the State Education Council began a reform initiative to decentralize public schools and re-declare them as independent schools. This two-tiered centralization framework is unique to Qatar in comparison with other GCC countries. Schools re-declared as independent schools were given more autonomy and flexibility in teacher employment and other school-level decision making and governed by the State Education Council. The Ministry of Education continues to govern all other non-independent government schools. Qatar has expanded its education evaluation policies to include a national level evaluation system for both students and school stakeholders. The Qatar Comprehensive Educational program measures student achievement in the country and the Qatar Comprehensive Survey System collects data from teachers and school administrators. These data are managed by the Qatar National Education Data System and used to inform education policy and reform at the country-level (Nagi, 2008).

In addition to these assessment mechanisms, Qatar has expanded its participation in cross-national testing schemes including TIMSS and PIRLS 2007 and 2011, and PISA 2009 and 2012. Qatar's policy focus on assessment and participation in cross-national assessments is interesting considering that its performance on these assessments is comparatively low even compared with other GCC countries. So, despite their generally low performance, they continue to participate in these assessments and supplement their data collection at the country level.

The first teacher education program, the Qatari Teachers Training Institute, was established in 1965 to train primary school teachers. This training program was only offered to males, but it did reduce dependence on expatriate teachers in primary schools. Females did not graduate from this program until 1971. All primary school teachers were trained at the Faculty of Education until 1975. Qatar experienced an increased demand for secondary teachers beginning in the 1970s and increased its recruitment of expatriate teachers to fill these positions. The training of male and female secondary school teachers did not begin until 1992 when diploma programs were established at the Faculty of Education. These programs recruited primarily female students from secondary schools in the country and provided them with specific training to teach secondary school. By 1990 all teachers, male and female, were required to hold an undergraduate degree and diploma from the Faculty of Education in order to be employed as teachers. Currently, all secondary science teachers employed in government schools are required to hold a minimum of an undergraduate degree in science but not in education. Teachers employed in independent schools must also hold a university degree, but they are also required to complete ongoing professional development training once they are in the field.

Saudi Arabia

The Kingdom of Saudi Arabia was unified in 1932, and established the Ministry of Education in 1954. In the pre-unification period, education was limited to private Islamic schools. Trades and vocational skills were learned through informal apprenticeships. Private, secular schools increased as a result of the creation of the MOE, and by the 1950s, there were 325 government schools across the Kingdom (al-Baadi, 1994). All schooling was limited to boys until the establishment of the General Administration of Girls' Education (GAGE) in 1960. In 2002 the

Ministry of Education dismantled the GAGE and assumed control of girls' schools (Alshumrani, 2008). Primary education begins at age 6 and lasts for six years. Students enter intermediate school between ages 12 – 14 and after three years, transition to secondary school. Secondary school lasts for three years and students can choose to enter vocational or religious programs. Schooling is compulsory for children ages 6 – 15, and all schooling is single sex (UNESCO, 2011).

Saudi Arabia has had difficulty keeping pace with the labor demands associated with educating a rapidly growing population. Teachers have been historically under-supplied and in high demand and the standards for entry into the field were very low. In some cases, the only qualification a person had to possess to become a teacher was the ability to read. Similarly to other GCC countries, Saudi Arabia imported expatriate labor to fill these voids in education sectors. As a result, it has had difficulty recruiting and retaining qualified nationals into teaching. Saudi policy has focused on building educational infrastructure in the Kingdom to train nationals for teaching positions. First, elementary teacher preparation programs were established. These programs began at the intermediate school level and lasted two years. Eventually these programs evolved to include three years of post-secondary training for secondary school teachers (al-Baadi, 1994). Currently, all teachers must have a minimum of an undergraduate degree, a teaching certificate, and pass the appropriate competency examinations in order to be employed in government schools (Alshumrani, 2008).

UAE

The United Arab Emirates is a federation of Abu Dhabi, Dubai, Sharjah, Ras Al Khaimah, Umm Al Qaiwain, Fugairah, and Ajman. These seven emirates were former British protectorates but

gained their independence in 1971, at which time they established themselves as a united country. The UAE is governed by the Supreme Council, which is headed by the leader of each of the seven emirates. The Ministry of Education governs education in all seven emirates. However, each emirate has its own education governing council (or “zone”). All public, government schools must follow the official curriculum. Private schools may charge fees and can follow their own curriculum.

Formal education in the UAE begins with primary education at age 6. Only primary education is compulsory; however many students attend pre-primary programs and many of these are private. Primary school lasts six years and is followed by three years of preparatory schooling. Secondary school begins at age 15 and lasts three years. At the secondary level, students can choose to attend general, academic schools, vocational or religious schools (Al-Nayadi, 1994). Emirati nationals can attend government schools and universities free of charge (Mohamed, 2008). Schooling is only compulsory at the primary level and lower secondary (preparatory) levels (Al-Nayadi, 1994). Boys and girls have equal access to education regardless of national status but, government schooling at lower secondary and secondary levels is single-sex (Ridge, 2009).

All teachers employed in the UAE must hold a minimum of an undergraduate degree in the subject they teach but, prospective teachers can complete their undergraduate teacher education training in one of two ways. The first is through a college of education, but the coursework is in education studies and general pedagogy not subject specialization. As such, teacher education programs in colleges of education only qualify teachers to teach at the primary level. The second option is for prospective teachers to complete their undergraduate studies at a specialized college. These specialized colleges grant degrees in subject, major areas and not in education

studies. After completing a subject specialization degree, individuals can then complete a Ministry approved teacher preparation program to teach at the secondary level (Mohamed, 2008).

Similarly to other GCC nations, the UAE is reliant on expatriate labor in education sectors, and the majority of teachers in boys' schools are expatriates. There are different requirements for nationals and expatriates with regard to teacher education and subject specialization. For example, all expatriate teachers must document a minimum grade point average ("C") but nationals are not subject to GPA requirements as a prerequisite to teach in government schools. Expatriates are also subject to employment requirements; they are ineligible to teach in the UAE if they are over 40 years old, or if they have less than two years of teaching experience. All teaching vacancies are prioritized to nationals, and expatriate applicants must go through a vetting process with school-level administrators before they can be hired (Mohamed, 2008).

Table 2

summarizes formal schooling characteristics including compulsory education and age policies and grade sequences for schools in these countries, and whether or not schooling is single sex.

Table 2: Formal Schooling Characteristics in the GCC Countries

Country	Primary and Secondary Compulsory Schooling ¹		Grades Provided for Primary and Secondary Schooling ¹	Single Sex Schooling at the Lower Secondary Level
	Ages	Grades		
Bahrain	6 – 17	1 - 9	1 - 12	Yes ²
Kuwait	5 ½ - 10	1 – 5	1 - 12	Yes ²
Oman	not compulsory	not compulsory	1 - 12	Yes ⁴
Qatar	6 – 15	1 – 9	1 – 12	Yes ²
Saudi Arabia	6 - 15	1 – 9	1 - 12	Yes ²
Dubai, UAE	5 ½ - 13 ½	1 – 9	1 - 12	Yes ³

¹TIMSS 2007 Encyclopedia (Mullis, et al, 2008)

²UNESCO-IBE, 2010/2011

³Ridge, 2009

⁴Al-Shanfari,1994

The literature reviewed and supplementary data from TIMSS 2007 indicate formal schooling and teacher education have developed very similarly across the GCC. In summary, pre-primary schooling is not compulsory in the GCC countries, but primary and lower secondary schooling is compulsory in all GCC countries except in Oman. All GCC countries provide formal schooling through the primary, lower secondary, and secondary levels. Upper secondary schooling is not compulsory in any GCC country. Cited literature (UNESCO-IBE, 2010/2011; Ridge, 2009; Al-Shanfari, 1994) for each GCC country indicates that government schools are single sex at the lower secondary level, but girls and boys have equal access to schooling at all levels. Some variation is expected in countries with diverse school types. It is unclear from the literature if all private and international schools are single-sex, and it is likely that some of the non-government schools across the countries of interest are coeducational.

Teacher Education Requirements in the GCC Countries

The literature establishes that teacher education programs in the GCC have evolved and expanded with the expansion of formal schooling. However, a closer look is needed to understand how teacher education policies have evolved in the region to understand how teachers are trained, and differences in training characteristics of teachers trained in the GCC compared with the target comparison country cases. Because of the reliance on expatriate teachers from Egypt, Jordan and Syria across the GCC, data for these countries are also discussed.

Teacher education programs typically include three phases: pre-service, induction, and in-service (Dworkin, 1994). Because this study is interested in identifying whether or not there are differences in the ways male and female teachers are trained through their initial training, only the pre-service and induction phases are discussed. Certification is discussed as a complement to these perspectives because teachers are typically required to hold a certification or pass a certification exam to teach in government schools. The information reported here is from the 2007 TIMSS Encyclopedia (Mullis, et al, 2008). This two-part volume reports country-level data and information about the contexts of formal education at all levels, as well as teacher education, induction and certification requirements.

Pre-service teacher education includes coursework and clinical experiences. Lower secondary science teachers in all GCC countries except for the UAE, and in all comparison countries except for Oman, are required to hold a degree from a teacher education program. Holding a degree from a teacher education program may be indicator that the teacher received content and pedagogical training to teach secondary science.

The connection between teachers' subject-area and education training is known as pedagogical content knowledge (PDK). PDK is part of a larger pre-service education framework which includes content knowledge and general pedagogical knowledge (Blömeke, et al, 2008). In a PDK-science training framework, pre-service teachers learn how to integrate various science disciplines and instructional strategies to support student learning in that content area (Nezalová, 2011). If a teacher is trained in these three elements – content knowledge, pedagogical content knowledge, and general content knowledge, they may be more able to support student learning in science.

Clinical experiences are also part of the pre-service teacher education process and include field-based, intern teaching experiences as a required component of initial teacher education. Clinical experience requirements at the pre-service level are more varied across the GCC and target comparison country cases. For example, all GCC except Oman countries require pre-service secondary science teachers to complete a pre-practicum and supervised practicum as part of their teacher education training. Oman is a unique case within the GCC because it requires a pre-practicum experience, but not a supervised practicum in the field.

The pre-service phase is followed by the induction phase. Induction is a teachers' transition from pre-service to novice, or first-year, teacher. The induction process can include a probationary period that the novice teacher must successfully complete in order to become certified or receive their permanent teaching credential. It can also involve supervised mentoring. TIMSS includes both these induction variables in its reporting of teacher education requirements. Only Bahrain, Kuwait and Saudi Arabia require secondary science teachers to complete probationary teaching period. So, based on these indicators it is assumed that once the pre-service training requirements

are met, secondary science teachers have full professional status as novice teachers. More variation is found across country's mentoring and induction program requirements. Across all the countries of interest, only Kuwait and the UAE require secondary science teachers to complete a mentoring or induction program.

Another element of the induction phase is teacher certification. Kinney (1964) defines teacher certification as:

“...a process of legal sanction, authorizing the holder of a credential to perform specific services in the public schools of the state. Its accepted purpose is to establish and maintain standards for the preparation and employment of persons who teach or render certain nonteaching services to the school.”

As Kinney's definition suggests, certification legitimizes and rationalizes teachers' professional status and is institutionalized as a requirement of teacher employment. One indicator of whether a teacher is certified in their country of employment is whether or not they have passed a certification exam. Bahrain, Kuwait, Saudi Arabia, the UAE, Egypt and Syria require secondary science teachers to pass a certification exam. Oman, Qatar, and Jordan do not require secondary science teachers to pass a certification exam.

Variation in teacher certification requirements exists between countries, and in some cases, between states within countries because teacher education policy is influenced by local and national factors (Dunkin, 1987). Table 3 highlights lower secondary science teacher education program and induction requirements for each GCC and target comparison country.

Table 3: Lower Secondary Science Teacher Education Program and Induction Requirements¹

Country	Degree from a Teacher Education Program	Pre-practicum During Teacher Education Program	Supervised Practicum in the Field	Passing a Certification Exam	Completion of a Probationary Teaching Period	Completion of a Mentoring or Induction Program
Bahrain	YES	YES	YES	YES	YES	NO
Kuwait	YES	YES	YES	YES	YES	YES
Oman	YES	YES	NO	NO	NO	NO
Qatar	YES	YES	YES	NO	NO	NO
Saudi Arabia	YES	YES	YES	YES	YES	NO
Dubai, UAE	NO	YES	YES	YES	NO	YES
Egypt	YES	NO	NO	YES	NO	NO
Jordan	YES	NO	NO	NO	NO	NO
Syria	NO	NO	NO	YES	NO	NO

¹TIMSS 2007 Encyclopedia (Mullis, et al, 2008)

As highlighted in Table 3, there is a lot of variation in teachers' initial training characteristics across the GCC and comparison. But, there is less variation in the *Degree from a Teacher Education Program* category in the GCC countries. This category is important because it serves as an indicator of a teachers' education training. For example, five of the six GCC countries (Bahrain, Kuwait, Oman, Qatar, and Saudi Arabia) require teachers to have degrees from a teacher education program. The UAE is the exception; it does not require teachers to have a degree from a teacher education program. Teachers in four of the six GCC (Bahrain, Kuwait, Saudi Arabia and the UAE) countries are required to pass a certification exam in order to teach. Teachers in Oman and Qatar are not required to pass a certification exam.

It is apparent that variation in the ways teachers move through the preparation pipeline does exist within and across the GCC and target comparison countries. Because teachers are expected to meet different requirements across the countries of interest, it is important to further investigate why these differences exist in a region that shares so many other common social, economic, and

political characteristics. Some of these differences can be explained by how these countries have developed nationalistic policy frameworks to develop national capacity in social, economic and political spheres, and how these policies have influenced education reform across the region. Though differences in teacher training characteristics are acknowledged, the policies GCC countries have instated to build capacity in teacher education are quite similar.

Nationalism and Teacher Employment in the GCC

The primary assumption of the crisis argument in the UAE is that expatriate teachers in boys' schools are poorly trained and this has contributed to differences in boys' and girls' achievement (Ridge, 2010). This specific argument is unique because it suggests that teacher training in UAE is unique and that these differences advantage girls taught by Emirati-trained teachers. However, males and females are required to satisfy the same criteria in a particular country. So, if student achievement is linked with teachers' training characteristics it could be assumed that both boys and girls would be affected and that neither group would be uniquely advantaged. One area only marginally discussed in the UAE crisis literature is how men and women in the UAE and across the GCC enter the teaching profession, and how teacher employment is guided by nationalistic policy reforms in the region.

Males and females in the GCC have equal opportunity to pursue teacher education programs. However, females enroll in these programs at greater rates compared with men. The supply and demand for qualified teachers is an issue of concern for education policy makers in the GCC because despite policy foci to incentive national males into teaching, the supply has not kept pace with demand. The demand for teachers is determined by several factors including birth rates and population growth at the national level which can affect the number of persons to be

educated in a specific nation and region, and; the introduction of special programs that require teachers with specialized training. In fact, when there is a high demand for teachers, standard requirements for entry into the field are often lowered to increase supply (Dworkin, 1994, p.5925).

Reliance on the employment of expatriate teachers is not unique to the UAE but it is less frequent in the Kingdom of Saudi Arabia which has developed policies reduce dependence on foreign workers in all public sectors including education. The Seventh Five-Year Development Plan (2000 – 2005) established labor policy mandates to limit the number of expatriates in teaching. This plan aimed to bolster public and private employment of Saudi nationals, and in the case of girls' government-run primary schools, replace 2,000 expatriate teachers with Saudi women. However, these policies did not include teachers in high-demand fields such as foreign languages, science, mathematics and technology, because of the limited number of Saudi nationals, both male and females, qualified to teach in these areas (Immigration and Refugee Board of Canada, 2002).

Many GCC countries have followed the Saudi Arabian model and increased policy foci to attract and retain nationals into teaching. The UAE remains specifically reliant on expatriate teachers especially in boys' schools (Ridge 2010; Ridge 2009; Kirk & Napier, 2009). According to Ridge (2010) 80 percent of teachers employed in boys' government schools are non-Emirati. In the UAE, the promotion of males and nationals into teaching is specifically mentioned in its strategic plan under the student outcomes competency thread (UAE, Ministry of Education, 2012). The majority of the country's population identifies as non-nationals, and the majority of teachers

employed in boys' schools are expatriates. Complete nationalization of the teaching force is noted as a priority in the country (Al-Nayadi, 1994).

Similar policies are also in place throughout the GCC countries. For example, a UNESCO report on the educational status of women and girls in Oman found that approximately 80 percent of teachers were Omani nationals (Rasseksh, 2004). This was an approximate 10 percent increase from the previous academic year (2002 – 2003) when 29 percent of the Omani teaching force was identified as non-Omani national. Even though the majority of teachers are Omani nationals, national educational policies continue to focus on the need to recruit and incentivize nationals and specifically male nationals into teaching.

Kuwait has historically experienced a shortage of “local” teachers in mathematics and science. In his study of teacher education trends in Kuwait in the post-Gulf war period, Al Sharaf (2006) found that only 23 percent of teachers were Kuwaiti nationals. Bahrain faces similar challenges in the disproportion of male nationals employed in government schools compared with female nationals. Data for the 2008-2009 academic year indicates that of the 9,773 Bahraini nationals employed as teachers in government schools, only 2,869 males were employed as teachers compared with 7,084 females (Kingdom of Bahrain, 2009). These data suggest that male Bahraini nationals do not enter teaching at the same rate as females.

In response to Qatar's performance on PISA 2006, the national education system was reformed to reflect recommendations by the RAND group. According to published reports, there is a reported lack of local expertise to manage the current education reform efforts to “modernize” the K-12 education system in Qatar. (RAND, 2007). However, teachers and school administrators have criticized the new professional licensure standards and evaluation systems

for not borrowing too heavily on Western education reform models which do not meet the needs of Qatari society (Ellili-Cherif, Romankowski & Nasser, 2011).

As the literature reviewed for each GCC county suggests, there is a demand for highly trained teachers for boys' schools in the region which is unmet despite policy foci to attract and retain male nationals into teaching careers. One contributing factor to why men enter teaching at lower rates than women in the GCC is the low status of teaching as a profession. Additionally, because the teaching profession is characterized as a historically feminized occupation, male GCC nationals do not enter teacher education programs at the same rate as women because they have more opportunities in the public sector yielding higher income (Ridge, 2010). This increases the demand for qualified male teachers to teach at boys' schools. These two factors – low social prestige and the characterization of teaching as a feminized occupation – have created a reliance on expatriate teachers in boys' schools in the UAE, specifically. Teaching has become a high-need, specialized field and expatriate workers have filled these labor needs despite government policies seeking to advance nationals' labor market opportunity. Though these policies have increased the number of nationals in teaching in Saudi Arabia, specifically, they have not succeeded in efforts to incentivize males to pursue teaching as a career in other GCC countries.

Theoretical Framework

This study employs two theoretical perspectives to investigate gender differences in student achievement and its relationship to teachers' training: neo-institutional theory and feminist theory. The neo-institutional perspective is of specific value in these analyses because it provides a framework to understand how teacher training programs have become rationalized and legitimized worldwide (Meyer, 1977,2001) and through this process, institutionalized egalitarian

expectations for social, economic and political participation even in national and regional contexts where gender constructs professional opportunity (Baker, LeTendre & Wiseman, 2005; Ramirez & Wotipka, 2001). As a compliment to this theoretical framework, this study also includes perspectives from gender studies and feminist theory literatures to understand how gender acts as structure limiting, and in some cases guiding, professional choice (Charles & Bradley, 2009). Specific to the goals of this study, these theoretical perspectives are used to investigate how gender as social structure (Risman, 2004) affects teachers' training and professional opportunity.

Gender opportunity structure and teaching

Gender opportunity structure is defined as the “variability in gender outcomes due to cross-national differences” (Wiseman, Baker, Riegle-Crumb & Ramirez, 2009). National and regional differences can include variability in family expectations, schooling experiences and access, as well as intrapersonal micro-interactions individuals experience in daily life. Baker & Jones (1993) discuss that the opportunity structure can shape individuals' associations between performance and behaviors with their future outcomes. These associations and linkages shape the opportunity structure itself and can impact achievement and career choice. In communities with high levels of gender segregation in the labor market like the GCC countries, the opportunity structure can reinforce patriarchal assumptions about teaching as “women's work” (Ridgeway & Correll, 2004), and limit males' interest and recruitment in becoming teachers.

Apple (1983) discusses the social and political implications of categorizing teaching as “women's work”. Teaching involves both service and nurturing, two dispositions linked with social constructions of femininity and motherhood. These skills have been historically

undervalued, resulting in lower wages and social prestige. Essentially, teaching became a sex-typed career path for women subject to both vertical and horizontal divisions from other labor sectors. According to Charles & Bradley (2009), “horizontal segregation refers to distributional inequalities that are not explicitly hierarchical, while vertical segregation refers to inequalities in rank or prestige. “ (p. 930). Female teachers are horizontally segregated through lower pay and limited decision-making in their work. They are vertically segregated by the fact that the majority of teachers are women, so in number alone they are grouped by sex-type by their career choice (Apple, 1983, p. 3).

Women in the GCC do possess some advantage over males in becoming teachers because the opportunity structure supports their entry into the field; however, female advantage in the teaching profession does not necessarily benefit them overall. This advantage actually veils their limited opportunity outside the education sector and reinforces gendered perceptions of teaching as a sex-typed career path. Understanding how and why teachers enter the field is important, especially considering that male, GCC nationals have greater options in other high-earning fields compared with women. The gender opportunity structure supports females’ entry into teaching because of the perception that it will not conflict with family responsibilities. The structure inhibits males’ entry into teaching for the same reasons females are supported. More specifically, because they have other professional options, many of which are higher-paying, teaching is devalued as a professional choice for males. Rather than dichotomizing this issue as “female advantage equals male disadvantage” in their professional opportunity, these things are happening simultaneously and taken for granted by individuals and society as a whole.

Institutional Isomorphism and Teacher Education

As evidenced by recent education policy reforms in the GCC, males do not necessarily lack access to teacher education programs or employment. In fact, GCC nationals are in high-demand as teachers. The issue is that the opportunity structure is more malleable for males than females, so they are less likely to become teachers since they have other options, including those yielding higher pay and greater social prestige. However, once teachers enter teacher education programs, we can expect them to experience similar coursework and pre-professional training though gender-structural forces affect their reasons for entering the field. Cross-national similarities in teacher education curricular can be explained by institutional isomorphism, defined as a process that shapes institutional characteristics resulting in similarity or convergence (DiMaggio & Powell, 1983). Institutional isomorphism can be shaped by coercive, mimetic or normative forces. According to DiMaggio & Powell (1983), “coercive isomorphism stems from political influence and the problem of legitimacy; mimetic isomorphism results from standard responses to uncertainty. (p. 150). Normative isomorphism results from “professionalization”, which shapes the nature and culture of work in a given field (p.152).

Teacher education programs are affected by all three types of institutional isomorphism because of the relationship between teacher quality and student achievement. Teacher education programs are under increasing levels of scrutiny by national governments to adopt curricula or training models of other countries that have high legitimacy. One legitimacy-enabling factor is a nation’s comparative advantage on international standardized tests including TIMSS. As a result teacher education programs have evolved to include subject content knowledge and pedagogical content knowledge and general pedagogical knowledge (Blömeke, et al., 2008) because international evidence suggests these are three critical components in training highly effective

teachers. This is also influenced by national rankings. The assumption is that the higher the test scores are for a given country, that the teachers in that country are more highly trained.

Educational policy borrowing is also an attempt to rationalize and legitimize institutional operations (Meyer & Rowan, 1977). These attempts are often loosely coupled or decoupled, meaning that the institutional actions and processes are often separated from the policy framework (Meyer & Rowan, 1977; Coburn, 2004). For example, though teacher education curricula may look very similar across countries, decoupling at the instructional level and through field-based program components can result in very different experiences and outcomes for pre-service teachers, and the students they eventually teach.

Research Hypotheses

The boys' crisis has only been discussed in the literature in one GCC nation, the United Arab Emirates, and this argument is linked to the training of expatriate teachers in boys' schools.

Ridge suggests that the country where a teacher receives his or her training may determine the type of training they receive, and ultimately their effectiveness once they enter the classroom.

This argument assumes that the pre-service education characteristics of teachers trained outside the GCC are different than teachers trained in the GCC. If there is a crisis, the evidence would show significant differences in secondary science teachers' pre-service training. Therefore, the first research question this study investigates is whether teachers' pre-service training characteristics are different in the GCC compared with target comparison countries. Egypt, Syria and Jordan are included because of the large number of expatriates trained in these countries that are employed in boys' schools across the GCC and in the UAE specifically. TIMSS does not report teachers' national status or where they received their training, so these factors cannot be

measured using available data; however, characteristics of teachers' training can be measured. This leads to the first hypothesis.

H1: There is no significant difference in 8th grade science teacher training by gender within or across the GCC countries compared to target comparison countries (Egypt, Jordan and Syria).

Cross-national variation of pre-service field training (practicum or student teaching experiences) in the UAE with Egypt, Jordan and Syria is documented in the literature (Ridge 2010; 2009) and confirmed through the review of teacher training characteristics already discussed. However, expectations for teachers' education training and certification are more similar across the GCC and comparison countries. The UAE is unique in that it requires pre-service teachers to complete field-based training as part of their teacher education program because teacher education reform in the country has been highly influenced by Western teacher education models. In fact, the largest teacher education program in the UAE, United Arab Emirates University (UAEU), is accredited by The Center for Quality Assurance in International Education (CQAIE) in conjunction with the National Council for Accreditation of Teacher Education (NCATE) (UAEU, 2012). The UAE may be a unique case within the GCC context because of the influence of Western university and accreditation partnerships and not reflective of the other policy frameworks across the GCC.

Understanding how teachers are trained within and across GCC countries compared with target comparison countries will identify differences in the experiences and skills teachers bring with them into the classroom. Essential to the goal of this study, which investigates if gender differences in 8th grade students' science achievement are associated with teachers' training, the

second hypothesis investigates the relationship between teachers' training and student achievement.

H2: There is no significant association between 8th grade science teacher training and student science achievement scores by gender within and across the GCC countries compared with target comparison countries (Egypt, Jordan and Syria).

There are two important elements to this research hypothesis. The first is that girls present a statistically significant advantage in science education at the 8th grade level compared with boys in all GCC countries. The only exception is in Syria, where boys demonstrate a small, but statistically significant advantage in science at the 8th grade level. The second important element to this hypothesis is whether or not differences exist in the ways male and female teachers are trained within and across the GCC and target comparison countries, and how teachers' training may associate with 8th grade boys' and girls' achievement in science. If training does associate with gender differences, it will provide empirical evidence to support the theory that boys are educationally disadvantaged because they are taught by less qualified teachers. However, if there is no significant difference across the GCC or compared with Egypt, Jordan and Syria, it will provide evidence that the supposed crisis is unrelated to teachers' training, and that gender differences in students' science achievement may be related to other background or cultural effects.

Data, Measures and Analyses

This study uses 8th grade student achievement, and teacher and student background questionnaire data from the 2007 Trends in International Mathematics and Science Study (TIMSS). 59 countries and 9 benchmarking communities participated in TIMSS 2007 and included Bahrain,

Kuwait, Oman, Qatar, Saudi Arabia, Egypt, Syria and Jordan; Dubai participated as a benchmarking community. TIMSS has been administered every four years since 1993 and the 2007 cycle is the most recent data available. It was administered in 2011 and these data are scheduled to be published January 2013. TIMSS 2007 includes student achievement in mathematics and science at the 4th and 8th grade levels, and background questionnaire data from 4th and 8th grade students, their teachers, and school administrators. Only 8th grade boys' and girls' mean science achievement scores, and 8th grade student and teacher background information is included in this study.

TIMSS 2007 Sampling Design

TIMSS 2007 was administered using a two-stage stratified cluster design. Schools were sampled first, followed by classrooms at the 8th grade level (or equivalent) in those schools. Each country sampled approximately 150 schools, and one or two in tact classrooms in each of these schools. Countries were charged with ensuring that the schools included in the sample represented the target population. These criteria included:

Measure of Size (MOS): average student enrollment per target grade, number of classrooms in the target grade, or the total student enrollment in the school.

Minimum Cluster Size (MCS): the expected number of sampled students per class (if the number of classrooms could not be provided).

Variables: any variables describing the school characteristics (e.g., type of school, level of urbanization, or sex of students served by the school).

School sampling probability and status: whether or not the school had participated in any other international study than TIMSS during the assessment cycle (Olson, et al, 2008).

Schools were selected using explicit and implicit stratification. For example, if a country wanted to include both private and public schools both were included. But, schools could also be selected so the students enrolled (not the school) were representative of the overall population. Classes were chosen using systematic random sampling.

Students were sampled using a probability-to-proportion size sampling technique. This was appropriate because of the nested nature of the data – schools within countries, classrooms within schools, and students within classrooms. All student samples were required to have a sample size of at least 4,000 students in mathematics and science classes (Olson, et al, 2008).

School and Student Exclusion Criteria

Because there are differences in the ages of students enrolled in 8th grade across the sampled countries and communities, the 8th grade assessment was only administered to students who were at least 13 ½ years old at the time of the test. Schools that did not have the target grades (4th or 8th) or failed to meet certain criteria were excluded. Schools were also excluded if there were geographically remote; had very low numbers of students; if their curriculum or school structure was different from the majority of schools in the country, or were specifically for learners with special needs. In some cases, students were excluded as well. These *within case exceptions* included students with intellectual and functional disabilities, and well as students who did not speak the language of the test (Olson, et al, 2008).

Assessment Framework

TIMSS 2007 was conducted at the end of the 2005/2006 school year in each of the participant and benchmarking communities. The 8th grade assessment included 429 question items, 215 in mathematics and 214 in science. These questions were then grouped into 14 question item blocks for both content areas (mathematics and science) using rotated design (Mullis, et al, 2008).

Multiple choice and constructed response questions were included for both 4th and 8th grade tests.

The assessment booklets given to students contained 2 blocks of science and 2 blocks of mathematics question items at each grade level. For the 8th grade science test, questions measured students' content knowledge in biology, earth science, chemistry and physics, as well as their knowledge, application, and reasoning skills in science. The assessment booklets were translated into the language of instruction in each participant country or community. Student achievement data was summarized using item response theory scaling methods (Olson, et al, 2008).

Contextual Background Questionnaires

The background questionnaires given to students, teachers, and school administrators were created to form a number of scales to create background indices for each sampled group and question. This was done to increase reliability of the data collected. Students' background questionnaires asked questions about their families, what they do in their time out of school, and their perspectives about what they learn in school and how they are taught (in math and science, specifically). Teachers of sampled students were asked about their pre-service and professional development education and training, their use of instructional time, knowledge of the

discipline/subject of the class, and their views on their students and their school (Olson, et al, 2008).

Limitations of Using TIMSS Data in this Study

Despite the rich data available for each participant country, TIMSS does have several limitations which are important to discuss. As a large international dataset, TIMSS may not account for unique cultural effects and conditions in each school in each participating country (Chen, 2004). For example, Dubai participated in TIMSS 2007 as a benchmarking community and data reported for Dubai may not reflect the unique cultural characteristics of the other Emirates.

A specific limitation of using the TIMSS data for this study is that it does not report teachers' nationality, or the country where they received their initial teacher training. This is a significant limitation because the boys' crisis argument in the UAE links teachers' national status and country where they received their initial training as primary factor leading to the underachievement of boys. TIMSS does not indicate if the schools sampled for each country are government, independent, or private schools; this information is only available from each country's TIMSS coordinator, or from the Ministry of Education, and is not publically available. This is a significant limitation because teachers employed in private and independent schools may not be held to the same training requirements as teachers employed in government schools. Despite these limitations, this study identifies how teachers' training is similar or different in and across the countries of interest. This will provide empirical evidence about how male and female teachers are trained across the region.

Methodology

Five of the six GCC countries, Bahrain, Kuwait, Oman, Qatar, and Saudi Arabia, participated in TIMSS 2007. Dubai, UAE participated as a benchmarking community in both the 2007 and 2011 TIMSS cycles. Egypt, Jordan and Syria are included as comparison cases because of the high number of expatriate teachers employed in boys' schools across the GCC to measure if there are statistically significant differences in the training characteristics of male and female teachers across the region.

Hypothesis 1

There is no significant difference in 8th grade science teacher training by gender within and across the GCC countries compared to target comparison countries (Egypt, Jordan and Syria).

The TIMSS background questionnaires offer rich data on teachers' pre-service training to teach secondary science. For Hypothesis 1, multiple independent samples *t*-tests are used to empirically measure statistically significant differences in female and male science teachers' training characteristics. The dependent variable, *Female Teacher* (BT4SEX), is coded as a dummy variable (1 = Female; 0=Male). The independent variables of interest for this analysis are *Teacher Age* (BT4GAGE), *Level of Formal Education Completed* (BT4GFEDC), *Number of Years Teaching* (BT4TAUT), *Science Education Training* (BT4SPSED), and *Teaching Certification* (BT4TLCE).

Teacher Age (BT4GAGE) reflects the age range of the teacher from 1 (Under 29) to 6 (60 or older) and is included as a background characteristic of the teacher (Female M = 887, SD = .92)

(Male $M = 8.10$, $SD = 1.03$). *Number of Years Teaching* is a measure of a teacher's years of experience from 1 – 49 years (Female $M = 10.31$, $SD = 7.13$) (Male $M = 12.57$, $SD = 8.42$). *Both Teacher Age* and *Number of Years Teaching* are included as indicators of how many years of classroom experience teachers have, and how far removed these teachers may be from their initial training experiences.

Level of Formal Education Completed (BT4GFEDC) is an indicator their completion of upper secondary school through post-graduate university education (Female $M = 4.74$, $SD = .704$) (Male $M = 4.90$, $SD = .666$). Post-secondary education is identified in three ways: post-secondary/non-tertiary vocational education, vocational tertiary education and professional tertiary education. Non-tertiary education (ISCED level 4) is defined as post-secondary vocational education. University-level degree programs are broken down into two types – professional and vocational. These are university-level degree programs that prepare students to pursue advanced study (ISCED level 5A) or enter a specific career (ISCED level 5B). Post-graduate education (ISCED level 6) is an indicator of teachers' completion of a post-graduate, second university degree (National Council of Education Statistics, 2007).

Science Education Training (BT4SPSED) is a dummy coded variable (1 = primary area of post-secondary study is science education; 0 = primary area of post-secondary study is not science education). This variable is used to indicate whether or not science education is the teachers' primary area of post-secondary study (Female $M = .348$, $SD = .476$) (Male $M = .331$, $SD = .470$). The TIMSS teacher background questionnaire asks teachers to report on their primary area of post-secondary study and the question options include training in biology, earth science, chemistry, or physics, or if their primary area of post-secondary study was mathematics. The

questionnaires also ask teachers about their pedagogical training in science education, general education, and mathematics education. *Science Education Training* is used because it specifically relates to a teachers' training in both science and science pedagogy.

If teachers report having a double major, or having post-secondary education in more than one field, TIMSS reports it in all areas that apply. For example, if a teacher reports having training in biology and in general education it is counted in both categories. Linking teachers' post-secondary education with the content of the courses they teach is essential to measure how their training may impact student achievement. TIMSS facilitates this linkage because it also asks teachers to report on the content of the classes they teach. Teachers in all GCC and target comparison countries except Syria identified that their 8th grade class included in TIMSS was an "integrated science" class and not a subject-specific class (biology, chemistry, earth science or physics). Teachers in Syria reported that their 8th grade science classes were grouped as "chemistry and physics" (62.4%) or "earth science and biology" (37.6 %). These data indicate science content is integrated at the 8th grade level, and despite the variation in class-type in Syria, teachers in all GCC and target comparison countries report integrating science disciplines overall. The *Science Education Training* variable is the most appropriate indicator of their training to teach integrated science

Teacher Certification (BT4TLCE) is a dummy variable (1 = teacher is certified; 0 = teacher is not certified = 0) of whether or not the teacher holds a certificate to teach 8th grade science (Female M = .8211, SD.383) (Male M = .8102, SD = .932). The TIMSS 2007 Encyclopedia reports that 8th grade science teachers in all countries included in this study are required to pass a

certification exam, except for teachers in Oman, Qatar and Jordan. As the literature review suggests, teacher certification is contextualized at the country-level, so it is expected that teachers employed in government schools will meet the certification requirements to teach 8th grade science in the country where they are employed. If teachers are employed in private or independent schools that are not subject to government regulations, which include certification requirements, these teachers may not hold a certificate or be expected to meet the same requirements of teachers in government schools. Considering this, it is expected that there will be some variation in teachers' level of certification in countries with diverse school types.

In order to confirm Hypotheses 1, there would have to be no statistically significant differences in male and female 8th grade science teachers' training characteristics within and across the GCC and target comparison countries. For example, if the data show that male and female teachers have similar pre-service training characteristics, gender differences in students' science achievement may not be attributed to how their teachers were trained. If significant differences are found in teachers' training characteristics, and if these differences disadvantage male teachers, it could provide evidence to support the boys' crisis theory that suggests teachers' training deficits may contribute to gender differences in students' science achievement. It could also indicate that teachers' initial training experiences vary significantly across the GCC and target comparison countries to such an extent that country-level contextual factors may be better predictors of student achievement.

Hypothesis 2

There is no significant association between 8th grade science teacher training and student science achievement scores by gender within and across the GCC countries compared with target comparison countries (Egypt, Jordan and Syria).

Hypothesis 2 suggests that there is no significant association between 8th grade science teachers' training and gender differences in 8th grade students' science achievement. To test this hypothesis, linear regression is used to identify if there is a relationship between 8th grade science teachers' training characteristics and students' achievement in 8th grade science, and whether or not these differences advantage or disadvantage boys or girls. Linear regression is an appropriate test for this analysis because it predicts the amount of change between an independent and dependent variable (Smith, Gratz & Bousquet, 2009). For the purpose of this study, linear regression is used because estimates the unit of change in students' science achievement scores that can be explained by their teachers' pre-service training and background characteristics.

The International Database (IDB) Analyzer add on for SPSS is used to calculate the regression to test Hypothesis 2 because it provides the appropriate weighting needed to merge teacher and student-level data files. Achievement scores are averaged using all plausible values. The IDB Analyzer calculates the correlation coefficient of the dependent variable (student science achievement) for each independent variable. This is reported as a *t*-score, which is then used to calculate the significance levels of each relationship (*p* value). Critical significance boys and girls in all GCC and target comparison countries is set at 1.96 ($p < .05$), 2.58 ($p < .01$), and 3.30

($p < .001$) except for the boys sample in Dubai. Because the boys sample in Dubai is smaller ($N=938$, $df=N-1$) critical significance is set at 1.98 ($p < .05$), 2.62 ($p < .01$) and 3.39 ($p < .001$).

The equation used for this analysis is as follows:

$$Y = \beta + \beta_1 \text{ Language of Test Spoken at Home} + \beta_2 \text{ Books in the Home} + \beta_3 \text{ Teacher Level of Formal Education} + \beta_4 \text{ Science Education Training} + \beta_5 \text{ Teacher Age} + \beta_6 \text{ Teacher Certification}_i + \beta_7 \text{ Number Of Years Teaching}$$

Y is 8th grade students' individual science achievement. Two separate regressions are run to test how boys and girls science achievement may be associated with student reported characteristics and teacher training characteristics. In the first regression, $Y = 8^{\text{th}} \text{ Grade Boys' Mean Science Achievement}$; in the second regression, $Y = 8^{\text{th}} \text{ Grade Girls' Mean Science Achievement}$.

The independent variables are at the student and teacher levels. At the student level, *Language of the Test Spoken at Home* (BS4GOLAN) and *Number of Books in the Home* (BS4BOOK) are used as proxy measures to account for cultural background characteristics and socioeconomic effects that may impact students' academic achievement. *Language of the Test Spoken at Home* and *Number of Books in the Home* are used to create a composite of students' socioeconomic status (Wiseman, et al, 2009). In other analyses using TIMSS, these variables are also coupled with a student's mother's and/or father's highest level of education (Baker, Goesling & LeTendre, 2002). *Language of the Test Spoken* at home ranges from 1 (almost never) to 4 (every day) (Girl M = 1.08, SD = .275) (Boy M = 1.08, SD = .278). *Books in the Home* ranges from 1 (none or a few books) to 5 (200 or more) (Girl M = 2.57, SD = 1.21) (Boy M = 2.51, SD = 1.20).

At the teacher level, the dependent variables (β_{1-7}) are *Teacher Age* (BT4GAGE), *Level of Formal Education Completed* (BT4GFEDC), *Number of Years Teaching* (BT4TAUT), *Science Education Training* (BT4SPSED), and *Teaching Certification* (BT4TLCE). These are the same variables used in the multiple samples *t*-tests for Hypothesis 1. They are included in the regression to identify how teachers' training characteristics may associate with student achievement in science.

Understanding gender differences in students' science achievement and in teachers' training are two important components of the boys' crisis argument. Hypothesis 2 measures the association between gender differences in student's science achievement and gender differences in teachers' training.

Findings and Results

Hypothesis 1

Hypothesis 1 investigates male and female 8th grade science teachers training characteristics in and across GCC and target comparison country in five areas: *Teacher Age*, *Level of Formal Education Completed*, *Science Education Training*, *Teaching Certification*, and *Number of Years Teaching*.

Teachers' Science Education Training

There are no statistically significant differences in 8th grade male and female teachers' science education training in any GCC or target comparison country, except for in Jordan ($t=-2.273$; $p<.05$) where female teachers have higher levels of science education training. The results of the

independent samples *t*-test for 8th grade teachers' science education training are illustrated in Table 4.

Table 4. 8th Grade Science Teachers' Science Education Training (BT4SPSED)

Country	Male Teacher (N)	Female Teacher (N)	Male Teacher Mean	Female Teacher Mean	Mean Difference	<i>t</i>	<i>p</i>
Bahrain	95	93	0.4105	0.4946	-0.0841	-1.156	ns
Kuwait	60	65	0.3833	0.3385	0.04487	0.519	ns
Oman	81	69	0.4568	0.3333	0.12346	1.547	ns
Qatar	140	126	0.2071	0.2381	-0.03095	-0.605	ns
Saudi Arabia	76	85	0.3158	0.3176	-0.00186	-0.025	ns
Dubai, UAE	34	59	0.3529	0.4746	-0.04265	-0.766	ns
Egypt	124	95	0.4355	0.4105	0.02496	0.369	ns
Jordan	88	112	0.2841	0.4375	-0.15341	-2.273	*
Syria	84	163	0.1905	0.2331	-0.04265	-0.766	ns

$p < .05$ (*), $p < .01$ (**), $p < .001$ (***)

Similarity in male and female teachers' science education training is not surprising considering that integrated science is taught at the lower secondary level in all GCC and target comparison countries. One interpretation of these findings is that because science is integrated at the 8th grade level, teachers are trained in science pedagogy rather than in a specific science discipline. Discipline-specific science content training may be more unique to upper secondary school teachers, but at the lower secondary level, teachers are trained in science education. Because TIMSS allows teachers' to self report all major areas of post-secondary education it is likely that teachers at the 8th grade level may have additional training in a specific science content in addition to their training in science education.

Teacher Certification

Significant differences were found in male and female 8th grade science teachers' certification status in Dubai, UAE ($t = .031, p < .05$) and in Syria ($t = .031, p < 0.31$). No significant differences were found in male and female 8th grade teachers' certification status in any other GCC or target comparison country. The results from the multiple independent samples t -tests for the Teacher Certification variable are reported in Table 5.

Table 5: 8th Grade Science Teachers' Teaching Certification (BT4TLCE)

Country	Male Teacher (N)	Female Teacher (N)	Male Teacher Mean	Female Teacher Mean	Mean Difference	t	p
Bahrain	98	93	0.9592	0.914	0.04521	1.274	ns
Kuwait	55	52	0.8	0.8077	-0.00769	-0.099	ns
Oman	78	65	0.9103	0.9538	-0.04359	-1.042	ns
Qatar	132	124	0.8485	0.8468	0.00171	0.038	ns
Saudi Arabia	72	80	0.7083	0.7125	-0.00417	-2.179	ns
Dubai, UAE	39	60	0.8974	0.9167	-0.1201	-2.179	*
Egypt	119	89	0.7311	0.6404	0.09064	1.385	ns
Jordan	88	112	0.7159	0.75	-0.03409	-0.54	ns
Syria	83	158	0.747	0.8671	-0.1201	-2.179	*

$p < .05$ (*), $p < .01$ (**), $p < .001$ (***)

Male and female 8th grade teachers' certification rates are not significantly different in any GCC or comparison country except for in Dubai, UAE and Syria. Analysis of teacher certification requirements in each of the countries of interest identify that the only countries that do not require teachers to pass a certification exam are Qatar and Jordan. Considering that teacher certification requirements are set by national Ministries of Education, all teachers employed in government schools are required to meet whatever criteria is required in the country where they teach. As such, little variation is expected in rates of certification among teachers in a particular country that requires certification.

The data show there are significant differences in male and female teachers' level of certification in Dubai, UAE and in Syria. In both these cases 8th grade female teachers are more likely to be certified than male teachers. One possible explanation for this variation is the high numbers of male teachers from Syria employed in boys' schools in Dubai and across the UAE (Ridge 2009). This suggests that teachers trained in Syria may be exported to other countries at greater rates than female teachers who may be more likely to remain in their home country. Both the UAE and Syria require teachers to be certified, but teachers employed in private or independent schools may not be required to be certified. This could suggest that there are more female teachers employed in government schools and more male teachers employed in private or independent schools in these two cases.

Though no significant differences were found in 8th grade male and female science teachers' science education training and certification status, significant differences were found in teachers' age, level of formal education, and years of teaching. Interestingly, the differences found in these three training characteristics advantaged males.

Teacher Age

As reported in Table 6, male and female 8th grade science teachers' age is not significantly different in Kuwait, Oman Saudi Arabia, the UAE, Egypt or Jordan. The only significant difference in male and female teachers age in the countries of interest were in Bahrain ($t = 2.96$, $p < .05$) and Qatar ($t = .00$, $p < .05$). In both these cases male 8th grade science teachers are older than female 8th grade science teachers. The results from the multiple independent samples t-tests for the Teacher Age variable are shown in Table 6.

Table 6: 8th Grade Teacher Age (BT4GAGE)

Country	Male Teacher (N)	Female Teacher (N)	Male Teacher Mean	Female Teacher Mean	Mean Difference	<i>t</i>	<i>p</i>
Bahrain	99	95	3.2626	2.9368	0.32578	2.965	*
Kuwait	63	65	3.4286	3.0308	0.3978	2.282	*
Oman	85	71	2.0706	2.0986	-0.028	-0.206	ns
Qatar	140	126	3.4571	2.7698	0.6873	6.37	***
Saudi Arabia	81	91	2.963	2.7582	0.20472	1.826	ns
Dubai, UAE	39	62	3.641	3.0645	0.14777	0.919	ns
Egypt	130	99	3.2385	3.2828	-0.04437	-0.418	ns
Jordan	88	112	2.8295	2.7589	0.07062	0.47	ns
Syria	85	166	3.1176	2.9699	0.14777	0.919	ns

p<.05 (*), p< .01 (**), p< .001 (***)

In both Bahrain and Jordan, male teachers are approximately 10 years older than female teachers.

This is not an indicator of male advantage, necessarily. It is an indicator that boys in these countries are more likely to be taught by an older teacher than girls.

Teachers' Level of Formal Education

A significant difference between male and female 8th grade teachers' level of formal education was found in Qatar ($t = 4.33, p < .001$). In Qatar, male 8th grade teachers have a higher level of formal education compared with female teachers. Other than this unique case, no significant differences in male and female 8th grade science teachers were found in any other GCC country, or any of the target comparison countries. Table 5 reports the results of the multiple independent samples *t*-tests used to identify differences in male and female 8th grade science teachers' level of formal education

Table 7. 8th Grade Science Teachers Level of Formal Education Completed (BT4GFEDC)

Country	Male Teacher (N)	Female Teacher (N)	Male Teacher Mean	Female Teacher Mean	Mean Difference	<i>t</i>	<i>p</i>
Bahrain	99	95	5.0909	5.0526	0.03828	0.657	ns
Kuwait	62	65	5.0806	5.0615	0.01911	0.416	ns
Oman	83	69	4.9759	4.971	0.00489	0.082	ns
Qatar	140	122	5.2	4.9918	0.2082	4.339	***
Saudi Arabia	81	91	4.9383	4.967	-0.02876	-0.528	ns
Dubai, UAE	40	61	5.025	4.918	-0.01807	-0.194	ns
Egypt	128	99	4.9531	5.0808	-0.12768	-1.63	ns
Jordan	88	112	5.0568	5	0.05682	0.698	ns
Syria	83	166	3.6265	3.6446	-0.01807	-0.194	ns

p<.05 (*), p<.01 (**), p<.001 (***)

Teachers' Years of Teaching Experience

Male teachers have significantly higher levels of education compared with female teachers in Bahrain ($t = 2.505, p = <.01$), Kuwait ($t = 4.312, p <.05$), Qatar ($t = 5.903, p <.05$), and Jordan ($t = 2.113, p <.05$). No statistically significant differences were found in male and female teachers' years of teaching experience in any other country. Table 8 reports the results from the independent samples *t*-tests for male and female 8th grade teachers' years of teaching experience in each GCC and target comparison country.

Table 8. 8th Grade Teachers Years of Teaching Experience (BT4TAUT)

Country	Male Teacher (N)	Female Teacher (N)	Male Teacher Mean	Female Teacher Mean	Mean Difference	<i>t</i>	<i>p</i>
Bahrain	90	89	13.1778	10.3596	2.81823	2.505	**
Kuwait	51	52	16.098	9.7885	6.30958	4.312	***
Oman	72	63	5.8889	6.8413	-0.95238	-1.024	ns
Qatar	134	118	14.5448	8.7542	5.79054	5.903	***
Saudi Arabia	73	80	10.4247	9.9375	0.48716	0.508	ns
Dubai, UAE	33	55	17.3333	11.2364	0.74513	0.569	ns
Egypt	120	95	14.45	14.6421	-0.19211	-0.198	ns
Jordan	81	106	10.6173	8.2358	2.38143	2.113	*
Syria	78	150	11.5385	10.7933	0.74513	0.569	ns

p<.05 (*), p<.01 (**), p<.001 (***)

Summary of Teacher Training Characteristics in each GCC and Target Comparison Country

Two interesting trends emerge from these analyses. The first is that male and female science teachers have similar levels of science education training in the GCC. Only male teachers in Jordan have lower levels of science education training, but there are no statistically significant differences in male and female teachers' science education training in any other target comparison country. Teachers' level of certification was more varied. For example, female teachers in Dubai, UAE and in Syria are more likely to be certified to teach 8th grade science than male teachers. This variation can be explained by the exportation of male teachers from Syria to schools across the GCC. This is important because these two indicators may be the best predictors of teachers' professional qualifications. Having training in science education suggests that a teacher has both content and pedagogical content knowledge, and certification implies that they meet the minimum required criteria to teach in government schools.

The second trend is that when differences in male and female teachers' training characteristics were found, that male teachers are not necessarily disadvantaged. Significant differences advantaging male teachers were found in three training categories: age (male teachers are older), level of formal education (they have received higher levels of post-secondary education), and number of years teaching (they have more classroom experience). One cautionary note is that these factors do not necessarily mean that they are better teachers. In fact, the age and number of years of experience a teacher has could be an indicator of how far removed they are from their initial training. This could result in lower quality instruction if the teacher is not engaged in ongoing professional development. Though professional development is important, this study is interested in the overall pre-service training and professional characteristics of teachers and not how they are professionally developed through their careers. The assumption that boys may be

disadvantaged because they are taught by male teachers with lower initial training qualifications is empirically invalidated by these analyses.

Teacher Training Characteristics across the GCC and Target Comparison Countries

The second aim of Hypothesis 1 is to measure differences in male and female 8th grade science teachers’ training characteristics across the GCC and target comparison countries. Table 9 reports differences in teachers’ training characteristics across the countries of interest.

Table 9. 8th Grade Teachers Training Characteristics across the GCC and Target Comparison Countries

Training Characteristic	N	Mean	SD	Male Teacher (N)	Female Teacher (N)	Male Teacher Mean	Female Teacher Mean	Mean Difference	t	P
Teacher Age	1,700	2.98	0.984	810	887	3.1062	2.8658	0.24033	5.042	***
Level of Formal Education	1,688	4.82	0.697	804	880	4.9017	4.7511	0.1506	4.505	***
Science Education	1,653	1.66	0.474	782	867	0.3312	0.3483	-0.01713	0.733	ns
Teacher Certification	1,601	1.18	0.387	764	833	0.8102	0.8211	-0.01092	0.562	ns
Number of Years Teaching	1,544	11.31	7.895	732	808	12.5779	10.1374	2.44049	6.103	***

p<.05 (*), p< .01 (**), p< .001 (***)

The cross-national analysis paints a strikingly similar picture of the differences in male and female teachers’ training characteristics across the GCC and target comparison countries. Male teachers are significantly older ($t = 5.042$, $p < .000$) than female teachers across the countries of interest. Teacher age is a categorical variable that indicates a teachers’ age in ten-year increments ranging from under 29 years of age, to over 60 years of age. Male teachers’ mean age is between 40 – 49 years old across the countries of interest.

Male teachers also have significantly higher levels of formal education and have more teaching experience than female teachers. Level of formal education is also a categorical variable and is assessed as a teachers' highest post-secondary degree completed using the ISCED ranking numbers. The data indicate that male teachers have significantly higher levels of education compared with female teachers, and their training is most often categorized as post-secondary, non-tertiary education (ISCED level 4) ($t = 4.505, p < .000$).

Teachers' years of teaching experience is a continuous variable that indicates a teachers' total number of years of teaching experience. Male teachers have on average two more years of teaching experience compared with female teachers, and this difference is significant across all the countries of interest ($t = 6.103, p < .000$).

The significant differences found in teachers' training characteristics across the countries of interest were also significantly different in the country-level analysis. No significant differences were found in male and female teachers' science education training or certification levels.

Teachers' science education training and certification are dummy coded to indicate if a teachers' primary area of post-secondary study is science education (1=Science Education; 0=Not Science Education) or if they are certified (1=Is certified; 0=Is not certified.) These findings mirror the country-level analysis and support the hypothesis that male and female teachers' training is not significantly different in these two areas.

These findings provide empirical evidence to confirm Hypothesis 1 across the GCC and target comparison countries, but only in teachers' science education training and certification.

However, significant differences were found to slightly advantage male teachers in their level of formal education, age, and years of teaching experience categories. The assumption of the boys' crisis argument is that male teachers trained outside the GCC, and UAE specifically, have lower levels of training, but as these findings show, when significant differences exist, males are in fact not disadvantaged.

Hypothesis 2

Hypothesis 2 suggests that because 8th grade male and female teachers training characteristics are expected to be similar in and across the GCC and target comparison countries, that there is no significant association between teachers' training and student achievement in science. Girls present an overwhelming advantage in science achievement at the 8th grade level for all countries except and in Syria where boys demonstrate a slight advantage. Because these differences and girls' overall advantage is known, the regression analyses for Hypothesis 2 provides interesting information student level and teacher level factors that may explain girls' advantage. A summary of the regression for girls' and for boys' achievement, predicted by student-level background effects and teacher training characteristics, is included as Appendix I. This section reviews the findings from these analyses.

Student Background and Achievement

The two student-level variables included in the regression analysis for Hypothesis 2 are *Language of the Test Spoke at Home* (BS4GOLAN) and *Number of Books in the Home* (BS4BOOK). These variables are used as proxy measures of background and socioeconomic characteristics that may affect student achievement.

Speaking the language of the test at home is positively associated with girls' science achievement in Egypt ($b=12.53, p<.05$), but there was no significant association found for boys' science achievement ($b = .08, ns$). Speaking the language of the test at home negatively affects both boys' and girls' science achievement in Qatar (Girls: $b = -11.98, p = .000$; Boys: $b = -21.58, p<.000$). Girls' and boys' science achievement is negatively associated with speaking the language of the test at home, and since both groups' achievement is affected in a similar way with similar levels of significance neither group presents a particular advantage. Arabic is the language of instruction in all government schools in Qatar and it is likely that the majority of Qatari nationals speak Arabic at home (Wiseman & Anderson, 2012). This could be an indicator that Qatari nationals perform lower in science compared with expatriate children who may speak another language at home.

Number of Books in the Home is used as a proxy measure of students' socioeconomic status which is known to have a significant effect on students' schooling outcomes and achievement levels (Baker & LeTendre, 2002; Heyneman & Loxley, 1983). The association between the *Number of Books* and student achievement levels is positive and significant for boys and girls in every GCC and target comparison county with one exception: boys in Kuwait. There is no significant relationship between the books in the home variable and boys' science achievement.

However, the association between girls' science achievement and books in the home is positive and significant ($b=5.60, p<.05$). This gender difference within the same county is compelling and may indicate that boys' experience greater social privilege overall, and that these privileges give them a unique advantage in school compared with girls.

Teacher Training Characteristics

The goal of Hypothesis 2 is to investigate if teachers' training characteristics may explain why girls outperform boys in science in the majority of GCC and target comparison countries.

The teacher training characteristic variables considered in this analysis are *Teacher Age, Number of Years Teaching, Level of Formal Education Completed, Science Education Training, and Teaching Certification*. The results from the independent samples *t*-tests conducted for Hypothesis 1 show that there are no significant differences in the male and female teachers' science education training across the countries of interest. There are small but significant differences observed in the age, years of teaching experience, and level of formal education categories. Male teachers are older, have more years of teaching experience, and higher levels of education compared with female teachers across the GCC and target comparison countries.

The regression analysis indicates that teachers' background and training characteristics do not predict student achievement in the same ways across the GCC and target comparison countries. For example, in Qatar, there is a very strong, positive association between the age of the teacher and boys' and girls' science achievement (Boys $b=14.26, p<.001$) (Girls, $b=12.81, p<.001$). In Qatar, the difference is positive for both groups, so neither sex is particularly advantaged or disadvantaged. Teachers' age is also positively associated with girls' science achievement ($b=14.65, p<.05$) in Kuwait, but it is negative, but not significant for boys' ($b= -17.68, ns$). So

even though male teachers are older in Kuwait, it does not necessarily affect boys' achievement in science.

Teachers' years of experience is a strong and positive predictor of boys' achievement in Qatar ($b=3.93, p<.001$) and in Saudi Arabia ($b=2.13, p<.05$). The significance is greater in Qatar than Saudi Arabia, but this is interesting considering that teachers' years of experience is the only training characteristic to have any effect on boys in the Kingdom. Girls' achievement is not significantly associated with any training or teacher background characteristics in Saudi Arabia.

Teachers' level of formal education is positively associated with boys' achievement in Jordan ($b=16.58, p<.05$). It is also a predictor of girls' achievement in Oman ($b=20.86, p<.05$) and Qatar ($b=6.71, p<.01$). In Dubai, teachers' level of education has a significantly negative effect on both girls' and boys' science achievement (Girls $b= -25.14, p<.001$) (Boys $b= -98.36, p<.001$). This is interesting because there are no significant differences in male or female teachers' level of education in Dubai compared with any other GCC country except Qatar, or any target comparison country. So, even though there are high numbers of expatriate teachers employed in boys' schools in the UAE, teachers' level of education does not explain why boys' achievement is lower. An explanation for this effect in Dubai could be found by investigating the type of post-graduate education male and female teachers receive. If their education and training is not in science content or science education, their increased levels of education may not be transferable to the classroom level, where students would benefit the most. This may explain why teachers' level of education has a negative effect on both boys' and girls' achievement. What can be interpreted from these findings is that in Dubai, at least, that boys and girls are equally disadvantaged in this category and not just boys as suggested by the crisis argument.

Teachers' science education training only had an effect on student achievement in Qatar and Dubai, but the girls and boys in these countries experience these effects differently. In Qatar there is a strong negative relationship between teachers' science education training and girls' achievement ($b=-22.40, p<.001$), but teachers' science education training has a strong positive effect on boys' science achievement ($b=27.50, p<.001$). So in Qatar, boys are more likely to do well in science if their teachers' main area of study was in science education, but being taught by a teacher with training in science education actually lowers girls' achievement.

There is also a significant negative association between teachers' science training and girls' achievement in Dubai ($b=-24.66, p<.05$), but teachers' science education training has no effect on boys' science achievement. So, in the Dubai case, girls are more likely to do well in science when they have a teacher whose primary area of study is not science education.

Being taught by a certified teacher negatively affects girls' science achievement in Qatar ($b=-53.63, p<.001$), but it positively affects boy's science achievement ($b=40.83, p<.001$). In Dubai, boys' achievement is likely to decrease if they are taught by a certified teacher ($b= -53.71, p<.05$). In sum, when boys in Dubai and girls in Qatar when girls have a certified teacher their science achievement score is likely to decrease. But, when boys in Qatar are taught by a certified teacher, their achievement is likely to increase.

Summary of Key Findings for Hypothesis 2

Hypothesis 2 asserts that there is no significant association between teachers' training characteristics and student achievement in science. The results from the regression analyses used to measure how teachers' training characteristics may predict (or not) girls' and boys' science achievement show no compelling evidence to suggest that teachers' training significantly associates with boys' and girls' achievement across the countries of interest. No significant relationship was found between any teacher training characteristic and boys' or girls' achievement in Bahrain, Egypt and Syria. Significant differences in a *single category* were found in Kuwait, Oman, Saudi Arabia, Jordan. So overall, these results confirm Hypothesis 2; there is no significant association between teachers' training characteristics and student achievement within specific gender-controlled categories. Though this seems to be the general trend, there are significant gender differences in student background characteristics in Kuwait and in teacher training and achievement in Qatar and Dubai, UAE that deserve a closer investigation.

In the cross-national analysis, socioeconomic status (as measured by the number of books in the home), was a significant predictor of both boys' and girls' achievement in all countries of interest, *except* for boys in Kuwait. No significant association was identified for any teacher training characteristic and boys' achievement in Kuwait. One possible interpretation of this difference is that boys in Kuwait are somehow buffered from any affect socioeconomic status may have on their achievement. The lack of association between boys' science achievement and socioeconomic status may indicate that Kuwaiti boys have a unique social advantage that is not experienced by Kuwait girls, or boys and girls across the region. Another possible interpretation is that more boys come from higher income families compared with girls. Additional analysis is needed to review population and income demographics in Kuwait to test this theory.

Significant and compelling gender differences were found in Qatar and in Dubai, UAE, but teacher training associates very differently with boys' and girls' achievement in nearly all measured categories. When significant associations were found in these two cases, neither boys' or girls' were particularly disadvantaged relative to the training characteristics of their teachers.

In Qatar, there is a positive relationship between boys' achievement and being taught by an older teacher with more years of teaching experience, and that is certified. The effects are very different for girls in Qatar. Girls' science achievement is only positively associated with having an older teacher with higher levels of formal education and science education training. Girls' achievement is likely to decrease if they are taught by a certified. Considering these findings, there are significant differences in the ways girls' and boys' achievement associates with teachers' training characteristics. As such, the findings for Qatar are largely inconclusive. What is apparent is that there are marked differences in the ways boys and girls experience schooling that cannot be fully explained without further research, and perhaps more contextual analysis at the country-level.

Dubai is sampled as a benchmarking community for the UAE, so what the findings indicate for Dubai may not be generalizable at the country-level. Girls' achievement is likely to decrease if their teacher's major area of post-secondary study is science education, and if their teacher is certified. Boy's achievement is likely to decrease if they are taught by a certified teacher. Boys' and girls' science achievement is negatively associated with teachers' level of education Dubai.

Because the crisis argument has only been discussed in the UAE, a more careful analysis of the Dubai case is needed in order to interpret these results.

Girls have a 12 point advantage in science at the 8th grade level in Dubai (Girl M=495) (Boy M=483), and demonstrate an academic advantage in upper secondary school as well (Ridge, 2009). Girls' and boys' experiences in school may also explain their different levels of achievement, as well as their schooling outcomes. These differences in students' schooling experiences are discussed in the crisis literature and associated with the high numbers of expatriates employed as teachers in boys' schools. So, it is assumed that girls are more likely to be taught by an Emirati female teacher, but boys are more likely to be taught by an expatriate male teacher. Ridge (2009; 2010) finds that girls are more likely to have a positive experience in school and that girls' schools are more "welcoming and supportive" compared with boys' schools. In comparison, Ridge also reports that the relationship between boys and their expatriate teachers is described as "ambivalent at best and openly hostile at worst" (2009, p. 3). For the purpose of this discussion and analysis, this relationship will be referred to as the *expatriate teacher – national student* effect.

The review and analysis of student achievement trends, teacher training characteristics, and teacher education policies across the GCC identify that the UAE is not unique in its hiring and recruitment of expatriate teachers in high-need fields like science (and mathematics). So, if the *expatriate teacher – national student* effect is the cause for boys' underachievement in the UAE it should be observable across the region. The findings produced in this study empirically show that this is not the case. In Dubai, both girls' and boys' science achievement negatively

associates with their teachers' level of education. Because both girls and boys science achievement is affected by their teachers' level of education, neither is uniquely disadvantaged compared with the other sex-group. There is also a significant negative association between teachers' science education training and girls' achievement, but teachers' science education training has no effect on boys' science achievement. These findings suggest that teachers' science education training may predict a girls' science achievement, it does not necessarily give them an advantage. If teachers' science education training negatively associated with boys' achievement, this would support the crisis argument. But, as these data show, boys' achievement is not significantly associated with their teachers' training in this area.

Teacher certification has a negative effect on boys' achievement, but not girl's achievement. As the literature review discussed, expatriate teachers must go through a rigorous vetting process, and they must demonstrate higher grades than their Emirati counterparts in order to be hired. Even though there are more expatriate teachers employed in boys' schools compared with girls' schools, male expatriate teachers are held to a higher employment standard than is expected of female Emirati teachers.

This discussion leads to two possible theories which could explain how the teacher-student relationship may have a greater effect on student achievement than any teacher training or background characteristic. The first is that the *expatriate teacher – national student* effect is the strongest predictor of boys' achievement in the UAE. This explanation suggests that shared national identity supports students' learning and achievement more than any teacher training or other background-level effect. Since boys are more likely to be taught by an expatriate teacher

than girls, perhaps this is why they have lower levels of achievement, higher dropout rates, and more negative opinions about school. This is the root of the crisis argument in the UAE, and leads to a second possible explanation of why boys' and girls' have different schooling experiences and achievement levels.

The second possible explanation also involves the relationship between teachers and students, but discusses how gender may predict achievement. The relationship between teachers and students in the classroom environment is unique because it both mirrors and contests the larger social relational context. Ridgeway and Correll (2004) define the social relational context as any situation in which individuals' actions are influenced by their interactions with others. These social interactions are determined by gender beliefs, as the "rules or instructions for enacting the social structure of difference and inequality that we understand to be gender" (p. 511). In the classroom environment gender beliefs define and structure the relationships between teachers and students and may affect girls' and boys' achievement in school. For example, how students see their teachers as role models, having legitimacy as professionals and as mentors, may impact their own academic expectations and achievement (Meyer & Rowan, 1977). In the absence of other professional opportunities in science-related fields, becoming a science teacher may have greater prestige for girls than boys. As a result, girls with interest in science may be more likely to see their science teachers as legitimate role models, and associate doing well in science with future career options. This could explain why girls persist in school longer, have greater achievement levels in science, and transition to tertiary education at greater rates than boys in the UAE.

Conclusion and Recommendations for Future Research

In summary, the findings reported here identify that there are no significant differences in teachers' science education training across the GCC and target comparison countries. Where significant differences were found in male and female teachers' training in specific countries, they did not universally advantage or disadvantage boys or girls. This confirms that gender differences in students' achievement are not associated with the ways their teachers are trained, and largely invalidates the "crisis for boys" theory in the UAE and across the GCC context.

The findings reported give important insight into how teachers are trained in and across the GCC and target comparison countries. All of the GCC countries have expanded their teacher education program frameworks, and have borrowed heavily from one another to support their national education priorities and goals. Further, each GCC nation has an articulated policy in place to recruit and retain nationals into teaching, and that male, nationals are in high demand. Despite these policies and incentives, male nationals do not enter teaching careers at the same rates as female nationals in these countries. This is not surprising considering they have other high paying professional options, and that teaching is a lower paying profession with lower social prestige. Teacher education is a relatively new endeavor in these countries, and national policy makers are trying to keep pace with international teacher education trends. These trends involve the need for increased and dedicated training for teachers in high need fields like science and mathematics. The expectation is that investing in teacher education, and instating more rigorous policies for teachers' certification and induction, will increase student achievement scores on national and large-scale international tests, and at the same time create national capacity to reduce the reliance on expatriate labor in education sectors.

One thing that is important to note is that while all GCC countries perform below the TIMSS international mean, it does not mean that teachers are poorly trained, or that students are not learning. Further research is needed to compare teacher training characteristics internationally to investigate how teacher training characteristics in the GCC may compare with countries outside the Arabian Gulf and MENA regions. TIMSS, like all other international testing schemes, give a “snapshot” of student achievement and the contexts of teaching, learning, and schooling. The data is valuable because it provides information on how school “works” in countries all over the world. What it does not do is provide a holistic assessment of the experience of schooling in these countries, and how culture and context play a role in shaping the experiences of students and teachers. This contextual information is essential to understand how gender differences in student achievement may be more related to unique background and cultural-level effects in their home communities than with school-level effects. Further research is needed in the GCC context, specifically, because of the social, economic and political importance of these countries in the international context.

In communities with high levels of legal and institutionalized gender segregation, boys’ and girls’ social, political and economic opportunities are socially determined. The associations they may make with doing well in school are shaped by their families, and the larger social opportunity structure. This should mean that because girls’ have fewer professional and social choices than boys that we could expect their achievement levels to be lower. However, we know this is not the case. What is known is that girls persist in school longer, have higher achievement levels, and transition to tertiary education at greater rates than boys. So despite their relative social disadvantage, girls in the GCC seem to experience schooling differently than boys, and this may explain why they continue to demonstrate higher levels of achievement. More country-

level research is needed to understand how both boys and girls in the GCC experience schooling, and how their schooling experiences and expectations are shaped by school and cultural factors.

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Summary of Regression Models for Hypothesis 2

	<u>Bahrain</u>		<u>Kuwait</u>		<u>Oman</u>		<u>Qatar</u>		<u>Saudi Arabia</u>	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Language of the Test	3.03 (2.90)	-1.31 (2.71)	-3.99 (2.49)	0.48 (4.56)	0.88 (3.23)	-0.09 (4.12)	-29.13 (2.43)	-53.01 (2.43)	-2.44 (0.62)	2.81 (2.49)
Books in the Home	10.84*** (9.96)	1.74*** (5.45)	5.60** (2.24)	3.68 (3.48)	16.60*** (2.96)	13.53*** (2.48)	12.81*** (1.36)	142.6*** (1.51)	10.06*** (2.06)	11.47*** (2.31)
Teacher Age	3.63 (3.16)	-7.00 (10.73)	14.65* (6.44)	-17.68 (20.47)	5.38 (6.15)	1.17 (9.55)	18.14*** (3.21)	23.94*** (3.11)	-3.55 (12.49)	-7.47 (9.35)
Number of Years Teaching	0.23 (0.85)	0.24 (0.85)	-0.87 (-0.79)	1.59 (0.69)	-0.98 (1.15)	1.67 (1.56)	-0.29 (3.93)	3.93*** (0.44)	1.04 (1.73)	2.13* (1.06)
Level of Formal Education Completed	0.95 (1.16)	6.98 (6.82)	-1.52 (32.02)	-31.84 (20.58)	20.86 (2.15)*	0.06 (0.01)	6.71** (2.15)	-7.30 (5.24)	-0.99 (258.68)	9.10 (8.67)
Science Education Training	1.01 (5.50)	-6.08 (7.28)	-7.81 (11.41)	-17.93 (13.44)	2.00 (8.78)	4.67 (9.38)	22.40*** (4.41)	27.50*** (5.60)	-0.44 (8.71)	-0.74 (11.71)
Certification	7.75 (7.09)	11.42 (18.3)	15.00 (11.61)	17.15 (14.24)	-2.80 (7.74)	-31.76 (21.35)	53.63*** (5.19)	40.83*** (6.22)	-2.40 (11.70)	-9.86 (10.77)
ϕ^2 (N-1)	1,593	1,891	1,125	1,008	1,699	1,756	3,014	2,927	1,476	1,466
R^2	0.05	0.06	0.04	0.05	0.06	0.05	0.19	0.32	0.04	0.05

p<.05 (*), p< .01 (**), p< .001 (***)

Standard errors reported in parentheses

Summary of Regression Models for Hypothesis 2 (Cont.)

	<u>Dubai, UAE</u>		<u>Egypt</u>		<u>Jordan</u>		<u>Syria</u>	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
<u>Language of the Test</u>	-1.13 (5.15)	1.85 (5.46)	12.53* (3.59)	3.41 (0.81)	-2.73 (4.01)	0.45 (4.34)	-0.61 (2.75)	-3.97 (2.41)
<u>Books in the Home</u>	18.78*** (3.40)	21.77*** (4.70)	9.26*** (2.77)	7.82* (3.77)	15.45*** (2.07)	18.33*** (3.07)	7.69*** (2.26)	6.19*** (1.65)
<u>Teacher Age</u>	22.48 (16.31)	-9.97 (13.80)	11.63 (2.19)	2.19 (7.92)	-2.80 (10.92)	10.48 (-49)	-1.61 (3.73)	7.75 (4.13)
<u>Number of Years Teaching</u>	0.09 (1.60)	1.01 (2.07)	-1.20 (1.32)	0.42 (1.02)	1.54 (1.99)	(1.64) (1.66)	0.48 (0.44)	-0.11 (0.60)
<u>Level of Formal Education Completed</u>	25.14*** (6.57)	98.36*** (28.20)	-19.12 (10.87)	8.36 (9.30)	-6.03 (11.54)	16.58* (2.55)	11.63 (6.98)	8.65 (5.96)
<u>Science Education Training</u>	-24.66* (12.10)	8.16 (15.45)	-8.89 (10.41)	-13.34 (9.70)	-7.18 (13.15)	21.00 (13.58)	-12.92 (8.94)	8.79 (8.06)
<u>Certification</u>	65.73 (37.29)	-53.71* (20.25)	-2.51 (10.20)	1.66 (10.58)	10.00 (10.01)	4.80 (12.85)	-1.61 (7.21)	12.03 (12.23)
<i>d_f(N-1)</i>	1,183	997	2,567	2,668	2,603	2,195	3,231	3,208
R²	0.15	0.28	0.04	0.02	0.05	0.09	0.03	0.04

p<.05 (*), p< .01 (**), p< .001 (***)

Standard errors reported in parentheses

Curriculum Vitae

Emily Anderson

EDUCATION

M.A., Comparative and International Education
Concentration: Sociology
Lehigh University College of Education, Bethlehem, PA
Expected degree completion: May 2012

M.Ed., Educational Leadership (2009)
Lehigh University College of Education, Bethlehem, PA

B.A., History/Teacher of Social Studies Certification (2005)
Centenary College, Hackettstown, NJ
Valedictorian, summa cum laude

CERTIFICATION

New Jersey Certificate of Eligibility with Advanced Standing: Teacher of Social Studies (K-12)

PROFESSIONAL EXPERIENCE

Centenary College, NJ

Assistant Professor of Education
September 2009 – present

Adjunct Instructor, Academic Foundations
September 2007 – May 2009

Assistant Director for Academic Transitions, First-year Programs
June 2008 – May 2009

Certification Coordinator for the Education Department
November 2007 – August 2009

Research Assistant, Office of Strategic Advancement
September 2006 – November 2007

Related Professional Experience

Research Assistant, Lehigh University College of Education
Summer 2011

Lead Pre-Kindergarten Teacher, Sunny Days Early Childhood Learning Center
September 2005 – May 2006

Social Studies Teacher (Pre-service); Grades 9 – 12
Phillipsburg High School: United States History II (College Preparatory and Applied)
North Hunterdon Regional High School: Advanced Placement Civics; United States History I
September 2004 – May 2005