Influential Factors causing the gender differences in mathematics' achievement scores among Iranian Eight graders based on TIMSS 2003 data

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Gender differences in mathematics performance has been a great controversy issue in educational domain and research documents show great discrepancies among girls and boys performance in school mathematics (Sprigler & Alsup (2003). Long research history in this area has shows that male advantage in mathematics achievement is a universal phenomenon (Janson, 1996, Mullis et al., 2000). While early research (Fennema & Sherman, 1977) indicated that males outperformed females in math achievement at the junior high and high school levels, there were also significant differences in attitudes toward math between the two groups. Gallagher and kaufman (2006) recognized that the math achievement and interest of boys are better than the girls. However they explained that they don't know the main cause of these differences.

O'Connor-Petruso, Schiering, Hayes & Serrano(2004) have shown that gender differences in math achievement become apparent at the secondary level when female students begin to exhibit less confidence in their math ability and perform lower than males on problem solving and higher level mathematics tasks.

In spite of research evidences for male's superiority in math achievement, some research findings do not support the difference between two genders in math achievement. As an example, Sprigler & Alsup (2003) refer to researcher indications that shown no gender difference on the mathematical reasoning ability at elementary level. Finding from longitudinal study about gender differences in mathematics show that there is no difference among boys and girls in mathematics achievement. (Ding, Song and Richardson; 2007). This study show that growth trend in mathematics among two genders was equivalent during the study times. According to a recent international study conducted by IEA, on average across all countries, there was essentially no difference in achievement between boys and girls at either the eighth or fourth grade (Mullis et al., 2004). Finding of two recent consecutive International studies (TIMSS 1999 &2003) in Iranian educational system (a system that co-education is prohibited and female teachers teach in the girls' schools and male teachers teach in the boys' schools) also confirms that there is no significant differences between boys and girls in mathematics achievement. Data from these studies show the significant decrease in the boys' mathematics achievement score from the time of TIMSS 1999 and the significant improvement in the girls' achievement over the same period. Teacher job satisfaction and the positive perspective of female teachers regarding teaching of mathematics may be the factors behind the better mathematics performance of Iranian girls than boys at Grade 8 in Iran (Kiamanesh, 2006).

Over the last three decades, diverse theories and frameworks have been developed and many have tried to identify factors that influence math performance in order to reduc gender inequality in math achievement (O'Connor-Petruso & Miranda, 2004). Research evidences show that gender differences in mathematics achievement are due to various factors such as biological factors (Geary et al., 2000), mathematics learning strategies (Carr and Jessup. 1997), sex hormones on brain organization (Kimura, 2002) and symbolic gender (Nielsen, 2003).

Research findings show that students' performance in mathematics are due to factors such attitude towards mathematics (Hammouri, 2004; kiamanesh, 2004), self-concept (Bryen & Shavelson, 1987; Campbell, Connolly & Pizzo, 1986), home environment (Weiss & Krappmann, 1993; Fullarton, 2004; Koutsoulis & Campbell, 2001 ; Howi , 2005), parental education (Beane & Lipka, 1986; Alomar, 2006), Schools climate and culture (Fullan,2001), and school connectedness or engagement (Blum & Libbey, 2004). Several studies have revealed that the educational level of students' parents (Beaton et al., 1996; Robitialle & Garden, 1989; Engheta, 2004), home educational resources (Mullis et al. 2000), socioeconomic status of the family (Marjoribanks, 2002), home language versus language of test (Howie, 2002) and providing quality homework assistance by parents (Engheta, 2004) are among factors that can explain variance in academic achievement. Home is the backbone of children's personality development, and influences them both directly and indirectly through the kind of relationship the family members have among themselves as well as through helping them to get in contact with the society (Weiss & Krappmann, 1993). Fullarton (2004) indicates that "at the student level, home background index …is a strong predictor of achievement in mathematics" (p-24).

The relationship between mathematics self-concept and math achievement is an area that has been investigated by researchers (Marsh, 1993; Hamachek, 1995). Low self-concept tends to appear together with students' underachievement. Most findings in this area showed that those who have higher self-concept, i.e., having more confidence in math, gain higher scores in mathematics (Wilhite, 1990). Not only self-concept influences students' mathematics achievement (Bryen & Shavelson, 1987, Campbell, Connolly & Pizzo, 1986), but also as Franken (1994) concludes, it forms the basis of all motivated behaviors. Many investigators consider the improvement of a student's academic self-concept as the basic educational outcome (Koutsoulis & Campbell, 2001).

School connectedness is defined as "the belief hold by students that whether adults in the school care about their learning and about them as individuals" (Blum and Libbey, 2004, p 231). Students who know their teacher care about them and have been had clear and reasonable expectation; can get better score (House, 2005). Supportive teacher play a significant role in student's engagement in school (House, 2005). School's climate and culture (Fullan, 2001) and school connectedness or engagement (Blum & Libbey, 2004) are two key factors for school's and its students' success. Freiberg (1998) points out that a positive school climate can promote higher morale, and improve student achievement. Bulach, Malone, and Castleman (1995) have also shown that there is a significant correlation between student's achievement and school climate. According to Klem & Connel (2004) students engaged in school are more likely to get higher test score. Schools with high SES students are more likely to have greater support from parents, fewer disciplinary problems, and more chance to attract talented and motivated teachers (Ma, & Willms. (1999). Students connected to their school report more cohesion and less friction among classmates and less likely to engage in conduct problem. " According to Papanastasiou (2002) school climate is influenced by the educational background of Students and it also influences teaching.

Although many factors inside and outside of school influence students' level of achievement, the quality of teaching is important for improving students' learning (Hammouri, 2004, Antonijevic, 2005). According to Butty (2001) instructional practices has impact on mathematics' achievement as well as attitude toward mathematics. A supportive classroom and Suitable teaching motivate students to become better math learners (House, 2004). Teachers who do not receive support in their work may be less motivated to teach and perform well in the classroom (Ostroff, 1992). Some research findings indicated that instructional practices have positive effect on students' mathematics achievement and attitude toward mathematics (Butty, 2001).

Purpose of the Study

The purpose of the present study has been to develop a conceptual model for predicting math achievement by examining different factors that have had an impact on the Iranian 8th graders' mathematics achievement as documented in TIMSS (2003). Also, we wanted to determine the contribution of each factor to the explained variance, in order to see if different models would emerge for boys and girls. Figure 1 is the proposed model for the total sample (boys and girls).

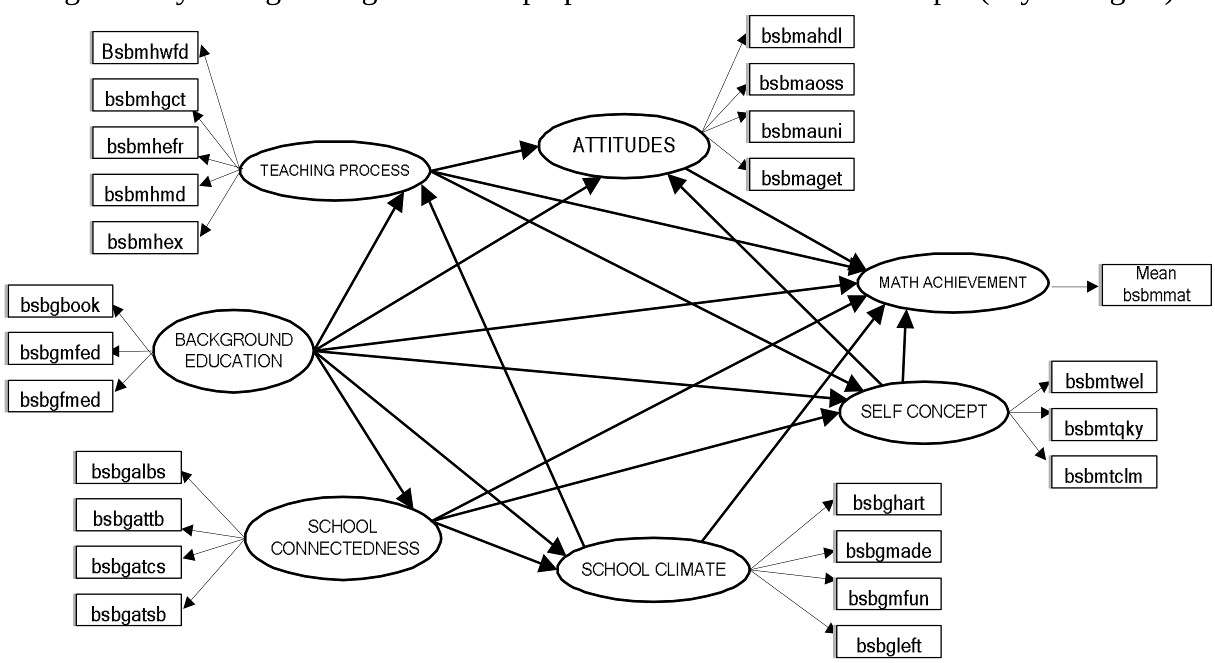

figure 1 : proposed model of mathematics achievement.

Significance of the study

One of the most remarkable findings of TIMSS (2003) regarding Iranian eighth graders is that the boys' math achievement scores have had a significant decline and the girls' scores have shown a significant improvement compared to the scores of (1999) and (1995). The Iranian boys' superiority in TIMSS (1995) and (1999) is reversed in TIMSS 2003. The significance of this study aims at identifying factors that may affect math achievement differently in boys and girls. By doing so it could pave the way for further comprehensive research on gender differences in mathematics.

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Methods

Data Sources

The data for this study were obtained from 5410 (2237 girls and 3173 boys) Iranian 8th graders who participated in TIMSS (2003). Due to the missing data, the final sample reduced to 4942 students (2054 girls and 2888 boys). Using research evidence, a tentative list of 36 items from the Student Questionnaire was selected for factor analysis. To determine whether there was an underlying structure among these items for total sample as well as boys' and girls' group, three different factor analyses were performed. The data were subjected to principal component factor analysis with Varimax Rotation and 23 out of the 36 items were selected for further analysis These items are the same for the three models: total, girls, and boys. Based on the Eigen Values over one, six factors were accepted as the most interpretable ones for the three models. Cumulative of the variance in total, girls' and boys' model, were 50%, 51.11% and 51.42% respectively. The obtained factors were named on the basis of research carried out on the TIMSS data (Martin et al., 2000; Papanastasiou, 2000 & 2002; Koutsoulis & Campbell, 2001). These factors were identified as Attitudes towards math, background education, Math Self-Concept, School Climate, School Connectedness, and Teaching Process. Factors and items as well as the Cronbach's alpha for each factor are defined in table 1. Factor loadings and items under each factors as well as the amount of the cumulative of the variance in three different models, indicated similar patterns for the three models.

TIMSS use 5 different math plausible values as well as mean of the five plausible values as the student's math achievement. In order to determine the criterion variable for this study, six different path analyses with the total sample were used. In each analysis the exogenous and endogenous were the same but the criterion variables were different. These were five different math plausible values as well as the mean of the plausible values. The path coefficients for the six analyses for total samples were estimated. The minimum and maximum of paths coefficient for each of the five math plausible values as well as the mean of the plausible values are as follows:

Table 1 Exploratory Factor Analysis and Cronbach' s alpha

Factors	Items	Loading			α	α	α
		total	girls	boys	total	girls	boys
background education	Number of book at home Father level of education Mother level of education	0.705 0.859 0.882	0.720 0.840 0.854	0.697 0.869 0.895	0.76	0.78	0.71
Self Concept	Agree do well in math Agree learn quickly Agree math is more difficult for me	0.745 0.746 0.711	0.762 0.771 0.737	0.712 0.704 0.687	0.71	0.72	0.69
Attitude toward math	Agree learning math help me in my daily life Agree learn other subjects Agree the get in to the university Agree to get the job	0.502 0.705 0.770 0.743	0.548 0.685 0.789 0.755	0.462 0.720 0.734 0.711	0.73	0.75	0.68
School connectedness	Like being in school Think that student in school try to their best Think that teachers in school care about students Think that teachers in school want students to do their best.	0.580 0.622 0.742 0.754	0.524 0.571 0.723 0.741	0.580 0.637 0.775 0.762	0.68	0.65	0.69
School Climate	Hurt by other students Made to do things by other students Made fun of or called name Left out of activities.	0.725 0.619 0.770 0.489	0.663 0.655 0.732 0.450	0.742 0.608 0.780 0.483	0.65	0.64	0.66
Teaching Process	Work on fractions and decimal Work with data in table, chart and graph Represent relationships Relate to daily lives Explain answers	0.633 0.598 0.611 0.458 0.361	0.662 0.604 0.596 0.490 0.327	0.616 0.592 0.634 0.425 0.383	0.69	0.71	0.68

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax

Each of five math plausible values		Mean plausible values
Background education → math achievement:	(from ß= 0.26 to 0.29)	(ß=0.29)
Self concept → math achievement:	(from ß= 0.52 to 0.55)	(ß=0.58)
Attitude toward math → math achievement:	(from ß= -0.15 to -0.19)	(ß= -0.18)
School climate→ math achievement:	(from ß= 0.04 to 0.05)	(ß= 0.05)
School connectedness → math achievement:	(from ß= -0.12 to -0.14)	(ß= -0.14)
Teaching process → math achievement:	(from ß= 0.10 to 0.14)	(ß= 0.13)

In addition, the highest and the lowest correlation coefficients between the 6 plausible values (mean of the 5 plausible values as well as 5 different math plausible values) were 0.932 and

0.935. Since the correlation coefficients between the plausible values, as well as the estimated path coefficient for each of the math plausible values and the path coefficient for the mean of the plausible values in the six analyses were close, the mean of the plausible values was selected as the criterion variable for this study.

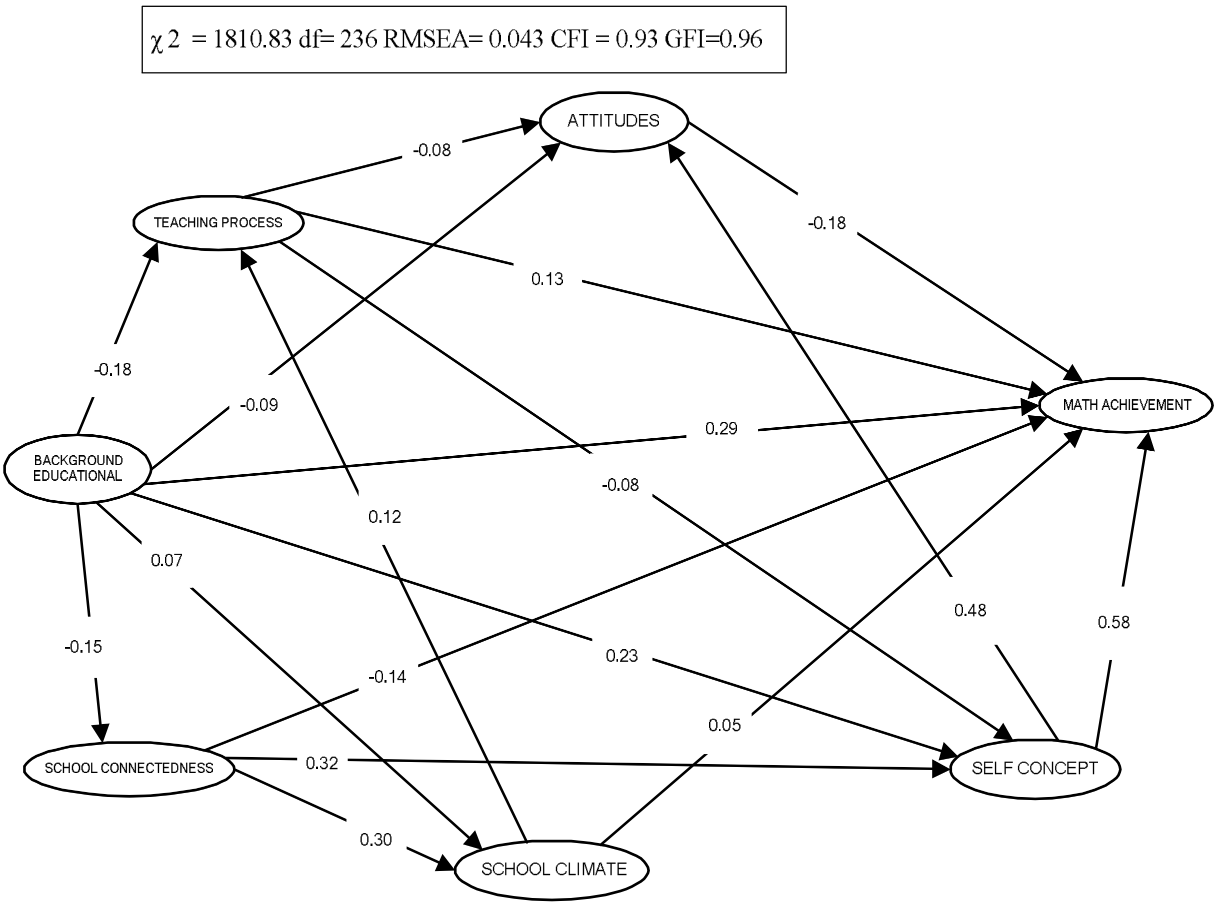

Figure 2. Complete Model with Parameter Standardized Solution (Both gender)

Result

The proposed model for the total sample was tested using LISREL 8.53 (Jöreskog and Sörbom, 1993). Diverse fit statistics were used to assess the goodness of fit for the three models. For the total model, measures of fit statistics are as follows: chi – square = 1810.83 (df = 236, p = 0.00), (GFI) = 0.96, (CFI) = 0.93, (RMSEA) = 0.043. All the fit indices, except chi – square showed a good fit. However, Chi – square is sensitive to sample size and the fit should be independent of the size of the sample. These indices for girls' model are: (χ^2 = 879.94, df = 236 ; GFI = 0.96 ; CFI = 0.92 ; RMSEA = 0.042) and for boys' model are : (χ^2 = 1260.71, df = 236 ; GFI = 0.95 ; CFI = 0.92 ; RMSEA = 0.046). All the indices support the proposed model fit the data for the three models.

Data from table 2 and Figures 2, 3 and 4 show that the direct and indirect impact of background education on self-concept and mathematics' achievement are positive and significant for the three models. Even though the total effects for the three models are almost equal for both endogenous variables, the indirect effects of background education on self-concept and mathematics achievement for girls' model (*ß* =-0.07, sig. and 0.15 Sig) are stronger than for boys' model (ß = -0.01, not .sig and 0.09 Sig) respectively. Direct effects of background education on Mathematics achievement in boys' model is stronger than for the girls' model (0.32 and 0.24 respectively.

Table 2: tested paths in SEM (total, girls' and boys' model)

paths	DIRECT EFFECT			INDIRECT EFFECT			TOTAL EFFECT		
	total	girls	boys	total	girls	boys	total	girls	boys
BACKGROUND EDUCATION									
SELF CONCEPT	0.23**	0.27**	0.22**	-0.03**	-0.07**	-0.01	0.20**	0.20**	0.21**
ATTITUDES	-0.09**	-0.08**	-0.10**	0.11**	0.10**	0.12**	0.02	0.02	0.02
TEACHING PROCESS	-0.18**	-0.17**	-0.19**	0.00	0.01	0.00	-0.17**	-0.16**	-0.19**
SCHOOLCONNECT	-0.15**	-0.21**	-0.12**	---	---	---	-0.15**	-0.21**	-0.12**
SCHOOL CLIMATE	0.07**	0.14**	0.03	-0.05**	-0.07**	-0.03**	0.03	0.07	0.00
ACHIEVEMENT	0.29**	0.24**	0.32**	0.11**	0.15**	0.09**	0.40**	0.39**	0.42**
TEACHING PROCESS									
SELF CONCEPT	-0.08**	0.00	-0.16**	---	---	---	-0.08**	0.00	-0.16**
ATTITUDES	-0.08**	-0.10**	-0.06	-0.04**	0.00	-0.09**	-0.12**	-0.10**	-015**
ACHIEVEMENT	0.13**	0.06	0.19**	-0.03	0.02	-0.07**	0.10**	0.08**	0.12**
SCHOOL CONNECTEDNESS									
SELF CONCEPT	0.32**	0.32**	0.34**	0.00	0.00	0.00	0.31**	0.32**	0.34**
TEACHING PROCESS	---	---	---	0.04**	0.05**	0.02**	0.04**	0.05**	0.02**
ATTITUDES	---	---	---	0.15**	0.12**	0.18**	0.15**	0.12**	0.18**
SCHOOL CLIMATE	0.30**	0.33**	0.26**	---	---	---	0.30**	0.33**	0.26**
ACHIEVEMENT	-0.14**	-0.15**	-0.14**	0.17**	0.20**	0.17**	0.03	0.05	0.03
SCHOOL CLIMATE									
SELF CONCEPT	---	---	---	-0.01**	0.00	-0.01	-0.01**	0.00	-0.01
ATTITUDES	---	---	---	-0.01**	-0.02	-0.01	-0.01**	-0.02	-0.01
TEACHING PROCESS	0.12**	0.16**	0.09**	---	---	---	0.12**	0.16**	0.09**
ACHIEVEMENT	0.05**	0.07**	0.01	0.01**	0.01	0.01	0.06**	0.09**	0.02
SELF CONCEPT									
ATTITUDES	0.48**	0.41**	0.55**				0.48**	0.41**	0.55**
ACHIEVEMENT	0.58**	0.63**	0.56**	-0.09**	-0.09**	-0.08**	0.49**	0.53**	0.48**
ATTITUDE									
ACHIEVEMENT	-0.18**	-0.23**	-0.15**	---	---	---	-0.18**	-0.23**	-0.15**

P< 0.01**

In spite of the negative and significant direct effects of background education on attitude towards mathematics for total sample as well as girls and boys' model (*ß* = -0.09, -0.08 and -0.10 respectively), and positive indirect effects of background education on attitude towards mathematics for the three models (*ß* = 0.11, 0.10 and 0.12 respectively), the total effects of this variable on attitude towards mathematics for the three models (*ß* = 0.02 for the three models) are negligible. Background education has indirect effect on attitude towards mathematics through self-concept for the three models and through teaching process for the total as well as the girls' model. Background education has negative and significant direct effects on teaching process as well as on school connectedness for the three models. The direct effects of background education on teaching process for girls' group is smaller than for boy's group (-0.17 and -0.19 respectively). Also, the direct effects of background education on school connectedness for girls' group is larger than for the boys' group (-0.21 and -0.12 respectively). There were no any intervening variables between background education and the above two endogenous variables for the three models.

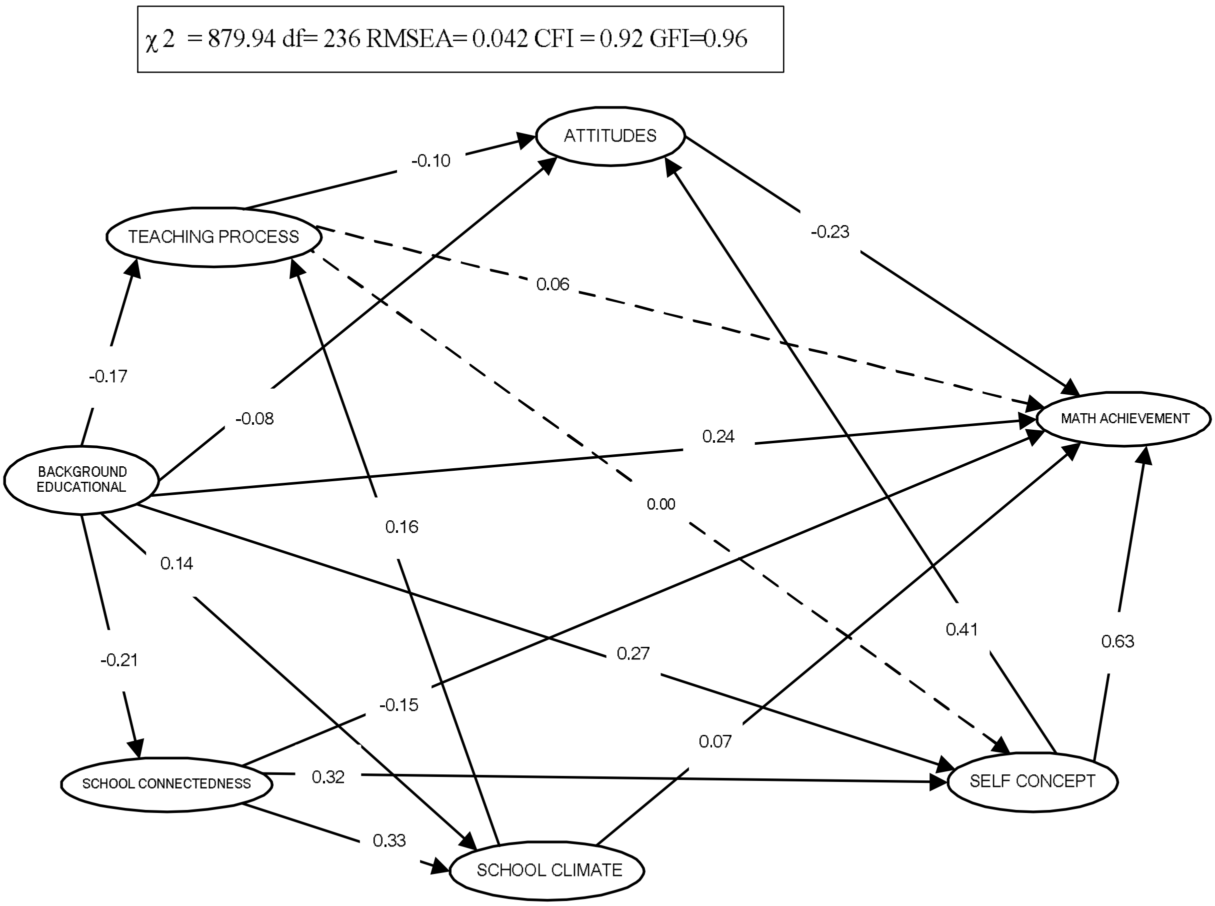

Figure3: Complete Model with Parameter Standardized Solution (Girls)

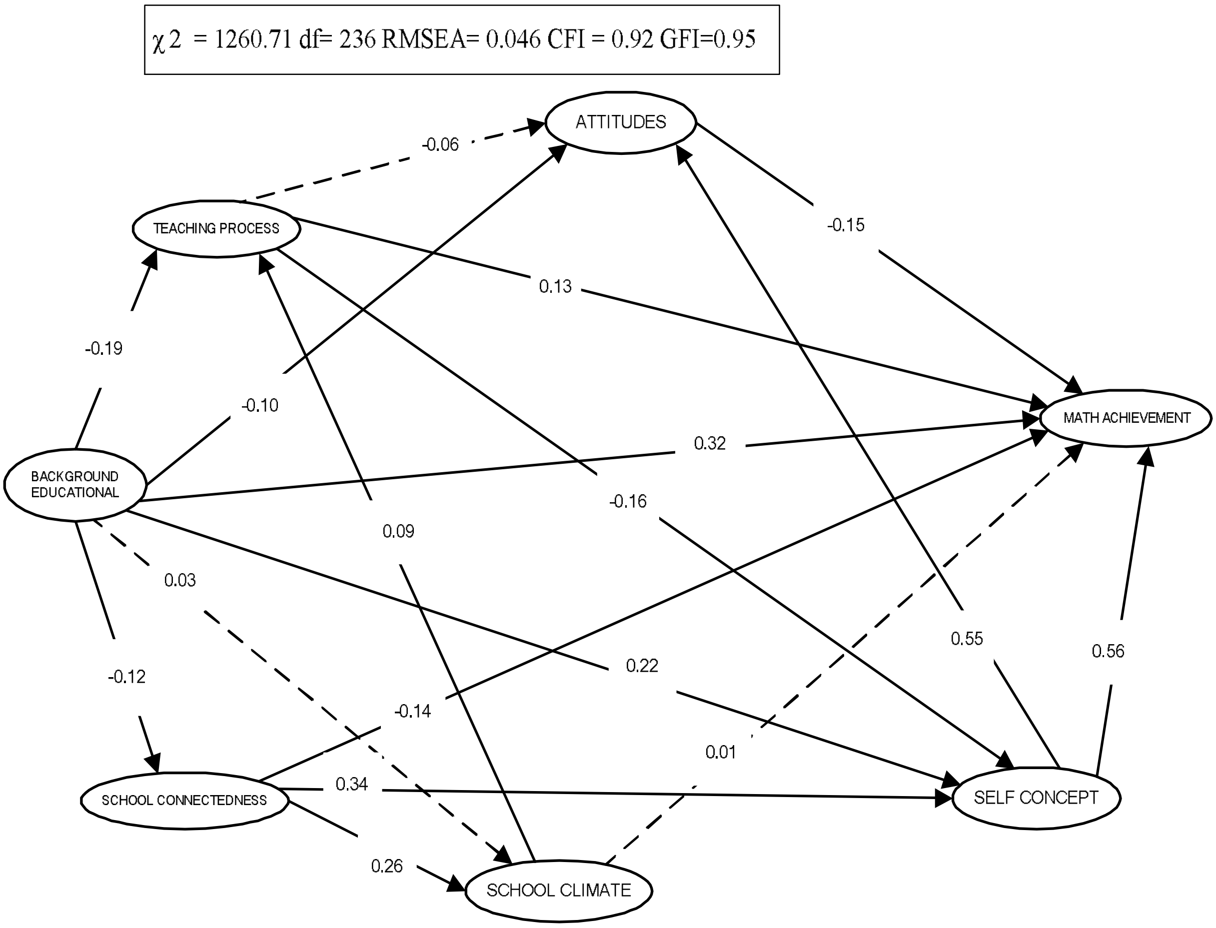

Figure4: Complete Model with Parameter Standardized Solution (Boys)

Background education has stronger effects on school climate for the girls' model compared to the other two models. Path from background education to school climate in the boys' model (0.03) was not significant. The total effects of background education on school climate for total as well as girls' and boys' models were 0.03, 0.07 and 0.00 respectively and not significant. School connectedness is the intervening variable for background education effects on school climate for the three models.

The direct effects of teaching process on self-concept in the girls' model were close to zero, but in the boys' model were -0.16 and significant. Direct and indirect effects of teaching process on mathematics achievement for the boys' model (0.12) is larger than for the girls' model (0.08),

Even though the direct effects of teaching process on attitude towards mathematics in girls' model is higher than for the boys' model (-0.10 and -0.06 respectively), total and indirect effects of this variables on attitude towards mathematics for the boys' model (-0.15) was higher than for the girls' model (0.10).

In the three models school connectedness has only strong direct effects on just self-concept and school climate has strong indirect effects on just attitude towards mathematics. The direct effects of school connectedness on mathematics achievement in the three models were negative and significant, but the indirect effects of this variable were positive and significant. In general, the total effects of school connectedness on mathematics achievement in the three models were small and not significant.

School climate has only directed effects on mathematics achievement and the effects for the girls' model (0.07, Sig) was higher than the boys' model (0.01, not. Sig). The direct effects of school climate on teaching process for the girls' model was (0.16) higher than the boys' model (0.099)..

Table 3. R^2 for the three models

PREDICTOR VARIEBLES	Predicted Variable	R^2		
		TOTAL	GIRLS	BOYS
BACKGROUND EDUCATION	MATH ACHIEVEMENT	0.16	0.15	0.17
BACKGROUND EDUCATION	MATH SELF CONCEPT	0.04	0.039	0.043
BACKGROUND EDUCATION	ATTITUDES TOWARD MATH	0.00052	0.00037	0.0058
BACKGROUND EDUCATION	TEACHING PROCESS	0.030	0.028	0.036
BACKGROUND EDUCATION	SCHOOL CONNECTEDNESS	0.023	0.045	0.013
BACKGROUND EDUCATION	SCHOOL CLIMATE	0.00065	0.0053	0.00
SELF,ATTITUDE, TEACH, SCHOOL CONNECTE & CLIMATE, BACKGROUND EDUCATION	MATH ACHIEVEMENT	0.41	0.46	0.39
TEACH, SCHOOL CONNECT& BACKGROUND EDUCATION	MATH SELF CONCEPT	0.14	0.13	0.18
SELF, TEACH & BACKGROUND EDUCATION	ATTITUDES TOWARD MATH	0.24	0.16	0.31
SCHOOL CONNECTEDNESS & BACKGROUND EDUCATION	SCHOOL CLIMATE	0.088	0.11	0.069
SCHOOL CLIMATE, BACKGROUND EDUCATION	TEACHING PROCESS	0.044	0.052	0.043
TEACHING PROCESS	MATH ACHIEVEMENT	0.01	0.0064	0.014
SCHOOL CONNECTEDNESS	MATH ACHIEVEMENT	0.0009	0.0025	0.0009
SCHOOL CLIMATE	MATH ACHIEVEMENT	0.0036	0.0081	0.0004
MATH SELF CONCEPT	MATH ACHIEVEMENT	0.24	0.28	0.23
ATTITUDES TOWARD MATH	MATH ACHIEVEMENT	0.03	0.05	0.02

Self-concept was a better predictor for attitude towards mathematics in the boys' model than in the girls' model (R^2= 0.30 and 0.16 respectively). There were no intervening variables between self-concept and attitude towards mathematics in the three models. Self-concept had strong positive direct and negative indirect effects (attitude towards mathematics as intervening variable) on mathematics achievement. This factor totally explained 0.28 percent of the

mathematics achievement variances in the girls' model (R^2=0.28) and 0.23 percent of the mathematics achievement variances in the boys' model (R^2=0.23). Factors in the models, including math self-concept, attitude towards mathematics, teaching process, school connectedness, school climate and background education explained 0.41, 0.46 and 0.39 percent of the variances in the mathematics achievement in the total, girls' and boys' models respectively. (See table 3).

Testing the equality of paths

The equality of the structural paths between the girls and boys models has been tested using multiple – group analysis. By imposing equality constraints on parameters across gender, the results, summarized in table 4, indicated that 6 out of the 17 tests of the differences between some of the paths in the models were significant.

Paths from teaching process to mathematic achievement and self concept to attitude towards mathematics in boys' model were stronger than in girls' model. Meanwhile, paths from school climate to mathematics achievement; parent background to school connectedness; teaching process to attitude towards mathematics and teaching process to self concept in girls' model were stronger than in boys' model.

Table 4. Testing equality of paths (girls' and boys' model)

paths	Δdf	$\Delta \chi^2$	P- value	paths	Δdf	$\Delta \chi^2$	P- value
background education to Self concept	1	1.42	0.24	School climate to teaching	1	0.02	0.89
background education to school climate	1	0.74	0.4	Teaching to Self concept	1	4.18	0.04
background education to Achievement	1	0.29	0.6	School connectedness to School climate	1	0.11	0.74
background education to Attitude	1	0.27	0.6	School connectedness to Self concept	1	0.4	0.5
background education to School connectedness	1	5.21	0.023	School connectedness to achievement	1	0.16	0.69
background education to teaching process	1	0.43	0.51	Self concept to attitude	1	4.51	0.037
Teaching to Attitude	1	4.11	0.04	Self concept to achievement	1	1.06	0.3
Teaching to Achievement	1	4.18	0.04	Attitude to achievement	1	0.07	0.79
School climate to Achievement	1	7.5	0.008				

Conclusions

This study showed that boy' and girls' models have nearly similar pattern. In the girls' model the direct effects of teaching process on math self- concept and math achievement and the indirect effects of this factor on attitude towards math and math achievement were not significant. The indirect impact of background education on teaching process through school climate was not significant. The same was true regarding the indirect effects of teaching process on attitude towards math through self-concept, and on math achievement through attitude towards math and self-concept.

In the boys' model, the direct effects of background education on school climate was not significant. The same was true regarding the teaching process on attitude towards math, and the direct and indirect effects of school climate on math achievement. Attitude towards math has significant direct negative effects on math achievement for the girls' and boys' model and the effects for girls' model is more than the boys' one. This finding is similar to the finding of Papanastasius (2002).

This study as many other research studies (Campbell, et al., 1994; Bryen & Shavelson, 1987; wilhite, 1990; Marsh, 1993; Franken, 1994; Hamachek, 1995; Koutsoulis & Campbell, 2001) indicated that math self-concept is one of strong predictors for predicting girls (28 %) and boys (23%) math achievement. Similar to findings from other research studies (see for example, Koller, Schnable & Baumert, 1986 and Crutis, 2006), math self-concept show strong positive direct effects on attitude towards math for the both groups, but its effects for girls (16.8%) is less than that of boys' (30.25%). Background education and school connectedness are two factors that have strong direct positive effects on girls and boys' math self-concept. Background education, school connectedness and teaching process explained 18% of the variance for boys' math self-concept. Also, the first two factors explained 13% of the variance for girls' math self-concept.

Similar to other research studies (Beane & Lipka, 1986; Robitialle & Garden, 1989; Weiss & Krappmann, 1993; Beaton et al., 1996; Mullis et al. 2000; Koutsoulis & Campbell, 2001 Marjoribanks, 2002; Engheta, 2004; Fullarton 2004; ; Howi , 2005; Alomar, 2006) this study showed that after math self-concept , background education was the most influential factor that had significant direct and indirect positive impact on math achievement. This factor explained 15 and 17 percent of the math achievement variances for girls and boys, respectively.

The three models in this study, explained 41%, 46% and 39% of the math achievement variances of the total sample as well as girls and boys, respectively. This study indicated that the more influential factors affecting girls' and boys' math achievement are background education, teaching process, math self- concept and attitude towards math. Even though the amount of variances explained by each factor are different in girls' and boys' model, testing the equality of the effects of each factor on math achievement show that only path from teaching process on math achievement for boys ($ß= 0.13$) is significantly more than girls' ($ß= 0.06$), and path from school climate on math achievement for girls ($ß= 0.07$) is significantly more than boys' ($ß= 0.01$). The differences between effects of other factors (background education, school connectedness, math self-concept and attitude towards math) on math achievement for both models are not significant.

In general, background education and teaching process are the two main influential factors for the boys' math achievement. Also, school climate, math self -concept and attitude towards math (negative effects) are the three main influential factors for the girls' math achievement. In addition, the effects of attitude towards math on math achievement for the three models were significant and negative. Direct effects of school connectedness on math achievement for the three models were significant and negative. Despite this, the total effects of school connectedness on math achievement for three models were not significant.

Finding from this study clearly indicated that boy' and girls' models as well as the total model have almost similar pattern. The observed differences between the direct, indirect and total path coefficients in the three models are small and their directions are the same.

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