IMPACT OF STUDENT, TEACHER, SCHOOL FACTORS ON ACHIEVEMENT IN MATHEMATICS AND SCIENCE BASED ON TIMSS 2003 ARAB COUNTRIES DATA

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EXECUTIVE SUMMARY

IEA, the International Association for the Evaluation of Educational Achievement, has conducted so far three international comparative studies of student achievement in mathematics and sciences. The third TIMSS (Trends in International Mathematics and Science Study) assessed eighth-grade and fourth-grade students in both mathematics and science. This round of testing is known as TIMSS 2003.

Forty eight countries participated in TIMSS 2003 of which nine were Arab countries. Nine Arab countries have participated in TIMSS at one time or another. Of the nine countries that participated in TIMSS 2003, eight participated at the eighth grade and three at the fourth grade.

Purpose

The purpose of the present study is to identify and compare the effect of student-level variable, teacher-level variables and school-level variables on each of mathematics and science achievement of Grade 8 students in the eight Arab countries which participated in TIMSS 2003.

TIMSS 2003 Background Questionnaires

The data from three types of background questionnaires were used in this study:

• The **school questionnaire** asked school principals or headmasters to provide information about the school contexts for the teaching and learning of mathematics and science.

• The **teacher questionnaire,** completed by the mathematics and science teachers of sampled students, collected information about the teachers' preparation and professional development, their pedagogical activities, and the implemented curriculum. At eighth grade there were separate versions for mathematics teachers and science teachers.

• The **student questionnaire**, completed by eighth-grade students who were tested, sought information about the students' home backgrounds and their experiences in learning mathematics and science.

Summary Indices and Derived Variables from Questionnaire Data

TIMSS 2003 collected data on many hundreds of variables from the students, teachers, principals that participated in the study. The purpose of these data is to help policymakers, curriculum specialists, researchers, and others better understand the performance of their educational systems. In addition to the data on the original questions asked in the various questionnaires, TIMSS created a range of indices and derived variables that summarized the data in ways that highlighted the relationship with mathematics and science achievement.

In this study the following TIMSS 2003 indices and derived variables were used as predictors:

I-Student-level Variables

1- Index of Time Students Spend Doing Mathematics Homework
2- Index of Self-Confidence in Learning Mathematics
3- Index of Students Valuing Math
4- Index of Students' Perception of Being Safe in School
5- Parents Highest Education Level
6- Students' Educational Aspirations Relative to Parents Educational Level
Availability of Computer

II-Teacher-level Variables

1. Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations on Instruction due to Student Factors
2. Index of Teachers' Emphasis on Mathematics Homework
3. Index of Mathematics Teachers' Perception of School Climate
4. Index of Mathematics Teachers' Perception of Safety in the Schools
5. Class Size For Mathematics Instruction
6. Math Teacher Has Full License or Certification

III-School-level Variables

1. Index of Principals' Perception of School Climate
2. Trends in Index of Good School and Class Attendance
3. Trends in Index of Availability of School Resources for Mathematics Instruction
4. Number Of Hours Of School Per Year
5. Number Of Weeks Of School Per Year

Sample and Population

In each country, representative samples of students were selected using a two-stage sampling design. Although countries could, with prior approval, adapt the sampling design to local circumstances, in general countries selected at least 150 schools at the first stage using probability-proportional-to-size sampling. At the second stage, one or two classes were randomly sampled in each school. Generally, this resulted in a sample size of at least 4,000 students per country. Some countries opted to include more schools and classes, enabling additional analyses, which resulted in larger sample sizes.

Dependent variables

The **Average Plausible Score for the Mathematics Teacher (APSMT)** was computed to be the mean of the average of the mathematics plausible score for the students in the sample taught by that mathematics teacher.

The **Average Plausible Score for the Science Teacher (APSST)** was computed to be the mean of the average of the science plausible score for the students in the sample taught by that mathematics teacher.

The **Average Plausible Score for the School (APSS)** was computed as the mean average plausible score of the students in the sample in that school.

Statistical Analyses

Two statistical analyses were used in this study: Step-wise multiple regression and variance component. For each of the eight countries six runs of stepwise regression were used as follows:

1. Stepwise regression with the student background variables as predictors and the Average Mathematics Plausible Score (AMSP) as dependent variable.
2. Stepwise regression with the student background variables as predictors and the Average Science Plausible Score (ASPS) as dependent variable.
3. Stepwise regression with the math teacher background variable as predictors and the Average Plausible Score for the Mathematics Teacher (APSMT) as dependent variable.
4. Stepwise regression with the math teacher background variable as predictors and the Average Plausible Score for the Science Teacher (APSST) as dependent variable.
5. Stepwise regression with the school background variables (related to each mathematics and science) as predictors and the Average Plausible Score for the School (APSS) as dependent variable.

The variance component analysis was done to compare the variance accounted for by the school as a random variable. The results of this analysis were used to compare the eight Arab countries on the extent to which variance across schools account for variance in achievement.

CONCLUSIONS AND RECOMMENDATIONS

In this section we present a summary of the results in the form conclusions under the headings: Between school variation, accounting for total variation, variance accounted for by student-level variables, variance accounted for by teacher-level variables, variance accounted for by school-level variables. Under each of these headings we rationalize and present the relevant recommendations.

In our discussion we shall distinguish between two kinds of characteristics or factors: Policy amenable factors and practice-amenable factors. Policy-amenable characteristics are those factors under the control of national educational policy or school management, and refer to substantive educational policy measures in areas such as curriculum, governance, accountability, professional teacher development and other school-level characteristics that are believed to improve teaching. Practice- amenable factors are aspects that are under the control of the school and its teachers and refer to action measures in teaching and learning as well as in school decisions.

Between-School Variation

The between-school variance indicates how much variation lies among schools. The larger the between-school variance, the more schools contribute to overall performance differences within each country. The group of countries which has higher percentage between-school variation than the average of the Arab countries comprises Lebanon and Egypt. Jordan is about the average of the Arab countries, whereas, Tunis, Saudi Arabia, Palestine, Bahrain, and Morocco are below the Arab countries average.

The percentage of between-school variation to total variance in science is higher in Lebanon and Egypt than the Arab countries average whereas the other remaining six countries lower percentage than the Arab countries average.

Conclusion 1:

The Arab countries vary in equity in provisions for each of mathematics education and science education as reflected in the variation of the proportion of between-school variance to total variance. Lebanon and Egypt have the highest proportions, while the other remaining five countries have lower proportions.

Recommendation 1:

In countries where there is high inequity in provisions for mathematics education or science education, we recommend further study of this issue with a view to identifying country- specific factors which contribute to this inequity, and consequently consider policies and measures to decrease this inequity without compromising quality as measured by achievement measures.

Accounting for Total Variation

The combined impact of student-, teacher-, and school variables on either mathematics or science achievement varies among the Arab countries as reflected by the overall variance in mathematics or science achievement accounted for by the three sources, the highest impact being in Lebanon and Egypt and the lowest in Morocco.

The impact of the student aptitude and background on mathematics or science achievement was higher than the impact of the teacher variables in all eight Arab countries except Bahrain as evidenced by relative contribution to the within-country variance in mathematics or science achievement. The pattern in the relative impact of the teacher and school variables on mathematics achievement was not consistent.

Conclusion 2:

The combined impact of student-, teacher-, and school variables on mathematics or science achievement varies among the Arab countries, the highest impact being in Lebanon and Egypt and the lowest in Morocco. The impact of the student aptitude and background on mathematics or science achievement was higher than the impact of the teacher variables in all eight Arab countries except Bahrain. However, there was no consistency regarding the comparison of the impact of teacher and school variables on mathematics achievement.

Variance Accounted for by Student-level Variables

The first variable to enter the regression equation in all countries except Bahrain is "Index of Self-Confidence in Learning" in both mathematics and science. This variable is defined by TIMSS 2003 as "student perceives that he/she usually does well in mathematics (science), mathematics (science) is easier for him/her than for many of classmates, mathematics (science) is one of his/her strengths, and perceives that he/she learns things quickly in mathematics (science)". One of two student level variables related to student home environment ("Parents Highest Education Level" or "Students' Educational

Aspirations Relative to Parents Educational Level") entered second in the regression equation in seven of the eight countries. The variable "Index of Students' Perception of Being Safe in School" entered third in four of the eight countries. This last variable was defined by TIMSS 2003 to "have a feeling of being safe in school (not subject to stealing, bullying, intimidation, ridicule, or neglect by other students).

Conclusion 3:

The student-level variables that impact mathematics achievement are listed below in descending order of their contribution to the prediction of mathematics achievement:

(1) **Index of Self-Confidence in Learning Mathematics**
(2) **Parents Highest Education Level**
(3) **Students' Educational Aspirations Relative to Parents Educational Level**
(4) **Index of Students' Perception of Being Safe in School**

Some of the four variables are policy-amenable, some are practice-amenable, and some are neither. The variable "Index of Self-Confidence in Learning Mathematics (Science)" is an affective student-level variable. According to TIMSS definition it involves self-perception on the part of the student regarding doing well in mathematics (science), ease of the subject, strength in the subject, and pace of learning the subject. Obviously, this index is not amenable to be changed by changing policies. Rather it may amenable by considering changes in classroom teaching and learning practices by sensitizing the teachers of mathematics and science to adopting practices that will enhance self-confidence in learning science and mathematics. Teaching skills that target enhancement of self-confidence in learning science and mathematics ought to become a component of teacher education programs as well as professional development in-service programs and activities.

Recommendation 4:

It is recommended that measures be taken to sensitize the teachers of mathematics and science to the importance of enhancing self-confidence in learning science and mathematics. Furthermore, teaching skills that target the enhancement of self-confidence in learning science and mathematics ought to become a component of teacher education programs as well as professional development in-service programs and activities.

The two variables "Parents Highest Education Level" and "Students' Educational Aspirations Relative to Parents Educational Level" are neither policy-amenable nor practice amenable. These two variables are linked to complex macro-level long-term social and economic changes. Since these two variables are closely related to the variable "Index of Self-Confidence in Learning Mathematics (Science)", one could speculate that a positive change, in the latter which is somewhat under the possible control of the school, may minimize the negative effect of low parental educational level.

Though the variable "Index of Students' Perception of Being Safe in School" is a student- level variable, it is closely related to the school environment and hence is policy-amenable as well as practice-amenable. This variable relates to self-perception on the part of the student regarding stealing, bullying, intimidation, ridicule, or neglect by other students in

school. It seems that these activities, particularly bullying and intimidation are relatively prevalent in the eight Arab schools and affects negatively the academic achievement in both mathematics and science. Increasing students' perception of safety in school by controlling and reducing bullying and intimation ought to be targeted by ministries of education policies as well as by school practices and control.

Recommendation 5:

To enhance achievement in mathematics and science, it is recommended to take the necessary measures at the ministries of education and school levels to increase students' perception of safety in school by controlling and reducing bullying and intimation in school.

Variance Accounted for by Teacher-level Variables

The impact of teacher-level variables on mathematics achievement was not consistent across the eight countries. In the five countries in which one or more teacher-level variable entered the regression equation, three such variables seem to compete for the first place in the order of entry of the variables: "Index of Principals' Perception of School Climate" (in Egypt and Jordan), "Index of Mathematics Teachers' Perception of Safety in the Schools" (in Lebanon and Saudi Arabia), and "Class Size For Mathematics Instruction" in Bahrain. The variable "Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations on Instruction due to Student Factors" entered second in Jordan and third in Egypt.

The impact of teacher level variables on science achievement was more pronounced and consistent than on mathematics education. In the seven countries in which one or more teacher-level variable entered the regression equation, three such variables seem to compete for the first place in the order of entry of the variables: "Index of Principals' Perception of School Climate" (in Bahrain and Jordan), "Index of Science Teachers' Perception of Safety in the Schools" (in Lebanon, Morocco, and Tunisia), and "Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors" (in Egypt and Saudi Arabia).

Conclusion 4:

Though there are some discrepancies in the impact of teacher-level variables on science and mathematics, there is a general trend that the teacher-level variables which impact mathematics and science achievement are:

- **Index of Principals' Perception of School Climate**
- **Index of Mathematics (Science) Teachers' Perception of Safety in the Schools**
- **Index of Teachers' Reports on Teaching Mathematics (Science) Classes with Few or No Limitations on Instruction due to Student Factors.**

All three variables are policy-amenable. In TIMSS 2003 (Appendix 1), the "Index of Principals' Perception of School Climate" variable is defined as the extent to which the teacher perceives favorably teachers' job satisfaction, teachers' understanding of the school's curricular goals, teachers' degree of success in implementing the school's curriculum, teachers' expectations for student achievement, parental support for student achievement,

parental involvement in school activities, students' regard for school property, students' desire to do well in school. The more favorable the perception of the science teacher of the school climate, the higher the science achievement is. The "Index of Mathematics (Science) Teachers' Perception of Safety in the Schools" is defined as the extent to which the teacher perceives that the school is located in a safe neighborhood, feeling that the teacher is safe at school, and perception of the sufficiency of school security policies and practices. The more favorable the perception of the science teacher of school safety, the higher the science achievement is. The "Index of Teachers' Reports on Teaching Mathematics (Science) Classes with Few or No Limitations on Instruction due to Student Factors" is defined as the extent to which the mathematics (science) teacher perceives that there are no or few limitations on instruction due to student factors (students with different academic abilities, students who come from a wide range of backgrounds, students with special needs, uninterested students, low morale among students, disruptive students). The fewer the limitations due to student factors reported by the teacher, the higher the student achievement in science.

Recommendation 6:

To enhance mathematics and science achievement, it is recommended that the ministries of education as well as school administrations adopt policies and measures that would:

- **improve the school climate by improving teachers' job satisfaction, teachers' understanding of the school's curricular goals, teachers' degree of success in implementing the school's curriculum, teachers' expectations for student achievement, parental support for student achievement, parental involvement in school activities, students' regard for school property, students' desire to do well in school.**
- **improve safety in schools by improving the sufficiency of school security policies and practices.**
- **reduce, as much as possible, limitations on science and mathematics instruction due to student factors.**

Variance Accounted for by School-level Variables

In the six countries in which one or more school-level variable entered the regression equation, variable "Index of Principals' Perception of School Climate" entered first in the regression equation for predicting mathematics achievement in all countries except Bahrain. Only in Egypt and Jordan, the variable "Trends in Index of Availability of School Resources for Mathematics Instruction" entered second. This variable is defined as the extent to which the principal of the school perceives "math resources for instruction are more available. Math resources include the following categories: instructional materials (e.g., textbook); budget for supplies (e.g., paper, pencils); school buildings and grounds; heating/cooling and lightening systems; instructional space (e.g., classrooms); computers for mathematics instruction; computer software for mathematics instruction; calculators for mathematics instruction; library materials relevant to mathematics instruction; audio-visual resources for mathematics instruction. The more available the resources for mathematics instruction are, the higher the mathematics achievement of the students in the school.

In the seven countries in which one or more school-level variable entered the regression equation for predicting science achievement, the variable "Index of Principals'

Perception of School Climate" entered first in the regression equation in all countries except Bahrain and Morocco and it entered second in Bahrain. The variable "Trends in Index of Availability of School Resources for Science Instruction" entered first in Morocco and Bahrain.

Conclusion 5:

The school-level variable that impact mathematics and science achievement are the following listed in the order of their importance:

- **Index of Principals' Perception of School Climate**
- **Trends in Index of Availability of School Resources for Mathematics (Science) Instruction.**

Since the teachers and principals agree on the importance of school climate, we reiterate our earlier recommendation in this regard. In addition we recommend the importance of availing instructional resources in mathematics and science.

Recommendation 7:

To enhance mathematics and science achievement, it is recommended that the ministries of education as well as school administrations adopt policies and measures that would avail instructional mathematics and science resources.

SECTION 1: INTRODUCTION

IEA, the International Association for the Evaluation of Educational Achievement, has conducted so far three international comparative studies of student achievement in mathematics and sciences. In 1994-95, TIMSS (known then as the Third International Mathematics and Science Study) assessed student achievement in both mathematics and science at third, fourth, seventh and eighth grades, and the final year of secondary school. In 1999, TIMSS (by now renamed the Trends in International Mathematics and Science Study) again assessed eighth-grade students in both mathematics and science to measure trends in student achievement since 1995.

TIMSS 2003, the third data collection in the TIMSS cycle of studies, was administered at the eighth and fourth grades.

At the heart of the TIMSS 2003 International Database are the student achievement scores in mathematics and science, together with responses of students, teachers, and principals to the background questionnaires. Student achievement scores and student questionnaire responses have been merged to facilitate secondary analyses. More specifically, the database includes the following for each country for which internationally comparable data are available:

- Students' responses to each of the mathematics and science items administered in the study
- Student achievement scores in mathematics and science
- Students' responses to the student questionnaires
- Teachers' responses to the teacher questionnaires

• Principals' responses to the school questionnaires
• National Research Coordinators' responses to the curriculum questionnaires.

Table 1.1 Arab Countries Participating in TIMSS 2003, 1999, and 1995

Countries	Grade 8			Grade 4	
	2003	1999	1995	2003	1995
Bahrain	x				
Egypt	x				
Jordan	x	x			
Kuwait			x		x
Lebanon	x				
Morocco	x	x		x	
Palestinian National Authority	x				
Saudi Arabia	x				
Tunisia	x	x		x	

Forty eight countries participated in TIMSS 2003 of which nine were Arab countries. Table 1.1 lists all the Arab countries that have participated in TIMSS in 1995, 1999, or 2003 at fourth or eighth grade. Nine Arab countries have participated in TIMSS at one time or another. Of the nine countries that participated in TIMSS 2003, eight participated at the eighth grade and three at the fourth grade.

Purpose

The purpose of the present study is to identify and compare the effect of student variable, teacher variables and school variables on each of overall mathematics and science achievement of Grade 8 students in the eight Arab countries which participated in TIMSS 2003.

The TIMSS 2003 Mathematics and Science Assessment

The TIMSS 2003 assessment of student achievement in mathematics and science was designed to measure trends in student achievement in mathematics and science at eighth and fourth grades. The assessment has ambitious coverage goals, reporting not only overall mathematics and science achievement scores, but also scores in important content areas in these subjects. The mathematics and science assessment frameworks for TIMSS 2003 were framed by two organizing dimensions or aspects, a content domain and a cognitive domain. There were five content domains in mathematics (number, algebra, measurement, geometry, and data) and five in science (life science, chemistry, physics, earth science, and environmental science) that defined the specific mathematics and science subject matter covered by the assessment. The cognitive domains, four in mathematics (knowing facts and procedures, using concepts, solving routine problems, and reasoning) and three in science (factual knowledge, conceptual understanding, and reasoning and analysis) defined the sets of behaviors expected of students as they engaged with the mathematics and science

content. Student achievement was reported in terms of performance in each content area as well as in mathematics and science overall.

The TIMSS 2003 eighth-grade assessment contained 383 items, 194 in mathematics and 189 in science. Between one-third and two-fifths of the items at each grade level were in constructed-response format, requiring students to generate and write their own answers. The remaining questions used a multiple-choice format. In scoring the items, correct answers to most questions were worth one point. However, responses to some constructed-response questions (particularly those requiring extended responses) were evaluated for partial credit, with a fully correct answer being awarded two points. The total number of score points available for analysis thus somewhat exceeds the number of items.

TIMSS 2003 Background Questionnaires

By gathering information about students' educational experiences together with their mathematics and science achievement on the TIMSS assessment, it is possible to identify factors or combinations of factors related to high achievement. The data from three types of background questionnaires were used in this study:

- The **school questionnaire** asked school principals or headmasters to provide information about the school contexts for the teaching and learning of mathematics and science.
- The **teacher questionnaire,** completed by the mathematics and science teachers of sampled students, collected information about the teachers' preparation and professional development, their pedagogical activities, and the implemented curriculum. At eighth grade there were separate versions for mathematics teachers and science teachers.
- The **student questionnaire**, completed by eighth-grade students who were tested, sought information about the students' home backgrounds and their experiences in learning mathematics and science.

There were different versions for countries where eighth-grade science is taught as a single subject and countries where it is taught as separate subjects (i.e., biology, chemistry, physics, and earth science). The international version of each of the TIMSS 2003 background questionnaires is described in Supplement 1 of the User Guide, and the documentation of the national adaptations to each questionnaire in Supplement 2. The indices and variables other than indices derived from the student, teacher, and school questionnaires, along with detailed descriptions and analysis notes, are provided in Supplement 3.

Summary Indices and Derived Variables from Questionnaire Data

TIMSS 2003 collected data on many hundreds of variables from the students, teachers, principals that participated in the study. The purpose of these data is to help policymakers, curriculum specialists, researchers, and others better understand the performance of their educational systems. In addition to the data on the original questions asked in the various questionnaires, TIMSS created a range of indices and derived variables that summarized the data in ways that highlighted the relationship with mathematics and science achievement. For example, a three-level index of Good School and Class Attendance was constructed from principals' ratings of the extent to which three student behaviors –

arriving late at school, absenteeism, and skipping classes – were a problem in the school. Students were assigned to the high level of the index if their principal reported that all three behaviors were not a problem. Students were assigned the low level of the index if their principal indicated that two or more of the behaviors were a serious problem or two behaviors were a minor problem and a third a serious problem. Students whose principals reported other combinations of responses were assigned to the medium category. The indices and other derived variables that were used in this study are listed Appendix 1 together with their definition and detailed descriptions as given by TIMSS 2003.

Plausible Value Variables

TIMSS estimates each student's achievement on the entire assessment conditional on the student's responses to the items that they took and the student's background characteristics. Because there is some error inherent in this imputation process, TIMSS draws five such estimates, or "plausible values," for each student on each of the scales. Each student, therefore, has five estimates of his or her achievement on the TIMSS mathematics and science scales.

Average Mathematics Plausible Score (AMPS) defined as the average of the five plausible values for the overall mathematics achievement was used in this study as a measure of overall mathematics achievement.

Similarly the **Average Science Plausible Score (ASPS)** defined as the average of the five plausible values for overall science achievement was used in this study as a measure of overall science achievement

Sample and Population

In each country, representative samples of students were selected using a two stage sampling design. Although countries could, with prior approval, adapt the sampling design to local circumstances, in general countries selected at least 150 schools at the first stage using probability-proportional-to-size sampling. At the second stage, one or two classes were randomly sampled in each school. Generally, this resulted in a sample size of at least 4,000 students per country. Some countries opted to include more schools and classes, enabling additional analyses, which resulted in larger sample sizes.

Data

Upon the request of the UNESCO Regional Office for Arab States, which sponsored this study, the IEA provided TIMSS data on a DVD? In this study four data files were used for each of the eight Arab countries which participated in TIMSS 2003. These files are:

1. **Student Back ground file** which a student-level file including data on student questionnaire with the plausible scores for each student in Grade 8
2. **Mathematics Teacher Background file**, which is a teacher-level file and includes data on mathematics teacher background questionnaires. This file did not include plausible scores associated with the teacher
3. **Science Teacher Background file**, which is a teacher-level file and includes data on science teacher background questionnaires. This file did not include plausible scores associated with the teacher

4. **School Background file** which is a school–level file data on school background questionnaire filled by the principal of the school. This file did not include plausible scores associated with the school

The **Average Plausible Score for the Mathematics Teacher (APSMT)** was computed to be the mean of the average of the mathematics plausible score for the students in the sample taught by that mathematics teacher.

The **Average Plausible Score for the Science Teacher (APSST)** was computed to be the mean of the average of the science plausible score for the students in the sample taught by that mathematics teacher.

The **Average Plausible Score for the School (APSS)** was computed as the mean average plausible score of the students in the sample in that school.

Statistical Analyses

Two statistical analyses were used in this study: Step-wise multiple regression and variance component. For each of the eight countries six runs of stepwise regression were used as follows:

6. Stepwise regression with the student background variables as predictors and the Average Mathematics Plausible Score (AMSP) as dependent variable
7. Stepwise regression with the student background variables as predictors and the Average Science Plausible Score (ASPS) as dependent variable
8. Stepwise regression with the math teacher background variable as predictors and the Average Plausible Score for the Mathematics Teacher (APSMT) as dependent variable
9. Stepwise regression with the math teacher background variable as predictors and the Average Plausible Score for the Science Teacher (APSST) as dependent variable
10. Stepwise regression with the school background variables (related to each mathematics and science) as predictors and the Average Plausible Score for the School (APSS) as dependent variable

For each stepwise regression analysis, two table and two associated graphs were produced. The order in which the significant variables were entered by the stepwise regression with the proportion of variance associated with each variable was presented in tabular form and graphical forms. Also descriptive statistics (the mean and standard deviation) of the relevant plausible scores for the levels of each of the significant predictors were presented in tabular and in graphical forms when needed.

The variance component analysis was done to compare the variance accounted for by the school as a random variable. The results of this analysis were used to compare the eight Arab countries on the extent to which variance across schools account for variance in achievement.

Using the Bahrain TIMSS 2003 student, teacher, and school data files, this section will present the results of the stepwise regression in three main parts: First, student variables will be entered as predictors and the Average Mathematics Plausible Score (AMPS) and Average Science Plausible Score (ASPS) as dependent variable (one at a time); Second, teacher variables will be entered as predictors and the Average Plausible Score for science and math, one at a time; and third, the school variables as predictors and the Average Plausible Score for science and math as dependent variables, one at a time.

Student Variables

Prediction of Mathematics Achievement from Student Variables

The following seven variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score as dependent variable:

1. Index of Time Students Spend Doing Mathematics Homework
2. Index of Self-Confidence in Learning Mathematics
3. Index of Students Valuing Math
4. Index of Students' Perception of Being Safe in School
5. Parents Highest Education Level
6. Students' Educational Aspirations Relative to Parents Educational Level
7. Availability of Computer

The results of the stepwise regression analysis are presented in Table 2.1 and graphically in Figure 2.1. Three variables accounted for accounted for more than 1% of the variance in the mathematics achievement as measured by Average Mathematics Plausible Score. These are:

1. Index of Self-Confidence in Learning Mathematics (17.9%)
2. Students' Educational Aspirations Relative to Parents Educational Level   (7.3%)
3. Index of Students' Perception of Being Safe in School (1.5%)

It should be noted that two of these variables (the first and the third) relate to the affective domain of the student while the second variable is environmental and belongs to the family of the student. On the other hand one variable is mathematics-specific while the others are not. For each of the three variables, the higher the value of the variable, the higher is the mean Average Mathematics Plausible Score (Table 2.2).

Referring to the definition of each of these three variables (Appendix 1), one can identify a likely profile of a student with higher mathematics achievement. A student with higher mathematics achievement is likely

- To be self-confident in learning mathematics (perceives that he/she usually does well in mathematics, mathematics is easier for him/ her than for many of classmates, mathematics is one of his/her strengths, and perceives that he/she learns things quickly in mathematics),
- To have high educational aspirations relative to parents educational level,

- To have a feeling of being safe in school (not subject to stealing, bullying, intimidation, ridicule, or neglect by other students).

Table 2.1: R^2 and Proportion of Variance in Average Plausible Math Score due to Significant Student Variables in the Stepwise Regression (Bahrain)

Variable	R^2	Proportion of variance[1]
Index Self-Confid Learning Math	0.179	0.179
Stds Educ Asprtns Rltv to Prnts Educ Lvl	0.252	0.073
Idx Std Prcptn Being Safe School	0.267	0.015
Availability of Computer	0.275	0.008
Index of Students Valuing Math	0.277	0.002
Parents Highest Education Level	0.279	0.002

[1] Difference in R^2

Figure 2.1: Proportion of Variance in Average Plausible Math Score due to Significant Student Variables (Bahrain)
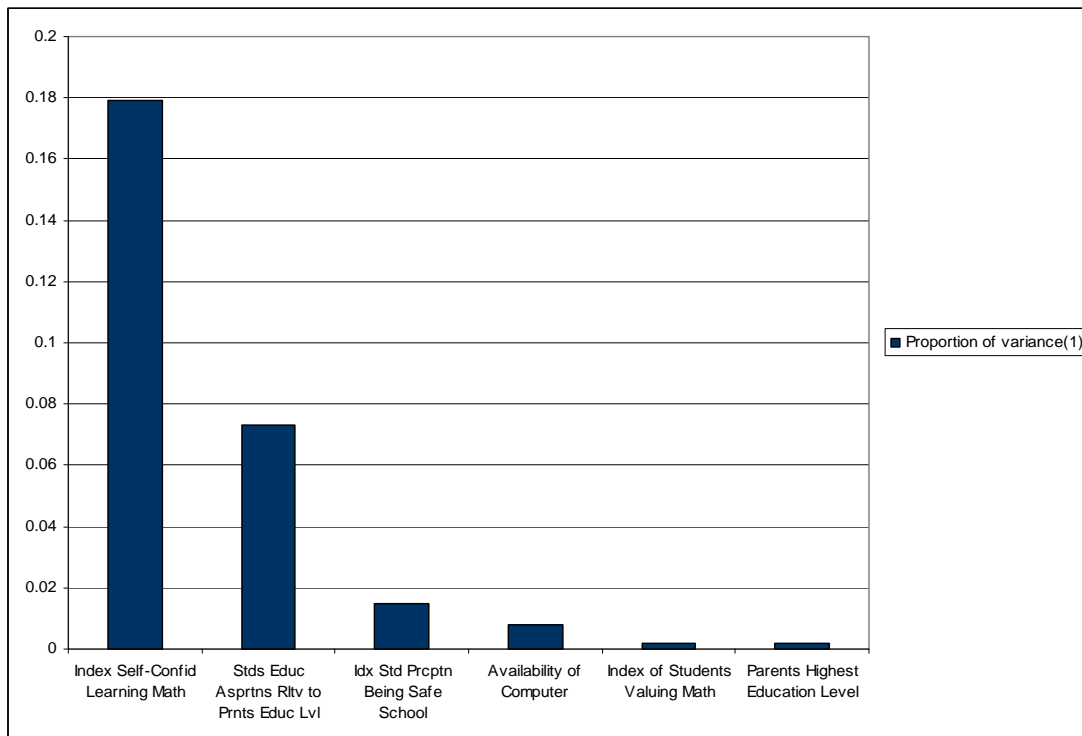
Table 2.2: Means and Standard Deviation of the Average Plausible Math Score by Levels of Significant Student Variables (Bahrain)

Variable	Level	Mean	S. D.
Index Self-Confid	- High	438.11	68.87
Learning Math	- Medium	381.59	62.72
	- Low	367.98	58.22
Stds educ asprtns	- Fini univ and either par went to univ	442.42	67.04
rltv to prnts educ lvl	- Fini univ but neither par went to univ	419.57	62.51
	- Not fini univ regardless of par edu	355.98	59.93
	- Do not know regardless of par edu	382.10	61.14
Idx Std Prcptn Being	- High	416.10	70.71
Safe School	- Medium	404.79	70.35
	- Low	377.27	68.48
Availability of Computer	- Use computer both at home and school	421.44	74.99
	- Use comp at home but not at school	402.96	70.00
	- Use comp at school but not at home	386.37	66.40
	-Use comp only at places other than home	377.72	63.32
	- Do not use computer at all	380.18	58.19
Index of students	- High	408.76	72.86
valuing Math	- Medium	396.18	68.60
	- Low	388.06	65.60
Parents Highest	- Fini univ / equival / higher	430.57	71.85
Education Level	- Fini post-sec voc/techn edu but no univ	409.52	71.22
	- Fini upp sec schooling	409.24	61.96
	- Fini low sec schooling	387.29	68.33
	- No more than prim	384.63	66.89

Prediction of Science Achievement from Student Variables

The following seven variables were entered in the stepwise multiple regression with the Average Science Plausible Score as a dependent variable:

1. Index of Time Students Spend Doing Science Homework
2. Index of Self-Confidence in Learning Science
3. Index of Students Valuing Science
4. Index of Students' Perception of Being Safe in School
5. Parents Highest Education Level
6. Students' Educational Aspirations Relative to Parents Educational Level
7. Availability of Computer

The results of the stepwise regression analysis are presented in Table 2.3 and graphically in Figure 2.3. Three variables accounted more than 1% of the variance each in the science achievement as measured by Average Science Plausible Score. These are:

1. Students' Educational Aspirations Relative to Parents Educational Level (10.2 %)
2. Index of Self-Confidence in Learning Science (4.5 %)
3. Index of Students' Perception of Being Safe in School (1.6 %)

Again two of these variables (the second and the third) relate to the affective domain of the student while the first variable is environmental and belongs to the family of the student. On the other hand one variable is science-specific while the others are not. For each of the three variables, the higher the value of the variable, the higher is the mean Average Science Plausible Score (Table 2.4).

Referring to the definition of each of these three variables (Appendix 1), one can identify a likely profile of a student with higher science achievement. A student with higher science achievement is likely

- To have higher educational aspirations relative to parents educational level,
- To be self-confident in learning science (perceives the he/she usually does well in science, science is easier for him/ her than for many of classmates, science is one of his/her strengths, and perceives that he/she learns things quickly in science),
- Has a feeling of being safe in school (not subject to stealing, bullying, intimidation, ridicule, or neglect by other students).

Table 2.3: R^2 and Proportion of Variance in Average Plausible Science Score due to Significant Student Variables in the Stepwise Regression (Bahrain)

Variables	R^2	Proportion of variance[1]
Stds Educ Asprtns Rltv to Prnts Educ Lvl	0.102	0.102
Index Self-Confid Learning Science	0.147	0.045
Idx Std Prcptn Being Safe School	0.163	0.016
Parents Highest Education Level	0.171	0.008
Availability of Computer	0.175	0.004
Index of Time on Science Homework	0.176	0.002

[1] Difference in R^2

**Figure 2.3: Proportion of Variance in Average Plausible Science Score
due to Significant Student Variables (Bahrain)**
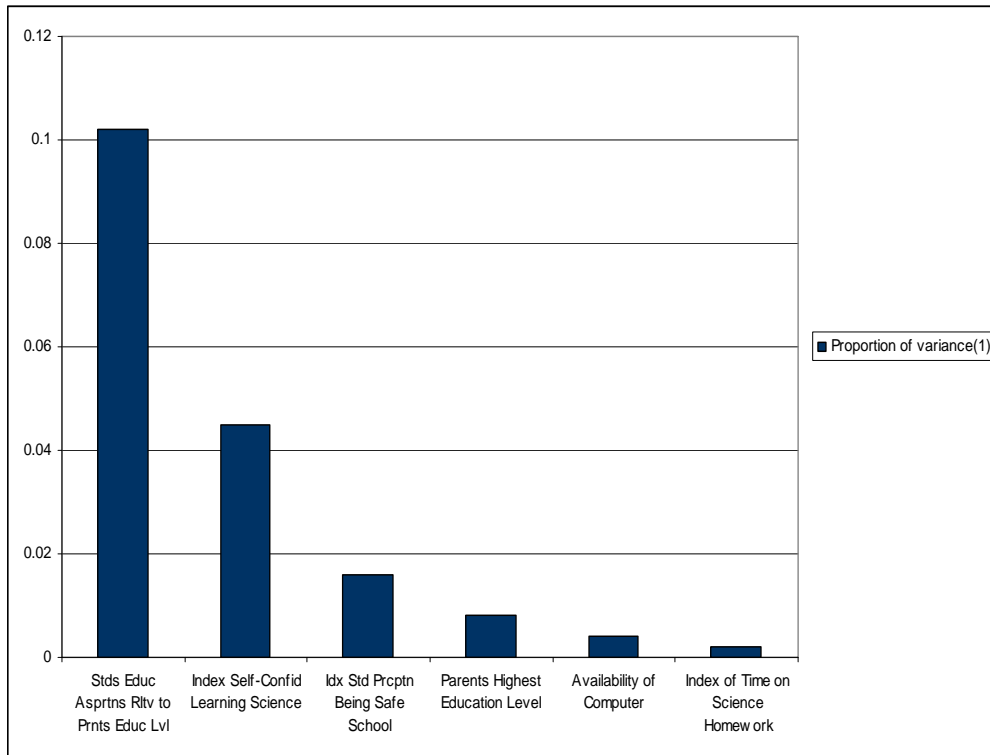
**Table 2.4: Means and Standard Deviation of the Average Plausible Science Score
by Levels of Significant Student Variables (Bahrain)**

Variable	Level	Mean	S. D.
Stds educ asprtns rltv	- Fini univ and either par went to univ	474.50	64.12
to prnts educ lvl	- Fini univ but neither par went to univ	454.53	59.06
	- Not fini univ regardless of par edu	394.14	62.13
	- Do not know regardless of par edu	427.35	60.49
Index Self-Confid	- High	457.30	66.78
Learning Science	- Medium	420.37	65.77
	- Low	412.62	63.27
Idx Std Prcptn Being	- High	450.57	65.96
Safe School	- Medium	440.83	67.67
	- Low	417.20	72.65
Parents Highest	- Fini univ / equival / higher	464.34	68.18
Education Level	- Fini post-sec voc/techn edu but no univ	446.43	69.16
	- Fini upp sec schooling	448.16	59.14

Variable	Level	Mean	S. D.
	- Fini low sec schooling	425.74	65.59
	- No more than prim	420.26	66.30
Availability of	- Use computer both at home and school	451.40	71.12
Computer	- Use comp at home but not at school	440.64	67.36
	- Use comp at school but not at home	429.69	68.85
	-Use comp only at places other than home	420.41	64.73
	- Do not use computer at all	417.36	63.59
Index of Time on	- High	425.40	68.37
Science Homework	- Medium	441.71	67.89
	- Low	447.31	68.75

Teacher Variables

Prediction of Mathematics Achievement from Mathematics Teacher Variables

The following six variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score for the mathematics teacher as dependent variable:

6. Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations on Instruction due to Student Factors
7. Index of Teachers' Emphasis on Mathematics Homework
8. Index of Mathematics Teachers' Perception of School Climate
9. Index of Mathematics Teachers' Perception of Safety in the Schools
10. Class Size For Mathematics Instruction
11. Math Teacher Has Full License or Certification

The results of the stepwise regression analysis are presented in Table 2.5 and graphically in Figure 2.5. Three variables accounted for more than 1% of the variance in the mathematics achievement each as measured by Average Mathematics Plausible Score. These are:

1. Class Size for Mathematics Instruction (19.5%)
2. Math Teacher Has Full License or Certification (6.3%)
3. Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations on Instruction due to Student Factors (3.8%)

It should be noted that two of these variables (the first and the third) relate to the classroom instruction while the second variable is external to the classroom. For class size, higher achievement in mean of Average Mathematics Plausible Score was associated with smaller class size (Table 2.6). Unexpectedly, the mathematics achievement of students whose teachers do not have full certification (but have provisional or emergency certification) is

higher than those who have (Table 2.6). On the other hand, students whose teachers reported high limitations on instructions due to student factors have lower mathematics achievement than those who reported low limitations on instructions due to student factors.

Referring to the definition of each of these three variables (Appendix 1), one can identify a likely profile of a teacher whose students have higher mathematics achievement. A teacher whose students have higher mathematics achievement is likely

- To be teaching smaller class,
- Is certified but not necessarily have full certification,
- Has a perception that there few or no limitations on instruction due to student factors (students with different academic abilities, students who come from a wide range of backgrounds, students with special needs, uninterested students, low morale among students, disruptive students).

Prediction of Science Achievement from Science Teacher Variables

The following six variables were entered in the stepwise multiple regression with the Average Science Plausible Score for the science teacher as dependent variable:

1. Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors
2. Index of Teachers' Emphasis on Science Homework
3. Index of Science Teachers' Perception of School Climate
4. Index of Science Teachers' Perception of Safety in the Schools
5. Class Size For Science Instruction
6. Math Teacher Has Full License or Certification

Table 2.5: R^2 and Proportion of Variance in Average Plausible Math Score due to Significant Teacher Variables in the Stepwise Regression (Bahrain)

Variables	R^2	Proportion of variance[1]
Class Size for Mathematics Instruction	0.195	0.195
Math teacher has Full License or Certif	0.258	0.063
Idx Tch Rpt Mth Clss Wo Lim Fctrs	0.296	0.038

[1] Difference in R^2

**Figure 2.5: Proportion of Variance in Average Plausible Math Score
due to Significant Teacher Variables (Bahrain)**
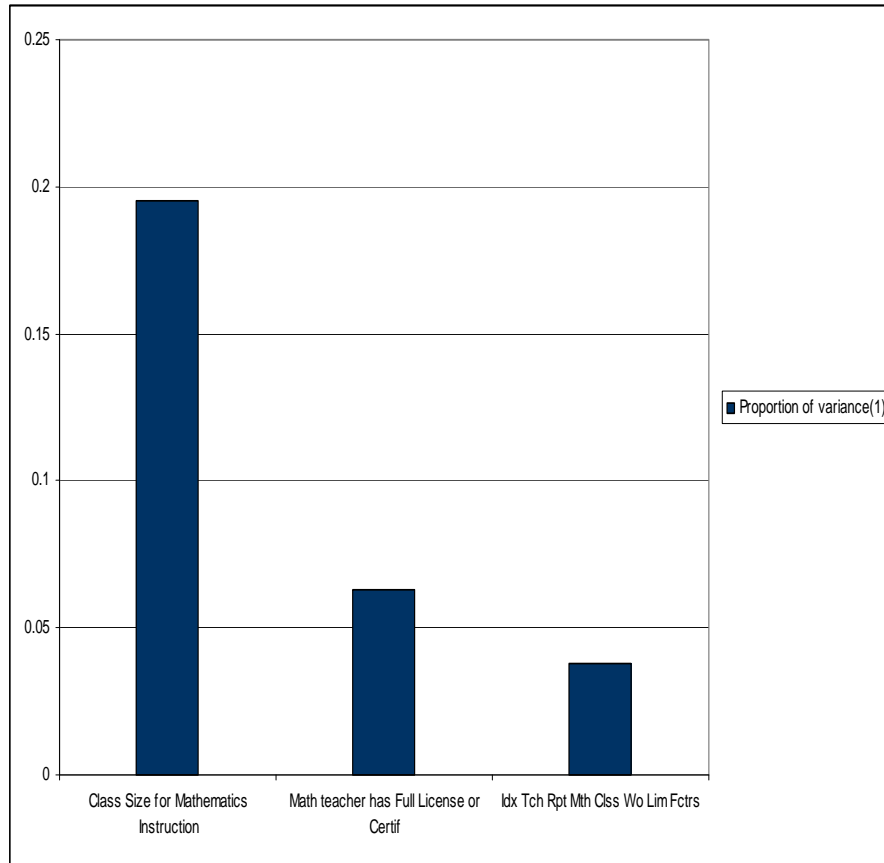
**Table 2.6: Means and Standard Deviation of the Average Plausible Math Score
by Levels of Significant Teacher Variables (Bahrain)**

Variable	Level	Mean	S. D.
Class Size for Mathematics	1 – 24 Students	456.60	34.12
Instruction	25 – 32 Students	404.34	34.13
	33 – 40 Students	395.63	24.98
	41 or more Students	408.35	7.81
Math teacher has Full	Yes	406.23	35.78
License or Certif	No	436.27	63.21
Idx Tch Rpt Mth Clss	- High	411.10	43.98
Wo Lim Fctrs	- Medium	407.44	30.74
	- Low	482.44	92.19

The results of the stepwise regression analysis are presented in Table 2.5 and graphically in Figure 2.7. Three variables accounted for more than 1% of the variance in the science achievement each as measured by Average Science Plausible Score. These are:

1. Index of Science Teachers' Perception of School Climate (20.6%)
2. Class Size for Science Instruction (10.4%)
3. Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors (3.1%)

It should be noted that two of these variables (the second and the third) relate to the classroom instruction while the third variable is external to the classroom but within the school. The more favorable the perception of the school climate the science teacher, the higher is the science achievement of the students of that teacher (Table 2.8). For class size higher achievement in mean of Average Science Plausible Score was associated with smaller class size (Table 2.8). On the other hand, students whose teachers reported high limitations on instructions due to student factors have lower science achievement than those who reported low limitations on instructions due to student factors.

Referring to the definition of each of these three variables (Appendix 1), one can identify a likely profile of a teacher whose students have higher science achievement. A teacher whose students have higher science achievement is likely:

- To have a favorable perception of the school climate (teachers' job satisfaction, teachers' understanding of the school's curricular goals, teachers' degree of success in implementing the school's curriculum, teachers' expectations for student achievement, parental support for student achievement, parental involvement in school activities, students' regard for school property, students' desire to do well in school);
- Is likely to be teaching smaller classes;
- Has a perception that there are few or no limitations on instruction due to student factors (students with different academic abilities, students who come from a wide range of backgrounds, students with special needs, uninterested students, low morale among students, disruptive students).

Table 2.7: R2 and Proportion of Variance in Average Plausible Science Score due to Significant Teacher Variables in the Stepwise Regression (Bahrain)

Variables	R^2	Proportion of variance[1]
Idx Science Tchr Prcptn Schl Climate	0.206	0.206
Class Size for Science Instruction	0.310	0.104
Idx Tch Rpt Mth Clss Wo Lim Fctrs	0.340	0.031

[1] Difference in R^2

Figure 2.7: Proportion of Variance in Average Plausible Science Score due to Significant Teacher Variables (Bahrain)
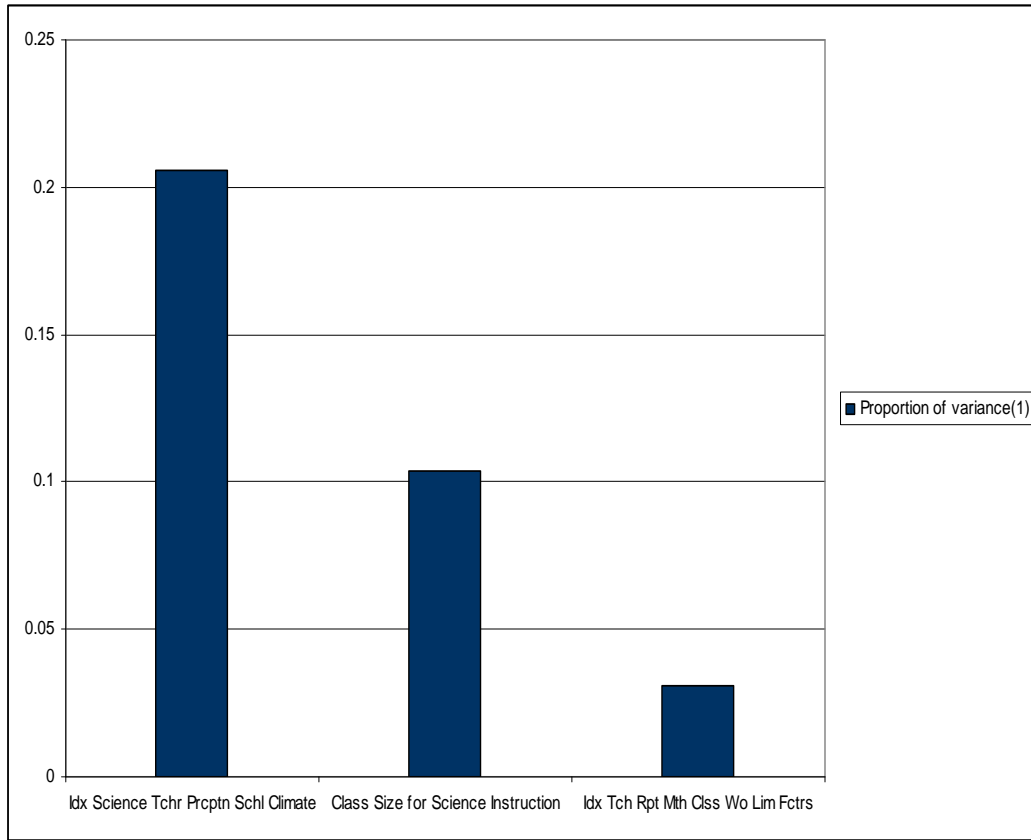
Table 2.8: Means and Standard Deviation of the Average Plausible Science by Levels of Significant Teacher Variables (Bahrain)

Variable	Level	Mean	S. D.
Idx Sci Tchr Prcptn	- High	470.30	29.81
Schl Climate	- Medium	442.03	24.38
	- Low	429.89	23.57
Class Size for	1 – 24 Students	465.44	30.16
Science Instruction	25 – 32 Students	439.76	25.79
	33 – 40 Students	430.82	23.39
	41 or more Students	455.13	9.42
Idx Tch Rpt Mth	- High	461.64	32.70
Clss Wo Lim Fctrs	- Medium	439.64	25.85
	- Low	433.10	20.90

School Variables

Prediction of Mathematics Achievement from School Variables

The following five variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score for the school as dependent variable:

6. Index of Principals' Perception of School Climate
7. Trends in Index of Good School and Class Attendance
8. Trends in Index of Availability of School Resources for Mathematics Instruction
9. Number Of Hours Of School Per Year
10. Number Of Weeks Of School Per Year

The results of the stepwise regression analysis are presented in Table 2.9. One variable accounted for more than 1% of the variance in the mathematics achievement each as measured by Average Mathematics Plausible Score:

-Trends in Index of Availability of School Resources for Mathematics Instruction (19.2%)

From Table 2.10, one can notice that the more available the resources for mathematics instruction are, the higher the mathematics achievement of the students in the school. Referring to Appendix 1 on can see that this variable is defined in terms of availability of is:

a = Instructional materials (e.g., textbook);
b = Budget for supplies (e.g., paper, pencils);
c = School buildings and grounds;
d = Heating/cooling and lightening systems;
e = Instructional space (e.g., classrooms);
g = Computers for mathematics instruction;
h = Computer software for mathematics instruction;
i = Calculators for mathematics instruction;
j = Library materials relevant to mathematics instruction;
k = Audio-visual resources for mathematics instruction.

Table 2.9: R^2 and Proportion of Variance in Average Plausible Math Score due to Significant School Variables in the Stepwise Regression (Bahrain)

Variables	R^2	Proportion of variance[1]
Idx Avlbl Schl Rsrcs Math Instr	0.192	0.192

[1] Difference in R^2

Table 2.10: Means and Standard Deviation of the Average Plausible Math Score by Levels of Significant School Variables (Bahrain)

Variable	Level	Mean	Std. D.
Idx Avlbl Schl Rsrcs	- High	436.50	31.85
Math Instr	- Medium	400.96	33.14
	- Low	387.61	23.40

Prediction of Science Achievement from School Variables

The following five variables were entered in the stepwise multiple regression with the Average Science Plausible Score for the school as dependent variable:

11. Index of Principals' Perception of School Climate
12. Trends in Index of Good School and Class Attendance
13. Trends in Index of Availability of School Resources for Science Instruction
14. Number Of Hours Of School Per Year
15. Number Of Weeks Of School Per Year

The results of the stepwise regression analysis are presented in Table 2.11. Two variables accounted for more than 1% each of the variance in the science achievement as measured by the Average Science Plausible Score:

-Trends in Index of Availability of School Resources for Science Instruction (19.2%)
- Index of Principals' Perception of School Climate (6.8%)

From Table 2.12, one can notice the more available the resources for science instruction are, the higher the science achievement of the students in the school and the more favorable the principal's perception of school climate the higher the science achievement of the students in the school.

Table 2.11: R^2 and Proportion of Variance in Average Plausible Science Score due to Significant School Variables in the Stepwise Regression (Bahrain)

Variables	R^2	Proportion of variance[1]
Idx Avlbl Schl Rsrcs Sci Instr	0.160	0.169
Idx Prncpl Percept School Climate	0.228	0.068

[1] Difference in R^2

Table 2.12: Means and Standard Deviation of the Average Plausible Science by Levels of Significant School Variables (Bahrain)

Variable	Level	Mean	S. D.
Idx Avlbl Schl Rsrcs	- High	458.19	23.78
Sci Instr	- Medium	436.71	27.00
	- Low	433.06	17.63
Idx Prncpl Percept	- High	458.11	26.23
School Climate	- Medium	440.99	27.17
	- Low	427.15	14.10

Referring to Appendix 1, one can identify the profile of the school with higher science achievement as the school:

- That has more resources for science instruction which include:

    a = Instructional materials (e.g., textbook);
    b = Budget for supplies (e.g., paper, pencils);
    c = School buildings and grounds;
    d = Heating/cooling and lightening systems;
    e = Instructional space (e.g., classrooms);
    l = science laboratory equipment and materials;
    m = Computers for science instruction;
    n = Computer software for science instruction;
    o = Calculators for science instruction;
    p = Library materials relevant to science instruction;
    q = Audio-visual resources for science instruction.

- Whose principal has more favorable perception of the school climate which is defined to include the following categories:

    a = Teachers' job satisfaction
    b = Teachers' understanding of the school's curricular goals
    c = Teachers' degree of success in implementing the school's curriculum
    d = Teachers' expectations for student achievement
    e = Parental support for student achievement
    f = Parental involvement in school activities
    g = Students' regard for school property
    h = Students' desire to do well in school

Section 3: The Case of Egypt

Using the Egypt TIMSS 2003 student, teacher, and school data files, this section will present the results of the stepwise regression in three main parts: First, student variables will be entered as predictors and the Average Mathematics Plausible Score (AMPS) and Average Science Plausible Score (ASPS) as dependent variable (one at a time); Second, teacher variables will be entered as predictors and the Average Plausible Score for science and math, one at a time ;and third, the school variables as predictors and the Average Plausible Score for science and math as dependent variables, one at a time.

Student Variables

Prediction of Mathematics Achievement from Student Variables

The following seven variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score as dependent variable:

1. Index of Time Students Spend Doing Mathematics Homework

2. Index of Self-Confidence in Learning Mathematics
3. Index of Students Valuing Math
4. Index of Students' Perception of Being Safe in School
5. Parents Highest Education Level
6. Students' Educational Aspirations Relative to Parents Educational Level
7. Availability of Computer

The results of the stepwise regression analysis are presented in Table 3.1 and graphically in Figure 3.1. Three variables accounted for accounted for more than 1% of the variance in the mathematics achievement as measured by Average Mathematics Plausible Score. These are:

1. Parents Highest Education Level (24.6 %)
2. Index of Self-Confidence in Learning Mathematics (6.0 %)
3. Index of Students' Perception of Being Safe in School (4.1 %)

It should be noted that two of these variables (the second and the third) relate to the affective domain of the student while the first variable is environmental and belongs to the family of the student. On the other hand one variable is mathematics-specific while the others are not. For each of the three variables, the higher the value of the variable, the higher is the mean Average Mathematics Plausible Score (Table 3.2).

Referring to the definition of each of these three variables (Appendix 1), one can identify a likely profile of a student with higher mathematics achievement. A student with higher mathematics achievement

- Is likely to have parents with higher educational level;
- More self-confident in learning mathematics (perceives that he/she usually does well in mathematics, mathematics is easier for him/ her than for many of classmates, mathematics is one of his/her strengths, and perceives that he /she learns things quickly in mathematics);
- Has a feeling of being safe in school (not subject to stealing, bullying, intimidation, ridicule, or neglect by other students).

Table 3.1: R^2 and Proportion of Variance in Average Plausible Math Score due to Significant Student Variables in the Stepwise Regression (Egypt)

Variables	R^2	Proportion of variance[1]
Parents Highest Education Level	0.246	0.246
Index Self-Confid Learning Math	0.307	0.060
Idx Std Prcptn Being Safe School	0.348	0.041
Stds Educ Asprtns Rltv to Prnts Educ Lvl	0.356	0.008
Index of Time on Math Homework	0.362	0.006
Availability of Computer	0.364	0.003

[1]   Difference in R^2

Figure 3.1: Proportion of Variance in Average Plausible Math Score due to Significant Student Variables (Egypt)
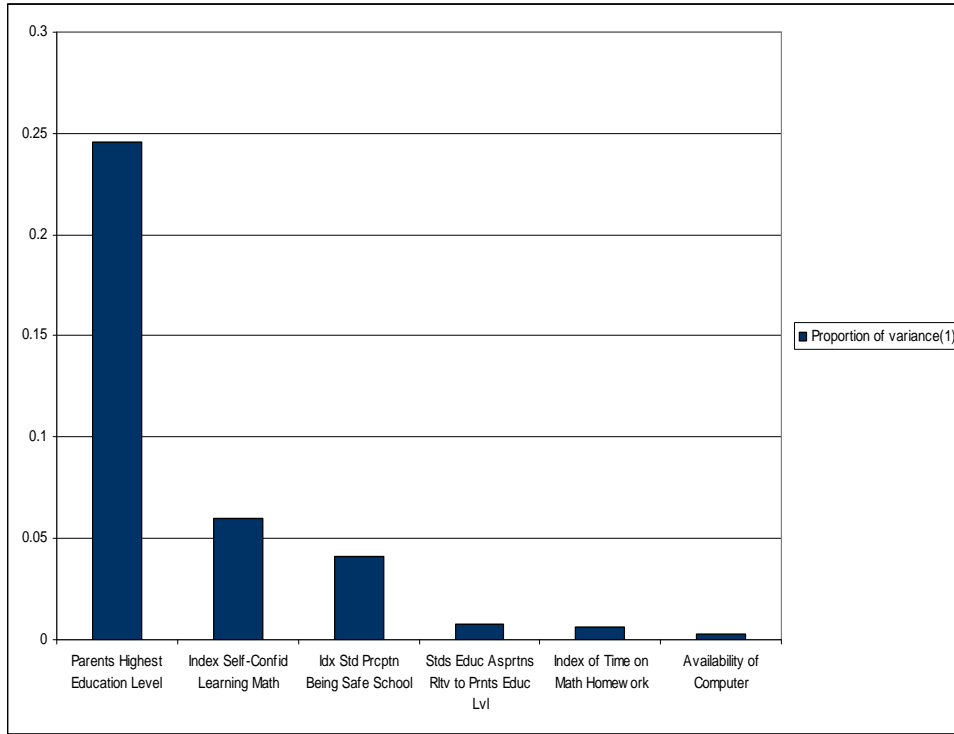
Table 3.2: Means and Standard Deviation of the Average Plausible Math Score by Levels of Significant Student Variables (Egypt)

Variable	Level	Mean	S. D.
Parents Highest Education Level	- Fini univ / equival / higher	498.80	79.97
	- Fini upp sec schooling	442.94	78.42
	- Fini low sec schooling	403.76	82.52
	- No more than prim	389.87	73.69
Index Self-Confid Learning Math	- High	470.41	88.83
	- Medium	406.28	82.22
	- Low	396.11	77.55
Idx Std Prcptn Being Safe School	- High	473.20	82.68
	- Medium	426.53	91.44
	- Low	383.78	90.71
Stds educ asprtns rltv to prnts educ lvl	- Fini univ and either par went to univ	506.35	75.05
	- Fini univ but neither par went to univ	428.99	78.39
	- Not fini univ regardless of par edu	372.82	68.46
	- Do not know regardless of par edu	432.89	84.48

Variable	Level	Mean	S. D.
Index of Time on Math Homework	- High	432.11	89.95
	- Medium	448.87	91.75
	- Low	457.35	94.97
Availability of Computer	- Use computer both at home and school	481.77	96.38
	- Use comp at home but not at school	443.26	96.46
	- Use comp at school but not at home	414.81	85.02
	-Use comp only at places other than home	405.13	84.93
	- Do not use computer at all	447.92	74.98

Prediction of Science Achievement from Student Variables

The following seven variables were entered in the stepwise multiple regression with the Average Science Plausible Score as a dependent variable:

1. Index of Time Students Spend Doing Science Homework
2. Index of Self-Confidence in Learning Science
3. Index of Students Valuing Science
4. Index of Students' Perception of Being Safe in School
5. Parents Highest Education Level
6. Students' Educational Aspirations Relative to Parents Educational Level
7. Availability of Computer

The results of the stepwise regression analysis are presented in Table 2.3 and graphically in Figure 3.3. Three variables accounted more than 1% of the variance each in the science achievement as measured by Average Science Plausible Score. These are:

1. Parents Highest Education Level (19.4 %)
2. Index of Self-Confidence in Learning Science (6.1 %)
3. Index of Students' Perception of Being Safe in School (4.1 %)

Again two of these variables (the second and the third) relate to the affective domain of the student while the first variable is environmental and belongs to the family of the student. On the other hand one variable is science-specific while the others are not. For each of the three variables, the higher the value of the variable, the higher is the mean Average Science Plausible Score (Table 3.4).

Referring to the definition of each of these three variables (Appendix 1), one can identify a likely profile of a student with higher science achievement. A student with higher science achievement:

- Is likely to have parents with higher educational level;
- More self-confident in learning science (perceives that he/she usually does well in science, science is easier for him/ her than for many of classmates, science is one of his/her strengths, and perceives that he /she learns things quickly in science);
- Has a feeling of being safe in school (not subject to stealing, bullying, intimidation, ridicule, or neglect by other students).

Table 3.3: R^2 and Proportion of Variance in Average Plausible Science Score due to Significant Student Variables in the Stepwise Regression (Egypt)

Variables	R^2	Proportion of variance[1]
Parents Highest Education Level	0.194	0.194
Index Self-Confid Learning Science	0.256	0.061
Idx Std Prcptn Being Safe School	0.297	0.041
Index of Time on Science Homework	0.305	0.008
Stds Educ Asprtns Rltv to Prnts Educ Lvl	0.313	0.008

[1]   Difference in R^2

Figure 3.3: Proportion of Variance in Average Plausible Science Score due to Significant Student Variables (Egypt)
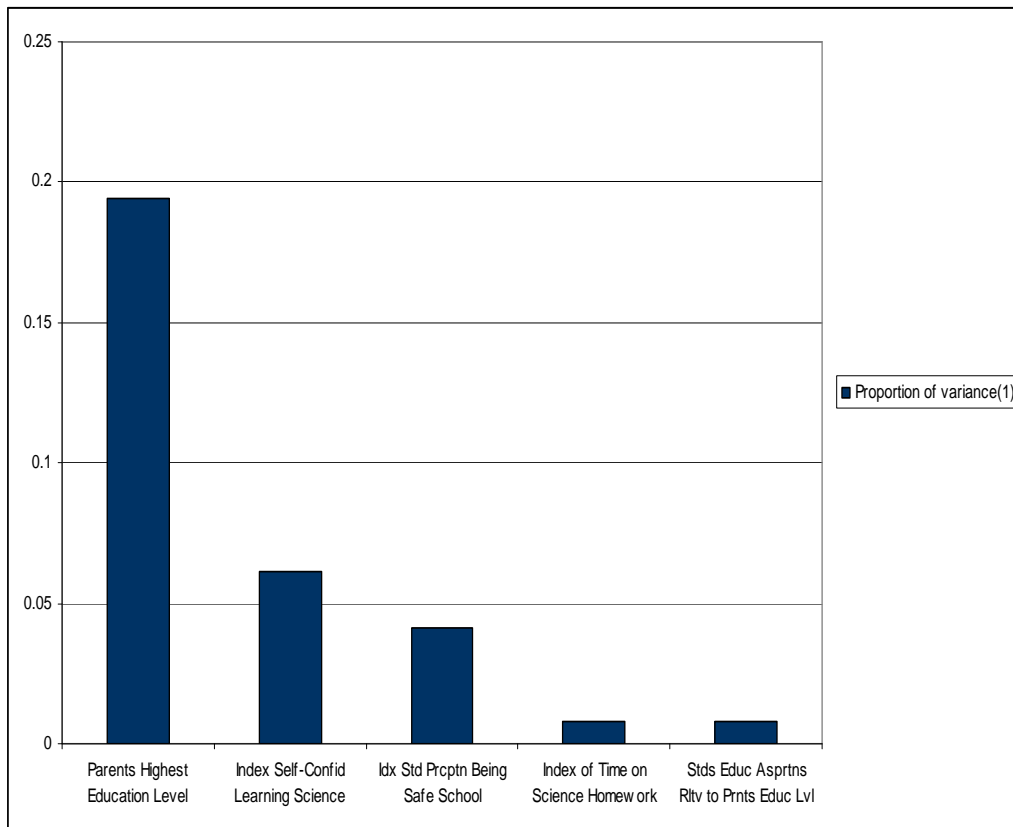
Table 3.4: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant Student Variables (Egypt)

Variable	Level	Mean	S. D.
Parents Highest Education Level	- Fini univ / equival / higher	506.78	79.37
	- Fini upp sec schooling	460.90	87.04
	- Fini low sec schooling	417.76	92.89
	- No more than prim	405.19	86.30
Index Self-Confid Learning Science	- High	477.76	88.91
	- Medium	413.68	95.72
	- Low	388.11	101.35
Idx Std Prcptn Being Safe School	- High	485.95	81.75
	- Medium	440.24	97.17
	- Low	388.43	103.48
Index of Time on Science Homework	- High	436.76	91.88
	- Medium	460.74	95.23
	- Low	474.71	98.37
Stds educ asprtns rltv to prnts educ lvl	- Fini univ and either par went to univ	513.72	74.37
	- Fini univ but neither par went to univ	447.39	87.93
	- Not fini univ regardless of par edu	386.72	81.33
	- Do not know regardless of par edu	445.11	91.99

Teacher Variables

Prediction of Mathematics Achievement from Mathematics Teacher Variables

The following six variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score for the mathematics teacher as dependent variable:

1. Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations on Instruction due to Student Factors
2. Index of Teachers' Emphasis on Mathematics Homework
3. Index of Mathematics Teachers' Perception of School Climate
4. Index of Mathematics Teachers' Perception of Safety in the Schools
5. Class Size For Mathematics Instruction
6. Math Teacher Has Full License or Certification

The results of the stepwise regression analysis are presented in Table 2.5 and graphically in Figure 2.5. One variable accounted for more than 1% of the variance in the mathematics achievement each as measured by Average Mathematics Plausible Score:

1. Index of Mathematics Teachers' Perception of School Climate (19.5%)

This variable does not relate to the classroom instruction but to the school environment. The more favorable the perception of the school climate the mathematics teacher has, the higher is the mathematics achievement of the students of that teacher (Table

3.6). For class size higher achievement in mean of Average Mathematics Plausible Score was associated with smaller class size (Table 2.8).

Referring to the definition of each of variable (Appendix 1), one can identify a likely profile of a teacher whose students have higher mathematics achievement. A teacher whose students have higher mathematics achievement is likely to have a favorable perception of the school climate (teachers' job satisfaction, teachers' understanding of the school's curricular goals, teachers' degree of success in implementing the school's curriculum, teachers' expectations for student achievement, parental support for student achievement, parental involvement in school activities, students' regard for school property, students' desire to do well in school)

Table 3.5: R^2 and Proportion of Variance in Average Plausible Math Score due to Significant Teacher Variables in the Stepwise Regression (Egypt)

Variables	R^2	Proportion of variance[1]
Idx Math Tchr Prcptn Schl Climate	0.144	0.144

[1] Difference in R^2

Table 3.6: Means and Standard Deviation of the Average Plausible Math Score by Levels of Significant Teacher Variables (Egypt)

Variable	Level	Mean	S. D.
Idx Math Tchr Prcptn Schl Climate	- High	470.21	56.33
	- Medium	434.19	66.04
	- Low	398.37	51.83

Prediction of Science Achievement from Science Teacher Variables

The following six variables were entered in the stepwise multiple regression with the Average Science Plausible Score for the science teacher as dependent variable:

1. Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors
2. Index of Teachers' Emphasis on Science Homework
3. Index of Science Teachers' Perception of School Climate
4. Index of Science Teachers' Perception of Safety in the Schools
5. Class Size For Science Instruction
6. Science Teacher Has Full License or Certification

The results of the stepwise regression analysis are presented in Table 3.7 and graphically in Figure 3.7. Four variables accounted for more than 1% of the variance in the science achievement each as measured by Average Science Plausible Score. These are:

1. Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors (12.0 %)
2. Index of Science Teachers' Perception of School Climate (4.2 %)
3. Science Teacher Has Full License or Certification (3.9)

4. Class Size for Science Instruction (2.9 %)

It should be noted that two of these variables (the first and the fourth) relate to the classroom instruction while the second and the third variables are external to the classroom but within the school. Students whose teachers reported high limitations on instructions due to student factors have lower science achievement than those who reported low limitations on instructions due to student factors (Table 3.8). The more favorable the perception of the school climate the science teacher has, the higher is science achievement of the students of that teacher (Table 3.8). Science achievement of students whose teachers do not have full certification (but have provisional or emergency certification) is higher than those who have (Table 3.8). For class size higher achievement in mean of Average Science Plausible Score was associated with smaller class size, less than 32 (Table 3.8).

Referring to the definition of each of these three variables (Appendix 1), one can identify a likely profile of a teacher whose students have higher science achievement. A teacher whose students have higher science achievement

- Is likely to have a perception that there are few or no limitations on instruction due to student factors (students with different academic abilities, students who come from a wide range of backgrounds, students with special needs, uninterested students, low morale among students, disruptive students);
- Has more favorable perception of the school climate (teachers' job satisfaction, teachers' understanding of the school's curricular goals, teachers' degree of success in implementing the school's curriculum, teachers' expectations for student achievement, parental support for student achievement, parental involvement in school activities, students' regard for school property, students' desire to do well in school);
- Is likely to be certified but not fully; and is likely to be teaching smaller classes.

Table 3.7: R^2 and Proportion of Variance in Average Plausible Science Score due to Significant Teacher Variables in the Stepwise Regression (Egypt)

Variables	R^2	Proportion of variance[1]
Idx Tch Rpt Sci Clss Wo Lim Fctrs	0.120	0.120
Idx Sci Tchr Prcptn Schl Climate	0.162	0.042
Sci teacher has Full License or Certif	0.201	0.039
Class Size for Science Instruction	0.230	0.029

[1] Difference in R^2

Figure 3.7: Proportion of Variance in Average Plausible Science Score due to Significant Teacher Variables (Egypt)
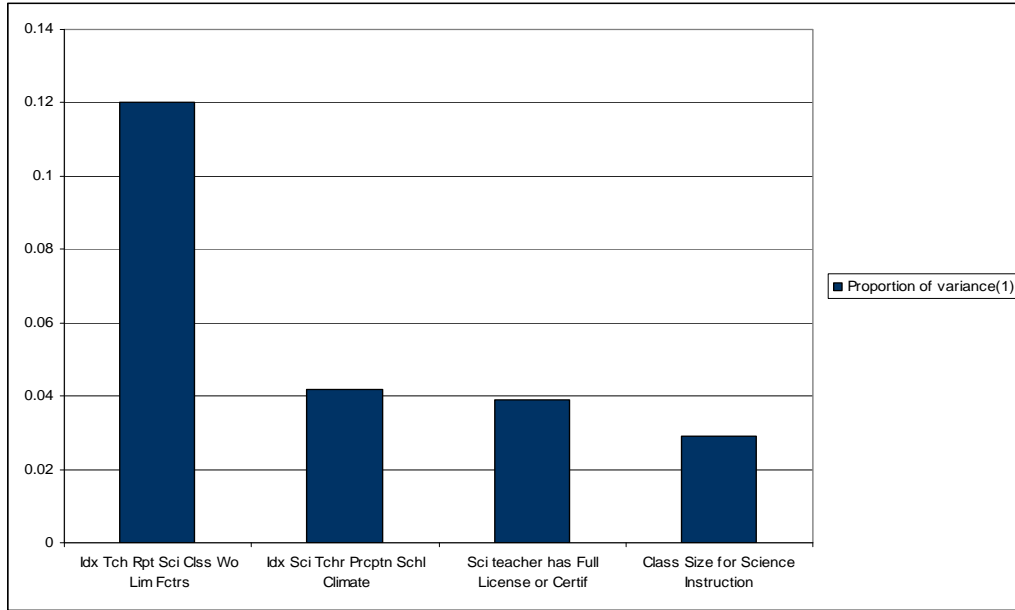
Table 3.8: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant Teacher Variables (Egypt)

Variable	Level	Mean	S. D.
Idx Tch Rpt Sci Clss Wo Lim Fctrs	- High	476.14	56.62
	- Medium	445.33	60.30
	- Low	413.39	66.62
Idx Sci Tchr Prcptn Schl Climate	- High	477.78	62.12
	- Medium	445.73	59.75
	- Low	424.00	66.08
Sci teacher has Full License or Certif	Yes	449.77	61.96
	No	520.63	13.88
Class Size for Science Instruction	1 – 24 Students	476.68	58.30
	25 – 32 Students	489.61	53.48
	33 – 40 Students	446.16	63.16
	41 or more Students	437.31	64.68

School Variables

Prediction of Mathematics Achievement from School Variables

The following five variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score for the school as dependent variable:

1. Index of Principals' Perception of School Climate
2. Trends in Index of Good School and Class Attendance
3. Trends in Index of Availability of School Resources for Mathematics Instruction
4. Number Of Hours Of School Per Year
5. Number Of Weeks Of School Per Year

The results of the stepwise regression analysis are presented in Table 3.9. Two variables accounted for more than 1% of the variance in the mathematics achievement each as measured by Average Mathematics Plausible Score (3.9):

1. Index of Principals' Perception of School Climate (11.1%)
2. Trends in Index of Availability of School Resources for Mathematics Instruction (3.1 %).

From Table 3.10, one can notice that the more favorable the principal's perception of school climate the higher the mathematics achievement of the students in the school and that the more available the resources for mathematics instruction are, the higher the mathematics achievement of the students in the school.

Referring to Appendix 1, one can identify the profile of the school with higher mathematics achievement as the school

- Whose principal has more favorable perception of the school climate which is defined to include the following categories:

  a = Teachers' job satisfaction
  b = Teachers' understanding of the school's curricular goals
  c = Teachers' degree of success in implementing the school's curriculum
  d = Teachers' expectations for student achievement
  e = Parental support for student achievement
  f = Parental involvement in school activities
  g = Students' regard for school property
  h = Students' desire to do well in school

- In which Math resources for instruction are more available. Math resources include the following categories:

  a = Instructional materials (e.g., textbook);
  b = Budget for supplies (e.g., paper, pencils);
  c = School buildings and grounds;
  d = Heating/cooling and lightening systems;
  e = Instructional space (e.g., classrooms);
  g = Computers for mathematics instruction;
  h = Computer software for mathematics instruction;
  i = Calculators for mathematics instruction;
  j = Library materials relevant to mathematics instruction;
  k = Audio-visual resources for mathematics instruction.

Table 3.9: R² and Proportion of Variance in Average Plausible Math Score due to Significant School Variables in the Stepwise Regression (Egypt)

Variables	R²	Proportion of variance[1]
Idx Prncpl Percept School Climate	0.111	0.111
Idx Avlbl Schl Rsrcs Math Instr	0.142	0.031

[1] Difference in R^2

Table 3.10: Means and Standard Deviation of the Average Plausible Math Score by Levels of Significant School Variables (Egypt)

Variable	Level	Mean	S. D.
Idx Prncpl Percept School Climate	- High	469.43	63.46
	- Medium	423.61	61.22
	- Low	415.08	59.08
Idx Avlbl Schl Rsrcs Math Instr	- High	456.40	61.40
	- Medium	426.45	64.00
	- Low	431.22	69.77

Prediction of Science Achievement from School Variables

The following five variables were entered in the stepwise multiple regression with the Average Science Plausible Score for the school as dependent variable:

1. Index of Principals' Perception of School Climate
2. Trends in Index of Good School and Class Attendance
3. Trends in Index of Availability of School Resources for Science Instruction
4. Number Of Hours Of School Per Year
5. Number Of Weeks Of School Per Year

The results of the stepwise regression analysis are presented in Table 3.11. One variable accounted for more than 1% of the variance in the science achievement as measured by the Average Science Plausible Score:

- Index of Principals' Perception of School Climate (9.1 %)

From Table 3.12, one can notice the more favorable the principal's perception of school climate the higher the science achievement of the students in the school.

Table 3.11: R² and Proportion of Variance in Average Plausible Science Score due to Significant School Variables in the Stepwise Regression (Egypt)

Variables	R²	Proportion of variance[1]
Idx Prncpl Percept School Climate	0.091	0.091

[1] Difference in R^2

Table 3.8: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant School Variables (Egypt)

Variable	Level	Mean	S. D.
Idx Prncpl Percept School Climate	- High	476.34	60.29
	- Medium	437.93	62.47
	- Low	425.60	61.66

Referring to Appendix 1, one can see that school climate is defined to include the following categories:

a = Teachers' job satisfaction
b = Teachers' understanding of the school's curricular goals
c = Teachers' degree of success in implementing the school's curriculum
d = Teachers' expectations for student achievement
e = Parental support for student achievement
f = Parental involvement in school activities
g = Students' regard for school property
h = Students' desire to do well in school

Section 4: the Case of Jordan

Using the Jordan TIMSS 2003 student, teacher, and school data files, this section will present the results of the stepwise regression in three main parts: First, student variables will be entered as predictors and the Average Mathematics Plausible Score (AMPS) and Average Science Plausible Score (ASPS) as dependent variable (one at a time); Second, teacher variables will be entered as predictors and the Average Plausible Score for science and math, one at a time ;and third, the school variables as predictors and the Average Plausible Score for science and math as dependent variables, one at a time.

Student Variables

Prediction of Mathematics Achievement from Student Variables

The following seven variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score as dependent variable:

1. Index of Time Students Spend Doing Mathematics Homework
2. Index of Self-Confidence in Learning Mathematics
3. Index of Students Valuing Math
4. Index of Students' Perception of Being Safe in School
5. Parents Highest Education Level
6. Students' Educational Aspirations Relative to Parents Educational Level
7. Availability of Computer

The results of the stepwise regression analysis are presented in Table 4.1 and graphically in Figure 4.1. Three variables accounted for accounted for more than 1% of the

variance in the mathematics achievement as measured by Average Mathematics Plausible Score. These are:

1. Index of Self-Confidence in Learning Mathematics (13.6 %)
2. Students' Educational Aspirations Relative to Parents Educational Level   (5.5%)
3. Parents Highest Education Level (6.6%)

The first variable relates to the affective domain of the student while the second and third variables are environmental and belong to the family of the student. On the other hand one variable is mathematics-specific while the others are not. For each of the three variables, the higher the value of the variable, the higher is the mean Average Mathematics Plausible Score (Table 4.2).

Referring to the definition of each of these three variables (Appendix 1), one can identify a likely profile of a student with higher mathematics achievement. A student with higher mathematics achievement:

- Is likely to be self-confident in learning mathematics (perceives that he/she usually does well in mathematics, mathematics is easier for him/ her than for many of classmates, mathematics is one of his/her strengths, and perceives that he /she learns things quickly in mathematics);
- To have higher educational aspiration relative to parents educational level;
- To have parents with higher educational level.

Table 4.1: R^2 and Proportion of Variance in Average Plausible Math Score due to Significant Student Variables in the Stepwise Regression (Jordan)

Variables	R^2	Proportion of variance[1]
Index Self-Confid Learning Math	0.136	0.136
Stds Educ Asprtns Rltv to Prnts Educ Lvl	0.191	0.055
Parents Highest Education Level	0.207	0.016
Availability of Computer	0.212	0.005
Index of Students Valuing Math	0.214	0.003
Idx Std Prcptn Being Safe School	0.215	0.001

[1] Difference in R^2

Figure 4.1: Proportion of Variance in Average Plausible Math Score due to Significant Student Variables (Jordan)
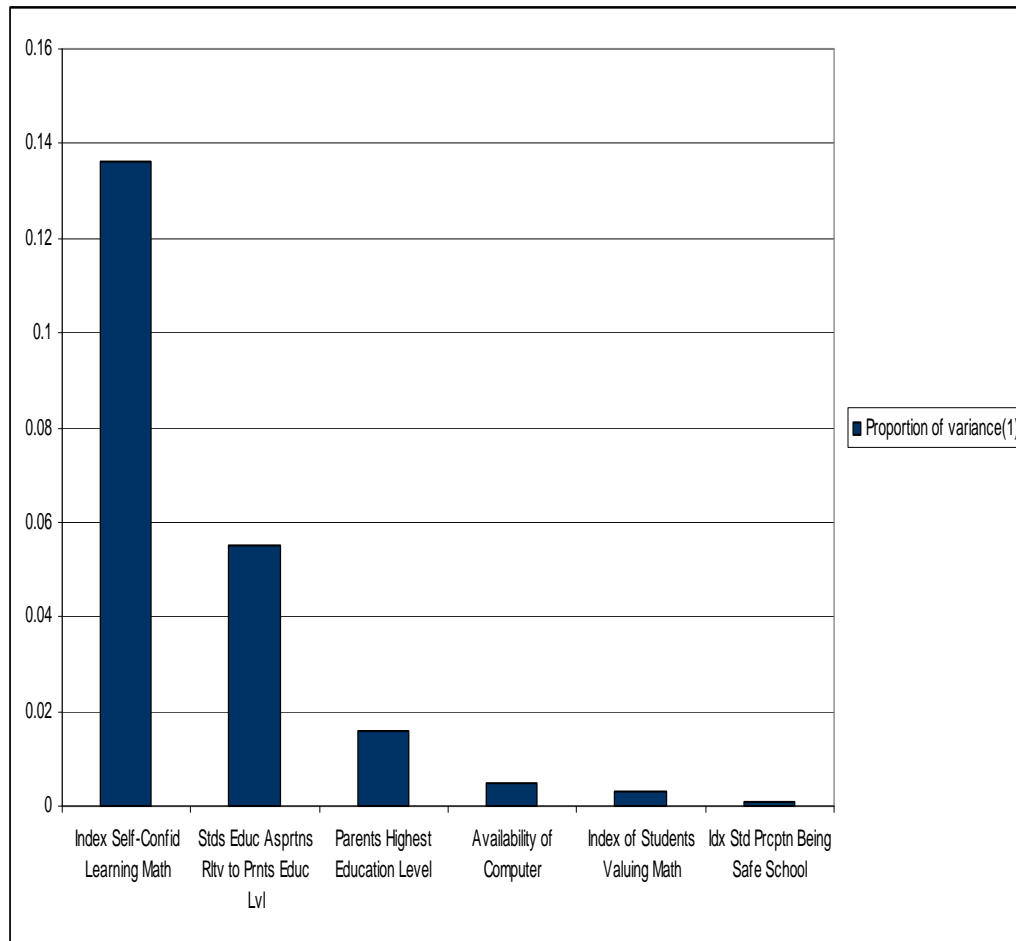
Table 4.2: Means and Standard Deviation of the Average Plausible Math Score by Levels of Significant Student Variables (Jordan)

Variable	Level	Mean	S. D.
Index Self-Confid Learning Math	- High	460.54	80.04
	- Medium	400.00	68.88
	- Low	392.49	67.63
Stds educ asprtns rltv to prnts educ lvl	- Fini univ and either par went to univ	467.22	81.14
	- Fini univ but neither par went to univ	438.41	76.11
	- Not fini univ regardless of par edu	376.77	68.09
	- Do not know regardless of par edu	409.35	72.06

Variable	Level	Mean	S. D.
Parents Highest Education Level	- Fini univ / equival / higher	453.77	83.59
	- Fini post- sec voc/techn edu but no univ	439.16	81.71
	- Fini upp sec schooling	419.86	73.99
	- Fini low sec schooling	402.57	73.77
	- No more than prim	377.51	74.11
Availability of Computer	- Use computer both at home and school	444.83	85.22
	- Use comp at home but not at school	426.71	86.22
	- Use comp at school but not at home	414.24	76.25
	- Use comp only at places other than home	395.30	84.56
	- Do not use computer at all	414.51	70.89
Index of Students Valuing Math	- High	434.69	80.36
	- Medium	395.08	76.84
	- Low	394.96	71.34
Idx Std Prcptn Being Safe School	- High	438.31	81.62
	- Medium	412.53	82.60
	- Low	430.43	79.17

Prediction of Science Achievement from Student Variables

The following seven variables were entered in the stepwise multiple regression with the Average Science Plausible Score as a dependent variable:

1. Index of Time Students Spend Doing Science Homework
2. Index of Self-Confidence in Learning Science
3. Index of Students Valuing Science
4. Index of Students' Perception of Being Safe in School
5. Parents Highest Education Level
6. Students' Educational Aspirations Relative to Parents Educational Level
7. Availability of Computer

The results of the stepwise regression analysis are presented in Table 4.3 and graphically in Figure 4.3. Three variables accounted more than 1% of the variance each in the science achievement as measured by Average Science Plausible Score. These are:

1. Index of Self-Confidence in Learning Science (11.1 %)
2. Students' Educational Aspirations Relative to Parents Educational Level (5.7%)
3. Parents Highest Education Level (1.7%)

The first variable relates to the affective domain of the student while the second and third variables are environmental and belong to the family of the student. On the other hand one variable is science-specific while the others are not. For each of the three variables, the higher the value of the variable, the higher is the mean Average Science Plausible Score (Table 4.4).

Referring to the definition of each of these three variables (Appendix 1), one can identify a likely profile of a student with higher science achievement. A student with higher science achievement

- Is likely to be self-confident in learning science (perceives that he/she usually does well in science, science is easier for him/ her than for many of classmates, science is one of his/her strengths, and perceives that he /she learns things quickly in science);
- To have higher educational aspiration relative to parents educational level;
- To have parents with higher educational

Table 4.3: R^2 and Proportion of Variance in Average Plausible Science Score due to Significant Student Variables in the Stepwise Regression (Jordan)

Variables	R^2	Proportion of variance[1]
Index Self-Confid Learning Science	0.111	0.111
Stds Educ Asprtns Rltv to Prnts Educ Lvl	0.168	0.057
Parents Highest Education Level	0.185	0.017
Index of Time on Science Homework	0.195	0.010
Index of Students Valuing Science	0.199	0.003
Idx Std Prcptn Being Safe School	0.201	0.002
Availability of Computer	0.203	0.002

[1] Difference in R^2

Figure 4.3: Proportion of Variance in Average Plausible Science Score due to Significant Student Variables (Jordan)
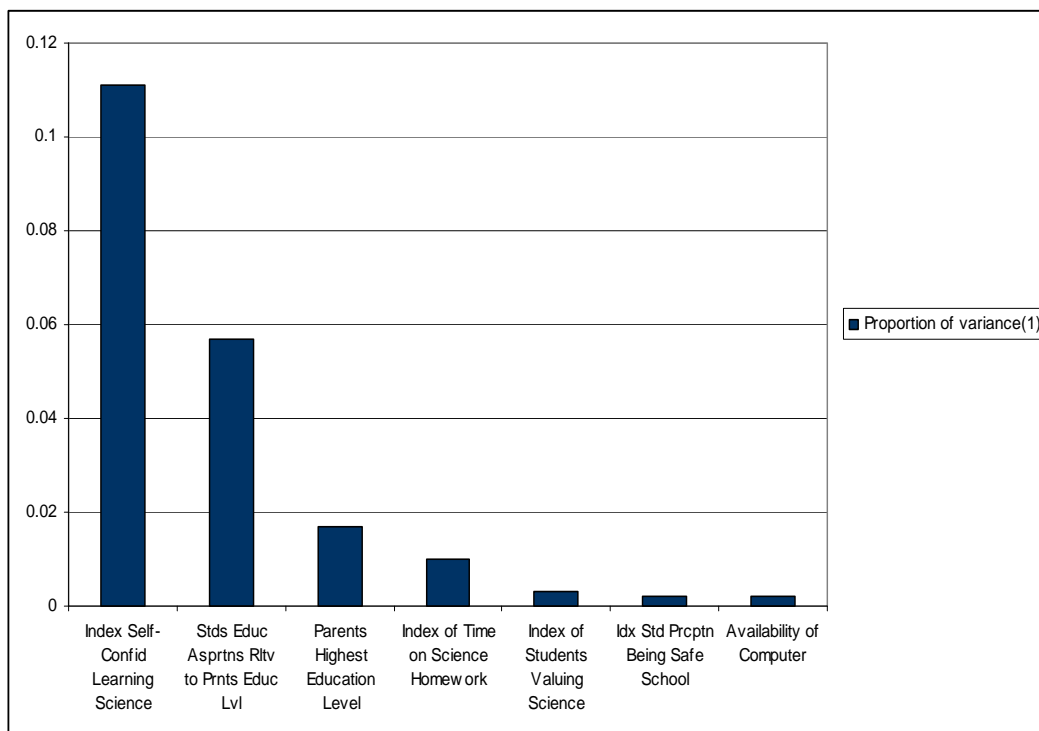
Table 4.4: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant Student Variables (Jordan)

Variable	Level	Mean	S. D.
Index Self-Confid Learning Science	- High	502.15	77.05
	- Medium	446.65	75.26
	- Low	431.21	78.04
Stds educ asprtns rltv to prnts educ lvl	- Fini univ and either par went to univ	515.29	77.72
	- Fini univ but neither par went to univ	489.92	76.59
	- Not fini univ regardless of par edu	430.48	74.66
	- Do not know regardless of par edu	464.25	72.78
Parents Highest Education Level	- Fini univ / equival / higher	502.91	80.92
	- Fini post- sec voc/techn edu but no univ	488.63	81.46
	- Fini upp sec schooling	474.94	72.42
	- Fini low sec schooling	455.27	80.27
	- No more than prim	428.97	82.70
Index of Time on Science Homework	- High	464.81	73.14
	- Medium	478.79	79.54
	- Low	496.26	79.32
Index of Students Valuing Science	- High	484.10	79.73
	- Medium	448.39	83.39
	- Low	440.45	88.18
Idx Std Prcptn Being Safe School	- High	490.37	77.54
	- Medium	463.64	86.29
	- Low	480.71	79.63
Availability of Computer	- Use computer both at home and school	492.77	84.72
	- Use comp at home but not at school	474.93	87.80
	- Use comp at school but not at home	465.28	79.35
	- Use comp only at places other than home	457.63	83.78
	- Do not use computer at all	472.91	75.13

Teacher Variables

Prediction of Mathematics Achievement from Mathematics Teacher Variables

The following six variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score for the mathematics teacher as dependent variable:

1. Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations on Instruction due to Student Factors
2. Index of Teachers' Emphasis on Mathematics Homework
3. Index of Mathematics Teachers' Perception of School Climate
4. Index of Mathematics Teachers' Perception of Safety in the Schools

5. Class Size For Mathematics Instruction
6. Math Teacher Has Full License or Certification

The results of the stepwise regression analysis are presented in Table 4.5. Two variables accounted for more than 1% of the variance in the mathematics achievement each as measured by Average Mathematics Plausible Score:

1. Index of Mathematics Teachers' Perception of School Climate (9.2%)
2. Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations on Instruction due to Student Factors (4.2%)

The first variable relates to the school environment while the second variable relates to the classroom instruction. The higher mathematics achievement is associated with more favorable perception of the school climate on the part of the mathematics teacher has and also with the teacher's perception that there are few or no limitations on instruction due to student factors (Table 4.6).

Referring to the definition of each of variable (Appendix 1), one can identify a likely profile of a teacher whose students have higher mathematics achievement. A teacher whose students have higher mathematics achievement

- Is likely to have a favorable perception of the school climate (teachers' job satisfaction, teachers' understanding of the school's curricular goals, teachers' degree of success in implementing the school's curriculum, teachers' expectations for student achievement, parental support for student achievement, parental involvement in school activities, students' regard for school property, students' desire to do well in school)
- Have a perception that there are no or few limitations on instruction due to student factors (students with different academic abilities, students who come from a wide range of backgrounds, students with special needs, uninterested students, low morale among students, disruptive students)

Table 4.5: R^2 and Proportion of Variance in Average Plausible Math Score due to Significant Teacher Variables in the Stepwise Regression (Jordan)

Variables	R^2	Proportion of variance[1]
Idx Math Tchr Prcptn Schl Climate	0.092	0.092
Idx Tch Tchr Rpt Mth Clss Wo Lim Fctrs	0.134	0.042

[1] Difference in R^2

Table 4.6: Means and Standard Deviation of the Average Plausible Math Score by Levels of Significant Teacher Variables (Jordan)

Variable	Level	Mean	S. D.
Idx Math Tchr Prcptn Schl Climate	- High	477.89	53.53
	- Medium	424.14	40.29
	- Low	411.32	47.23

Variable	Level	Mean	S. D.
Idx Tch Tchr Rpt Mth Clss Wo Lim Fctrs	- High	449.65	41.20
	- Medium	419.54	44.63
	- Low	407.63	44.58

Prediction of Science Achievement from Science Teacher Variables

The following six variables were entered in the stepwise multiple regression with the Average Science Plausible Score for the science teacher as dependent variable:

1. Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors
2. Index of Teachers' Emphasis on Science Homework
3. Index of Science Teachers' Perception of School Climate
4. Index of Science Teachers' Perception of Safety in the Schools
5. Class Size For Science Instruction
6. Science Teacher Has Full License or Certification

The results of the stepwise regression analysis are presented in Table 4.7 and only one variable accounted for more than 1% of the variance in the science achievement as measured by Average Science Plausible Score:

-Index of Science Teachers' Perception of School Climate (12.9%)

The more favorable the perception of the school climate the science teacher has, the higher is science achievement of the students of that teacher (Table 4.8).

Referring to the definition of this variable (Appendix 1), one can say that a teacher whose students have higher science achievement is likely to have a favorable perception of the school climate (teachers' job satisfaction, teachers' understanding of the school's curricular goals, teachers' degree of success in implementing the school's curriculum, teachers' expectations for student achievement, parental support for student achievement, parental involvement in school activities, students' regard for school property, students' desire to do well in school).

Table 4.7: R^2 and Proportion of Variance in Average Plausible Science Score due to Significant Teacher Variables in the Stepwise Regression (Jordan)

Variables	R^2	Proportion of variance[1]
Idx Sci Tchr Prcptn Schl Climate	0.129	0.129

[1]   Difference in R^2

**Table 4.8: Means and Standard Deviation of the Average Plausible Science Score
Levels of Significant Teacher Variables (Jordan)**

Variable	Level	Mean	S. D.
Idx Sci Tchr Prcptn Schl Climate	- High	510.62	28.76
	- Medium	480.44	33.87
	- Low	457.98	47.31

School Variables

Prediction of Mathematics Achievement from School Variables

The following five variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score for the school as dependent variable:

1. Index of Principals' Perception of School Climate
2. Trends in Index of Good School and Class Attendance
3. Trends in Index of Availability of School Resources for Mathematics Instruction
4. Number Of Hours Of School Per Year
5. Number Of Weeks Of School Per Year

The results of the stepwise regression analysis are presented in Table 4.9. Three variables accounted for more than 1% of the variance in the mathematics achievement each as measured by Average Mathematics Plausible Score:

1. Index of Principals' Perception of School Climate (7.8 %)
2. Trends in Index of Availability of School Resources for Mathematics Instruction (6.9 %).
3. Trends in Index of Good School and Class Attendance (3.7%)

From Table 3.10, one can notice that the more favorable the principal's perception of school climate the higher is the mathematics achievement of the students in the school; the more available the resources for mathematics instruction are, the higher the mathematics achievement of the students in the school; and, the higher the index of good school/class attendance the higher the mathematics achievement in the school.

Referring to Appendix 1, one can identify the profile of the school with higher mathematics achievement as the school:

- Whose principal has more favorable perception of the school climate which is defined to include the following categories:

> a = Teachers' job satisfaction
> b = Teachers' understanding of the school's curricular goals
> c = Teachers' degree of success in implementing the school's curriculum
> d = Teachers' expectations for student achievement
> e = Parental support for student achievement
> f = Parental involvement in school activities
> g = Students' regard for school property
> h = Students' desire to do well in school

- In which Math resources for instruction are more available. Math resources include the following categories:

  a = Instructional materials (e.g., textbook);
  b = Budget for supplies (e.g., paper, pencils);
  c = School buildings and grounds;
  d = Heating/cooling and lightening systems;
  e = Instructional space (e.g., classrooms);
  g = Computers for mathematics instruction;
  h = Computer software for mathematics instruction;
  i = Calculators for mathematics instruction;
  j = Library materials relevant to mathematics instruction;
  k = Audio-visual resources for mathematics instruction.

- The index of good school/attendance is computed from principals' responses to two questions concerning the problem behaviors of students in their schools with respect to three problem behavior categories:

  a = Arriving late at school
  b = Absenteeism (i.e., unjustified absences)
  c = Skipping class

Table 4.9: R^2 and Proportion of Variance in Average Plausible Math Score due to Significant School Variables in the Stepwise Regression (Jordan)

Variables	R^2	Proportion of variance[1]
Idx Prncpl Percept School Climate	0.078	0.078
Idx Avlbl Schl Rsrcs Math Instr	0.147	0.069
Idx Good School / Class Attendance	0.185	0.037

[1] Difference in R^2

Table 4.10: Means and Standard Deviation of the Average Plausible Math Score by Levels of Significant School Variables (Jordan)

Variable	Level	Mean	S. D.
Idx Prncpl Percept School Climate	- High	448.09	44.00
	- Medium	419.59	43.20
	- Low	399.73	50.77
Idx Avlbl Schl Rsrcs Math Instr	- High	456.30	48.30
	- Medium	418.52	43.09
	- Low	405.40	43.29
Idx Good School / Class Attendance	- High	431.70	44.40
	- Medium	424.63	44.67
	- Low	388.93	41.29

Prediction of Science Achievement from School Variables

The following five variables were entered in the stepwise multiple regression with the Average Science Plausible Score for the school as dependent variable:

1. Index of Principals' Perception of School Climate
2. Trends in Index of Good School and Class Attendance
3. Trends in Index of Availability of School Resources for Science Instruction
4. Number Of Hours Of School Per Year
5. Number Of Weeks Of School Per Year

The results of the stepwise regression analysis are presented in Table 3.11. Three variables accounted for more than 1% of the variance in the science achievement as measured by the Average Science Plausible Score:

1. Index of Principals' Perception of School Climate (8.4 %)
2. Trends in Index of Availability of School Resources for Science Instruction (5.5 %).
3. Trends in Index of Good School and Class Attendance (2.8 %)

From Table 4.12, one can notice that the more favorable the principal's perception of school climate the higher is the science achievement of the students in the school; the more available the resources for science instruction are, the higher the science achievement of the students in the school; and, the higher the index of good school/class attendance the higher the science achievement in the school.

Table 4.11: R^2 and Proportion of Variance in Average Plausible Science Score due to Significant School Variables in the Stepwise Regression (Jordan)

Variables	R^2	Proportion of variance[1]
Idx Prncpl Percept School Climate	0.084	0.084
Idx Avlbl Schl Rsrcs Sci Instr	0.139	0.055
Idx Good School / Class Attendance	0.166	0.028

[1] Difference in R^2

Table 4.12: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant School Variables (Jordan)

Variable	Level	Mean	S. D.
Idx Prncpl Percept School Climate	- High	496.64	35.84
	- Medium	472.05	39.32
	- Low	446.99	49.80
Idx Avlbl Schl Rsrcs Sci Instr	- High	503.06	39.22
	- Medium	469.46	39.68
	- Low	461.14	43.60
Idx Good School / Class Attendance	- High	480.24	37.74
	- Medium	476.39	41.10
	- Low	444.63	45.28

- Whose principal has more favorable perception of the school climate which is defined to include the following categories:

  a = Teachers' job satisfaction
  b = Teachers' understanding of the school's curricular goals
  c = Teachers' degree of success in implementing the school's curriculum
  d = Teachers' expectations for student achievement
  e = Parental support for student achievement
  f = Parental involvement in school activities
  g = Students' regard for school property
  h = Students' desire to do well in school

- In which science resources for instruction are more available. Science resources include the following categories:

  a = Instructional materials (e.g., textbook);
  b = Budget for supplies (e.g., paper, pencils);
  c = School buildings and grounds;
  d = Heating/cooling and lightening systems;
  e = Instructional space (e.g., classrooms);
  l = science laboratory equipment and materials;
  m = Computers for science instruction;
  n = Computer software for science instruction;
  o = Calculators for science instruction;
  p = Library materials relevant to science instruction;
  q = Audio-visual resources for science instruction.

- The index of good school/attendance is computed from principals' responses to two questions concerning the problem behaviors of students in their schools with respect to three problem behavior categories:
  a = Arriving late at school
  b = Absenteeism (i.e., unjustified absences)
  c = Skipping class

Section 5: The Case of Lebanon

Using the Lebanon TIMSS 2003 student, teacher, and school data files, this section will present the results of the stepwise regression in three main parts: First, student variables will be entered as predictors and the Average Mathematics Plausible Score (AMPS) and Average Science Plausible Score (ASPS) as dependent variable (one at a time); Second, teacher variables will be entered as predictors and the Average Plausible Score for science and math, one at a time ;and third, the school variables as predictors and the Average Plausible Score for science and math as dependent variables, one at a time.

Student Variables

Prediction of Mathematics Achievement from Student Variables

The following seven variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score as dependent variable:

1. Index of Time Students Spend Doing Mathematics Homework
2. Index of Self-Confidence in Learning Mathematics
3. Index of Students Valuing Math
4. Index of Students' Perception of Being Safe in School
5. Parents Highest Education Level
6. Students' Educational Aspirations Relative to Parents Educational Level
7. Availability of Computer

The results of the stepwise regression analysis are presented in Table 5.1 and graphically in Figure 5.1. Five variables accounted for accounted for more than 1% of the variance in the mathematics achievement as measured by Average Mathematics Plausible Score. These are:

1. Index of Self-Confidence in Learning Mathematics (16.2 %)
2. Parents Highest Education Level (9.9 %)
3. Index of Students' Perception of Being Safe in School (7.0%)
4. Availability of Computer (2.2%)
5. Students' Educational Aspirations Relative to Parents Educational Level (1.6 %)

Three variables (first, third, fifth) relate to the affective domain of the student while the second and fourth variables are environmental and belong to the family and school of the student. On the other hand one variable is mathematics-specific while the others are not. For each of the five variables, the higher the value of the variable, the higher is the mean Average Mathematics Plausible Score (Table 5.2).

Referring to the definition of each of these three variables (Appendix 1), one can identify a likely profile of a student with higher mathematics achievement. A student with higher mathematics achievement is likely to:

- Be self-confident in learning mathematics (perceives that he/she usually does well in mathematics, mathematics is easier for him/ her than for many of classmates, mathematics is one of his/her strengths, and perceives that he /she learns things quickly in mathematics);
- Have parents with higher educational level;
- Have a feeling of being safe in school (not subject to stealing, bullying, intimidation, ridicule, or neglect by other students);
- Have higher educational aspiration relative to parents educational level; and, to have parents with higher educational level;
- Have more access to computers.

Table 2.1: R^2 and Proportion of Variance in Average Plausible Math Score due to Significant Student Variables in the Stepwise Regression (Lebanon)

Variables	R^2	Proportion of variance[1]
Index Self-Confid Learning Math	0.162	0.162
Parents Highest Education Level	0.251	0.089
Idx Std Prcptn Being Safe School	0.321	0.070
Availability of Computer	0.343	0.022
Stds Educ Asprtns Rltv to Prnts Educ Lvl	0.360	0.016
Index of Students Valuing Math	0.365	0.006

[1]   Difference in R^2

Figure 2.1: Proportion of Variance in Average Plausible Math Score due to Significant Student Variables (Lebanon)
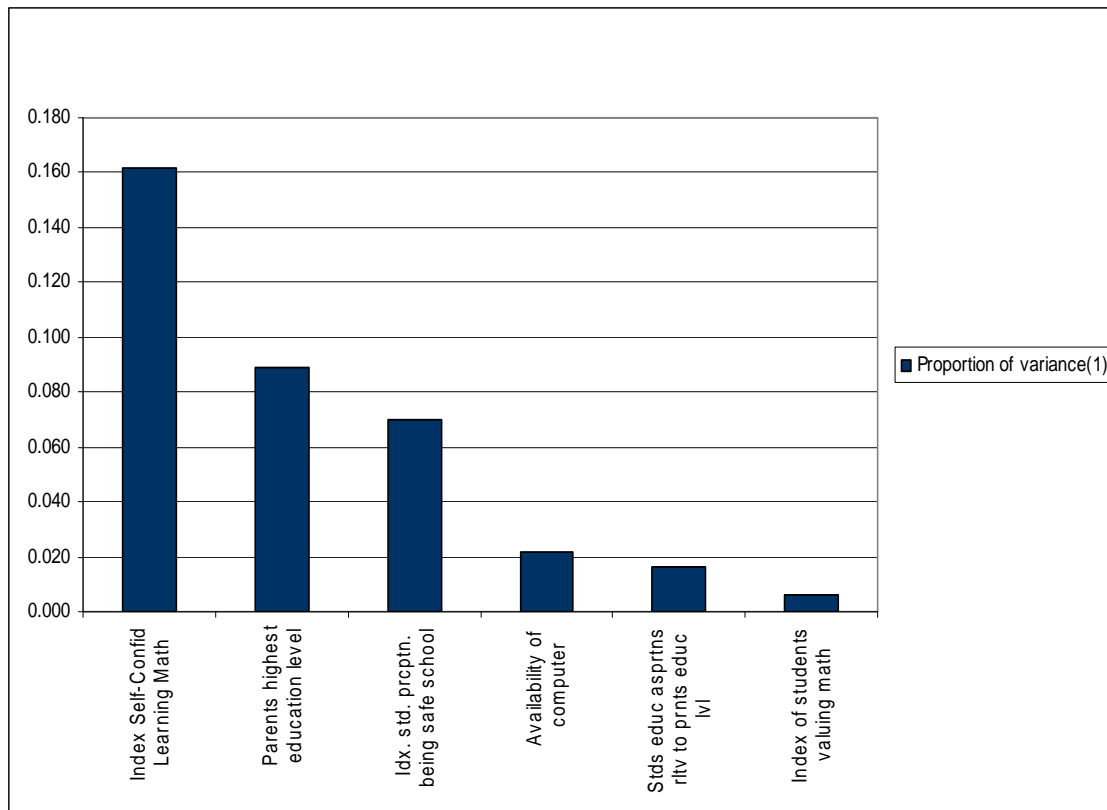
Table 2.2: Means and Standard Deviation of the Average Plausible Math Score by Levels of Significant Student Variables (Lebanon)

Variable	Level	Mean	S. D.
Index Self-Confid Learning Math	- High	467.72	61.16
	- Medium	419.36	54.34
	- Low	405.49	52.02
Parents Highest	- Fini univ/equival/higher	468.75	64.14
Education Level	- Fini post-sec voc/techn edu but no univ	454.91	62.92
	- Fini upp sec schooling	439.86	57.15
	- Fini low sec schooling	421.82	54.27
	- No more than prim	408.25	55.78
Idx Std Prcptn	- High	463.66	62.13
Being Safe School	- Medium	437.84	60.5
	- Low	408.98	53.88
Availability of Computer	- Use computer both at home and school	463.21	62.01
	- Use comp at home but not at school	418.41	58.04
	- Use comp at school but not at home	431.49	59.5
	-Use comp only at places other than home	410.27	53.52
	- Do not use computer at all	418.09	54.14
Stds educ asprtns	- Fini univ and either par went to univ	468.75	64.14
rltv to prnts educ lvl	- Fini univ but neither par went to univ	454.91	62.92
	- Fini upp sec schooling	439.86	57.15
	- Not fini univ regardless of par edu	421.82	54.27
	- Do not know regardless of par edu	408.25	55.78
Index of students	- High	447.76	61.7
valuing Math	- Medium	418.74	60.49
	- Low	408.32	55.54

Prediction of Science Achievement from Student Variables

In Lebanon, Biology, Physic, and Chemistry are taught as separate subjects. In TIMSS 2003, the three subjects have different variables defined for time doing homework, self-confidence in learning, and valuing the subject. Consequently 13 variables were entered in the stepwise multiple regression with the Average Science Plausible Score as a dependent variable:

1. Index of Time Students Spend Doing Physics Homework
2. Index of Time Students Spend Doing Biology Homework
3. Index of Time Students Spend Doing Chemistry Homework
4. Index of Self-Confidence in Learning Physics
5. Index of Self-Confidence in Learning Biology

6. Index of Self-Confidence in Learning Chemistry
7. Index of Students Valuing Biology
8. Index of Students Valuing Physics
9. Index of Students Valuing Chemistry
10. Index of Students' Perception of Being Safe in School
11. Parents Highest Education Level
12. Students' Educational Aspirations Relative to Parents Educational Level
13. Availability of Computer

The results of the stepwise regression analysis are presented in Table 5.3 and graphically in Figure 5.3. Eight variables accounted more than 1% of the variance each in the science achievement as measured by Average Science Plausible Score. These are:

1. Index of Students' Perception of Being Safe in School (14.8%)
2. Parents Highest Education Level (10.4%)
3. Index of Self-Confidence in Learning Biology (5.7 %)
4. Students' Educational Aspirations Relative to Parents Educational Level (2.4%)
5. Index of Self-Confidence in Learning Physics (2.1%)
6. Index of Time Students Spend Doing Physics Homework (1.8%)
7. Availability of Computer (1.4%)
8. Index of Self-Confidence in Learning Chemistry (1.1%)

The first, third, fifth, and eightieth variables relate to the affective domain of the student while the rest are environmental and belong to the family or the school environments. On the other hand four variables are science-specific while the others are not. For all variables, the higher the value of the variable, the higher is the mean Average Science Plausible Score (Table 5.4).

Referring to the definition of each of these three variables (Appendix 1), one can identify a likely profile of a student with higher science achievement. A student with higher science achievement is likely:

- To have a feeling of being safe in school (not subject to stealing, bullying, intimidation, ridicule, or neglect by other students);
- To have parents with higher educational
- To be self-confident in learning Biology (perceives that he/she usually does well in biology, Biology is easier for him/ her than for many of classmates, Biology is one of his/her strengths, and perceives that he /she learns things quickly in Biology);
  To have higher educational aspiration relative to parents educational level;
- To be self-confident in learning Physics (perceives that he/she usually does well in Physics, Physics is easier for him/ her than for many of classmates, Physics is one of his/her strengths, and perceives that he /she learns things quickly in Physics);
- To spend more time on doing Physics homework
- To have more access to computers at home and school
- To be self-confident in learning Chemistry (perceives that he/she usually does well in Chemistry, Chemistry is easier for him/ her than for many of classmates,

Chemistry is one of his/her strengths, and perceives that he /she learns things quickly in Chemistry).

Teacher Variables

Prediction of Mathematics Achievement from Mathematics Teacher Variables

The following six variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score for the mathematics teacher as dependent variable:

1. Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations on Instruction due to Student Factors
2. Index of Teachers' Emphasis on Mathematics Homework
3. Index of Mathematics Teachers' Perception of School Climate
4. Index of Mathematics Teachers' Perception of Safety in the Schools
5. Class Size For Mathematics Instruction
6. Math Teacher Has Full License or Certification

The results of the stepwise regression analysis are presented in Table 5.5. One variable accounted for more than 1% of the variance in the mathematics achievement each as measured by Average Mathematics Plausible Score:

1. Index of Mathematics Teachers' Perception of Safety in the Schools (9.2%)

The higher mathematics achievement is associated with more favorable perception of the safety in school (Table 5.6).

Referring to the definition of the variable (Appendix 1), one can say that higher mathematics achievement is associated with more favorable teachers' perception of safety in school.(the extent to which the teacher perceives that the school is located in a safe neighborhood, feeling that the teacher is safe at school, and perception of the sufficiency of school security policies and practices).

Table 5.3: R^2 and Proportion of Variance in Average Plausible Science Score due to Significant Student Variables in the Stepwise Regression (Lebanon)

Variables	R^2	Proportion of variance[1]
Idx Std Prcptn Being Safe School	0.148	0.148
Parents Highest Education Level	0.252	0.104
Index Self-Confid Learning Biology	0.309	0.057
Stds Educ Asprtns Rltv to Prnts Educ Lvl	0.333	0.024
Index Self-Confid Learning Physics	0.354	0.021
Index of Time on Physics Homework	0.372	0.018
Availability of Computer	0.386	0.014
Index Self-Confid Learning Chemist	0.398	0.011
Index of Time on Biology Homework	0.402	0.004

[1]   Difference in R^2

Figure 2.3: Proportion of Variance in Average Plausible Science Score due to Significant Student Variables (Lebanon)
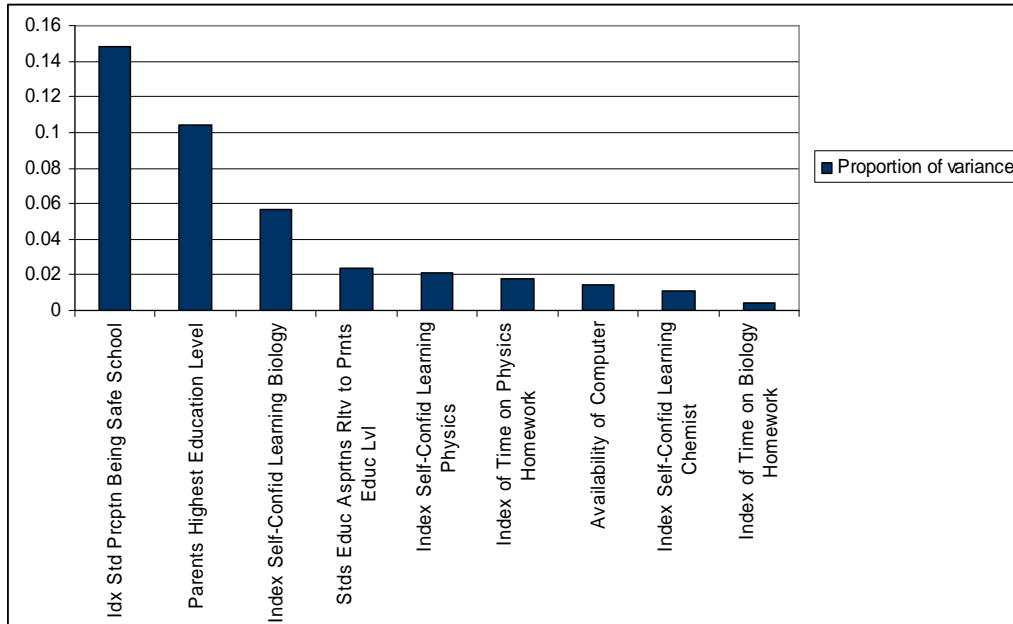
Table 5.4: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant Student Variables (Lebanon)

Variable	Level		Mean	S. D.
Idx Std Prcptn Being Safe School		- High	437.18	80.93
		- Medium	403.00	80.70
	- Low		352.28	74.88
Parents Highest Education Level	- Fini univ / equival / higher		437.15	87.55
	- Fini post-sec voc/techn edu but no univ		423.48	84.94
	- Fini upp sec schooling		409.78	77.30
	- Fini low sec schooling		382.23	75.94
	- No more than prim		352.40	76.50
Index Self-Confid Learning Biology	- High		431.83	84.14
	- Medium		373.85	78.00
	- Low		367.42	73.96
Stds educ asprtns rltv to prnts educ lvl	- Fini univ and either par went to univ		450.57	81.96
	- Fini univ but neither par went to univ		412.72	82.28
	- Not fini univ regardless of par edu		353.13	72.28
	- Do not know regardless of par edu		356.77	78.07

Variable	Level	Mean	S. D.
Index Self-Confid Learning Physics	- High	431.99	86.46
	- Medium	376.73	77.00
	- Low	385.72	80.31
Index of Time on Physics Homework	- High	379.18	82.15
	- Medium	397.19	84.53
	- Low	420.59	85.61
Availability of Computer	- Use computer both at home and school	431.72	84.30
	- Use comp at home but not at school	384.17	82.35
	- Use comp at school but not at home	388.76	80.82
	-Use comp only at places other than home	359.38	77.91
	- Do not use computer at all	371.94	73.91
Index Self-Confid Learning Chemist	- High	427.83	85.45
	- Medium	376.75	77.92
	- Low	367.07	79.70
Index of Time on Biology Homework	- High	378.15	76.46
	- Medium	393.49	84.94
	- Low	422.98	86.17

Table 5.5: R^2 and Proportion of Variance in Average Plausible Math Score due to Significant Teacher Variables in the Stepwise Regression (Lebanon)

Variables	R^2	Proportion of variance[1]
Idx Math Tchr Prcptn Schl Safety	0.093	0.093

[1] Difference in R^2

Table 5.6: Means and Standard Deviation of the Average Plausible Math Score by Levels of Significant Teacher Variables (Lebanon)

Variable	Level	Mean	S. D.
Idx Math Tchr Prcptn Schl Safety	- High	438.55	49.70
	- Medium	408.79	40.16
	- Low	393.31	37.87

Prediction of Science Achievement from Science Teacher Variables

The following six variables were entered in the stepwise multiple regression with the Average Science Plausible Score for the science teacher as dependent variable:

1. Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors
2. Index of Teachers' Emphasis on Science Homework

3. Index of Science Teachers' Perception of School Climate
4. Index of Science Teachers' Perception of Safety in the Schools
5. Class Size For Science Instruction
6. Science Teacher Has Full License or Certification

The results of the stepwise regression analysis are presented in Table 5.7. Four variables accounted for more than 1% of the variance in the science achievement as measured by Average Science Plausible Score:
1. Index of Science Teachers' Perception of Safety in the Schools (17.4%)
2. Index of Science Teachers' Perception of School Climate (3.1%)
3. Class Size for Science Instruction (3.3%)
4. Index of Teachers' Emphasis on Science Homework (2.2%)

The higher the value of the variable the higher science achievement is except for class size and index of teachers' emphasis on homework (Table 4.8).

Referring to the definitions of these variables (Appendix 1), one can the profile of the science teacher whose students have higher science achievement to be likely

- To have favorable teachers' perception of safety in school.(the extent to which the teacher perceives that the school is located in a safe neighborhood, feeling that the teacher is safe at school, and perception of the sufficiency of school security policies and practices
- To have a favorable perception of the school climate (teachers' job satisfaction, teachers' understanding of the school's curricular goals, teachers' degree of success in implementing the school's curriculum, teachers' expectations for student achievement, parental support for student
- To teach larger classes (41 or more students)
- Less emphasis on science homework

Table 5.7: R^2 and Proportion of Variance in Average Plausible Science Score due to Significant Teacher Variables in the Stepwise Regression (Lebanon)

Variables	R^2	Proportion of variance[1]
Idx Science Tchr Prcptn Schl Safety	0.174	0.174
Idx Science Tchr Prcptn Schl Climate	0.205	0.031
Class Size for Science Instruction	0.237	0.033
Idx Tchr Emphasis on Sci Homework	0.260	0.022

[1] Difference in R^2

Table 5.8: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant Teacher Variables (Lebanon)

Variable	Level	Mean	S. D.
Idx Sci Tchr Prcptn	- High	411.14	62.22
Schl Safety	- Medium	347.25	46.50
	- Low	347.73	54.48
Idx Sci Tchr Prcptn	- High	419.13	56.47
Schl Climate	- Medium	406.97	64.71
	- Low	360.80	55.42
Class Size for	1 – 24 Students	394.41	69.61
Science Instruction	25 – 32 Students	389.21	60.25
	33 – 40 Students	424.10	56.45
	41 or more Students	435.69	37.93
Idx Tchr Emphasis	- High	381.91	59.30
on Sci Homework	- Medium	404.82	63.84
	- Low	401.89	74.87

School Variables

Prediction of Mathematics Achievement from School Variables

The following five variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score for the school as dependent variable:

1. Index of Principals' Perception of School Climate
2. Trends in Index of Good School and Class Attendance
3. Trends in Index of Availability of School Resources for Mathematics Instruction
4. Number Of Hours Of School Per Year
5. Number Of Weeks Of School Per Year

The results of the stepwise regression analysis are presented in Table 5.9. Only on variable accounted for more than 1% of the variance in the mathematics achievement as measured by the Average Mathematics Plausible Score:

1. Index of Principals' Perception of School Climate (15.5%)

From Table 5.10, one can notice that the more favorable the principal's perception of school climate the higher is the mathematics achievement of the students in the school

Referring to Appendix 1, one can see that school climate is defined to include the following categories:

a = Teachers' job satisfaction
b = Teachers' understanding of the school's curricular goals
c = Teachers' degree of success in implementing the school's curriculum

d = Teachers' expectations for student achievement
e = Parental support for student achievement
f = Parental involvement in school activities
g = Students' regard for school property
h = Students' desire to do well in school

Table 5.9: R^2 and Proportion of Variance in Average Plausible Math Score due to Significant School Variables in the Stepwise Regression (Lebanon)

Variables	R^2	Proportion of variance[1]
Idx Prncpl Percept School Climate	0.155	0.155

[1] Difference in R^2

Table 5.10: Means and Standard Deviation of the Average Plausible Math Score by Levels of Significant School Variables (Lebanon)

Variable	Level	Mean	S. D.
Idx Prncpl Percept School Climate	- High	457.44	42.34
	- Medium	438.84	49.28
	- Low	395.88	33.44

Prediction of Science Achievement from School Variables

The following five variables were entered in the stepwise multiple regression with the Average Science Plausible Score for the school as dependent variable:

1. Index of Principals' Perception of School Climate
2. Trends in Index of Good School and Class Attendance
3. Trends in Index of Availability of School Resources for Science Instruction
4. Number Of Hours Of School Per Year
5. Number Of Weeks Of School Per Year

The results of the stepwise regression analysis are presented in Table 5.11. One variable accounted for more than 1% of the variance in the science achievement as measured by the Average Science Plausible Score:

1. Index of Principals' Perception of School Climate (14.8 %)

From Table 4.12, one can notice that the more favorable the principal's perception of school climate the higher is the science achievement of the students in the school.

Referring to Appendix 1, one can see that school climate is defined to include the following categories:

a = Teachers' job satisfaction
b = Teachers' understanding of the school's curricular goals
c = Teachers' degree of success in implementing the school's curriculum
d = Teachers' expectations for student achievement

e = Parental support for student achievement
f = Parental involvement in school activities
g = Students' regard for school property
h = Students' desire to do well in school

Table 5.11: R^2 and Proportion of Variance in Average Plausible Science Score due to Significant School Variables in the Stepwise Regression (Lebanon)

Variables	R^2	Proportion of variance[1]
Idx Prncpl Percept School Climate	0.148	0.148

[1] Difference in R^2

Table 5.12: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant School Variables (Lebanon)

Variable	Level	Mean	S. D.
Idx Prncpl Percept School Climate	- High	419.60	58.20
	- Medium	403.38	63.30
	- Low	343.45	42.91

Section 6: the case of Morocco

Using the Morocco TIMSS 2003 student, teacher, and school data files, this section will present the results of the stepwise regression in three main parts: First, student variables will be entered as predictors and the Average Mathematics Plausible Score (AMPS) and Average Science Plausible Score (ASPS) as dependent variable (one at a time); Second, teacher variables will be entered as predictors and the Average Plausible Score for science and math, one at a time ;and third, the school variables as predictors and the Average Plausible Score for science and math as dependent variables, one at a time.

Student Variables

Prediction of Mathematics Achievement from Student Variables

The following seven variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score as dependent variable:

1. Index of Time Students Spend Doing Mathematics Homework
2. Index of Self-Confidence in Learning Mathematics
3. Index of Students Valuing Math
4. Index of Students' Perception of Being Safe in School
5. Parents Highest Education Level

6. Students' Educational Aspirations Relative to Parents Educational Level
7. Availability of Computer

`The results of the stepwise regression analysis are presented in Table 6.1 and graphically in Figure 6.1. Three variables accounted for more than 1% of the variance in the mathematics achievement as measured by Average Mathematics Plausible Score. These are:

1. Index of Self-Confidence in Learning Mathematics (10.8%)
2. Availability of Computer (1.5%)
3. Parents Highest Education Level (1.7%)

It should be noted that that the variable relates to the affective domain of the student while the second variable is environmental and belongs to the family of the student and school/home environment. On the other hand one variable is mathematics-specific while the others are not. For each of the three variables, the higher the value of the variable, the higher is the mean Average Mathematics Plausible Score with the exception of availability of computer where the differences between the levels of this variable are small and not practically significant (Table 6.2).

Referring to the definition of each of these three variables (Appendix 1), one can identify a likely profile of a student with higher mathematics achievement. A student with higher mathematics achievement is likely:

- To be self-confident in learning mathematics (perceives that he/she usually does well in mathematics, mathematics is easier for him/ her than for many of classmates, mathematics is one of his/her strengths, and perceives that he /she learns things quickly in mathematics),
- To have parents with higher educational level

Table 6.1: R2 and Proportion of Variance in Average Plausible Math Score due to Significant Student Variables in the Stepwise Regression (Morocco)

Variables	R^2	Proportion of variance[1]
Index Self-Confid Learning Math	0.108	0.108
Availability of Computer	0.123	0.015
Parents Highest Education Level	0.140	0.017
Stds Educ Asprtns Rltv to Prnts Educ Lvl	0.146	0.005

[1] Difference in R^2

Figure 6.1: Proportion of Variance in Average Plausible Math Score due to Significant Student Variables (Morocco)
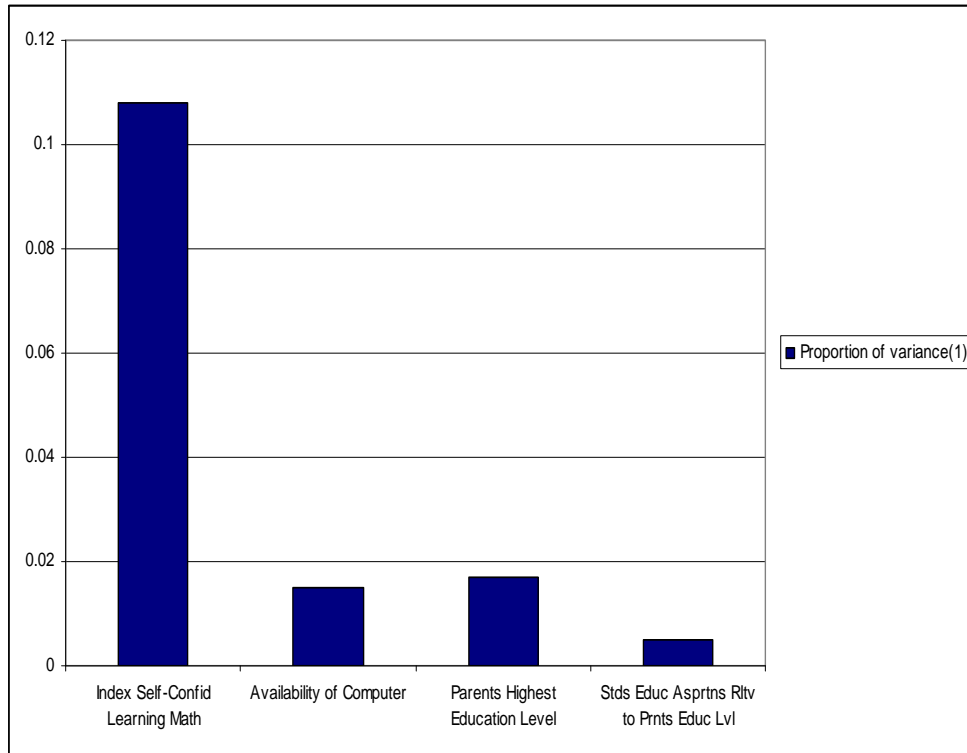
Table 6.2: Means and Standard Deviation of the Average Plausible Math Score by Levels of Significant Student Variables (Morocco)

Variable	Level	Mean	S. D.
Index Self-Confid	- High	414.04	62.42
Learning Math	- Medium	377.52	55.42
	- Low	367.18	53.52
Availability	- Use computer both at home and school	374.55	59.66
of Computer	- Use comp at home but not at school	387.49	63.89
	- Use comp at school but not at home	388.55	61.88
	- Use comp only at places other than home	393.71	60.89
	- Do not use computer at all	392.16	58.91
Parents Highest	- Fini univ / equival / higher	407.01	62.54
Education Level	- Fini upp sec schooling	398.91	60.93
	- Fini low sec schooling	374.85	59.70
	- No more than prim	385.54	58.37

Variable	Level	Mean	S. D.
Stds educ asprtns rltv	- Fini univ and either par went to univ	412.92	61.61
to prnts educ lvl	- Fini univ but neither par went to univ	398.45	63.13
	- Not fini univ regardless of par edu	377.19	53.90
	- Do not know regardless of par edu	382.96	57.73

Prediction of Science Achievement from Student Variables

The following seven variables were entered in the stepwise multiple regression with the Average Science Plausible Score as a dependent variable:

1. Index of Time Students Spend Doing Science Homework
2. Index of Self-Confidence in Learning Science
3. Index of Students Valuing Science
4. Index of Students' Perception of Being Safe in School
5. Parents Highest Education Level
6. Students' Educational Aspirations Relative to Parents Educational Level
7. Availability of Computer

The results of the stepwise regression analysis are presented in Table 6.3 and graphically in Figure 6.3. Four variables accounted for more than 1% of the variance each in the science achievement as measured by Average Science Plausible Score. These are:

1. Index of Self-Confidence in Learning Science (5.4 %)
2. Availability of Computer (2.9%)
3. Parents Highest Education Level (1.4 %)
4. Index of Time Students Spend Doing Science Homework (1.1 %)

The first variable relates to the affective domain of the student while the other variables are environmental and belong to the family of the student. On the other hand one variable is science-specific while the others are not. For the first and third variables, the higher the value of the variable, the higher is the mean Average Science Plausible Score (Table 6.4). There is no clear and significant direction for the differences in the second and fourth variables

Referring to the definition of each of these three variables (Appendix 1), one can identify a likely profile of a student with higher science achievement. A student with higher science achievement is likely:

- To be self-confident in learning science (perceives the he/she usually does well in science, science is easier for him/ her than for many of classmates, science is one of his/her strengths, and perceives that he /she learns things quickly in science),
- To have parents with higher educational level

Table 6.3: R^2 and Proportion of Variance in Average Plausible Science Score due to Significant Student Variables in the Stepwise Regression (Morocco)

Variables	R^2	Proportion of variance[1]
Index Self-Confid Learning Science	0.054	0.054
Availability of Computer	0.083	0.029
Parents Highest Education Level	0.096	0.014
Index of Time on Science Homework	0.107	0.011
Stds Educ Asprtns Rltv to Prnts Educ Lvl	0.111	0.004
Index of Students Valuing Science	0.115	0.003

[1]   Difference in R^2

Figure 6.3: Proportion of Variance in Average Plausible Science Score due to Significant Student Variables (Morocco)
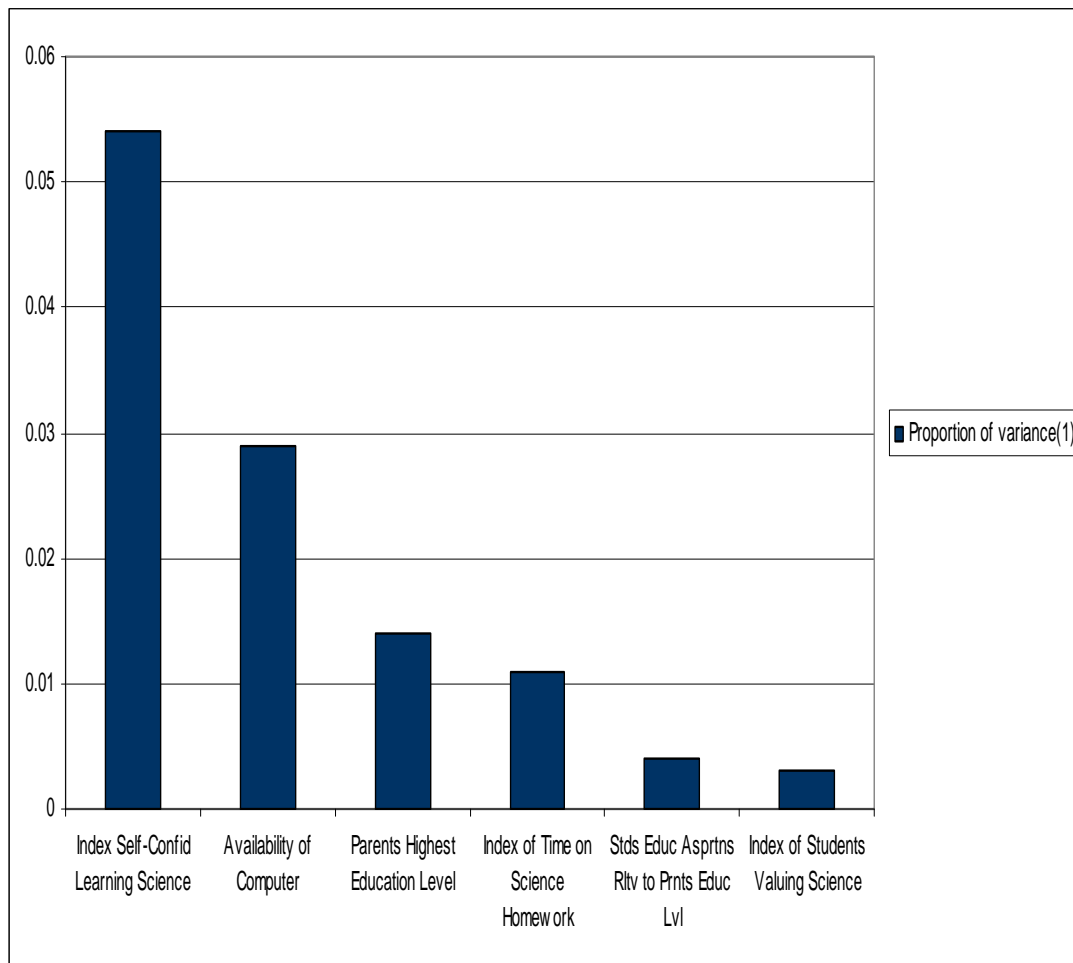
Table 6.4: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant Student Variables (Morocco)

Variable	Level	Mean	S. D.
Index Self-Confid	- High	417.06	61.45
Learning Science	- Medium	387.96	58.07
	- Low	380.41	56.16
Availability of	- Use computer both at home and school	379.10	62.54
Computer	- Use comp at home but not at school	390.76	62.43
	- Use comp at school but not at home	400.34	61.63
	- Use comp only at places other than home	411.47	60.00
	- Do not use computer at all	406.73	58.13
Parents Highest	- Fini univ / equival / higher	414.37	64.05
Education Level	- Fini upp sec schooling	407.50	62.03
	- Fini low sec schooling	389.41	60.19
	- No more than prim	399.51	59.57
Index of Time on	- High	393.49	60.41
Science Homework	- Medium	397.10	61.16
	- Low	410.26	60.73
Stds educ asprtns	- Fini univ and either par went to univ	418.06	64.19
rltv to prnts educ lvl	- Fini univ but neither par went to univ	408.39	62.20
	- Not fini univ regardless of par edu	393.01	58.90
	- Do not know regardless of par edu	396.54	59.24
Index of Students	- High	401.48	62.07
Valuing Science	- Medium	396.40	58.96
	- Low	411.96	59.44

Teacher Variables

Prediction of Mathematics Achievement from Mathematics Teacher Variables

The following six variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score for the mathematics teacher as dependent variable:

4. Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations on Instruction due to Student Factors
5. Index of Teachers' Emphasis on Mathematics Homework
6. Index of Mathematics Teachers' Perception of School Climate
7. Index of Mathematics Teachers' Perception of Safety in the Schools
8. Class Size For Mathematics Instruction

9. Math Teacher Has Full License or Certification

The results of the stepwise regression analysis showed that none of the teachers variables entered in the regression equation when the mathematics achievement each as measured by Average Mathematics Plausible Score was used as dependent variable.

Prediction of Science Achievement from Science Teacher Variables

The following six variables were entered in the stepwise multiple regression with the Average Science Plausible Score for the science teacher as dependent variable:

1. Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors
2. Index of Teachers' Emphasis on Science Homework
3. Index of Science Teachers' Perception of School Climate
4. Index of Science Teachers' Perception of Safety in the Schools
5. Class Size For Science Instruction
6. Math Teacher Has Full License or Certification

The results of the stepwise regression analysis are presented in Table 6.5. One variable accounted for more than 1% of the variance in the science achievement each as measured by Average Science Plausible Score:

1. Index of Science Teachers' Perception of Safety in the Schools (20.6%)

The more favorable the perception of the school safety the science teacher has the more favorable teachers' perception of safety in school (the extent to which the teacher perceives that the school is located in a safe neighborhood, feeling that the teacher is safe at school, and perception of the sufficiency of school security policies and practices) (Table 6.6 and Appendix 1).

Table 6.5: R^2 and Proportion of Variance in Average Plausible Science Score due to Significant Teacher Variables in the Stepwise Regression (Morocco)

Variables	R^2	Proportion of variance[1]
Idx Sci Tchr Prcptn School Safet	0.048	0.048

[1] Difference in R^2

Table 6.6: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant Teacher Variables (Morocco)

Variable	Level	Mean	S. D.
Idx Sci Tchr Prcptn	- High	403.14	26.66
School Safet	- Medium	397.82	28.88
	- Low	387.99	22.60

School Variables

Prediction of Mathematics Achievement from School Variables

The following five variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score for the school as dependent variable:

16. Index of Principals' Perception of School Climate
17. Trends in Index of Good School and Class Attendance
18. Trends in Index of Availability of School Resources for Mathematics Instruction
19. Number Of Hours Of School Per Year
20. Number Of Weeks Of School Per Year

The results of the stepwise regression analysis show that no school variable entered the regression equation when the mathematics achievement each as measured by Average Mathematics Plausible Score was used as dependent variable:

Prediction of Science Achievement from School Variables

The following five variables were entered in the stepwise multiple regression with the Average Science Plausible Score for the school as dependent variable:

21. Index of Principals' Perception of School Climate
22. Trends in Index of Good School and Class Attendance
23. Trends in Index of Availability of School Resources for Science Instruction
24. Number Of Hours Of School Per Year
25. Number Of Weeks Of School Per Year

The results of the stepwise regression analysis are presented in Table 6.7. One variable accounted for more than 1% each of the variance in the science achievement as measured by the Average Science Plausible Score:

-Trends in Index of Availability of School Resources for Science Instruction (14.9%)

One can notice that the differences in the levels of this variable are small and not consistent. (Table 6.8)

Resources for science instruction include (Appendix 1):

a = Instructional materials (e.g., textbook);
b = Budget for supplies (e.g., paper, pencils);
c = School buildings and grounds;
d = Heating/cooling and lightening systems;
e = Instructional space (e.g., classrooms);
l = science laboratory equipment and materials;
m = Computers for science instruction;
n = Computer software for science instruction;
o = Calculators for science instruction;
p = Library materials relevant to science instruction;
q = Audio-visual resources for science instruction

Table 6.7: R² and Proportion of Variance in Average Plausible Science Score due to Significant School Variables in the Stepwise Regression (Morocco)

Variables	R^2	Proportion of variance[1]
Idx Avlbl Schl Rsrcs Sci Instr	0.149	0.149

[1] Difference in R^2

Table 6.8: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant School Variables (Morocco)

Variable	Level	Mean	S. D.
Idx Avlbl Schl	- High	389.33	26.40
Rsrcs Sci Instr	- Medium	398.66	28.69
	- Low	404.33	27.97

Section 7: the Case of Palestine

Using the Palestine TIMSS 2003 student, teacher, and school data files, this section will present the results of the stepwise regression in three main parts: First, student variables will be entered as predictors and the Average Mathematics Plausible Score (AMPS) and Average Science Plausible Score (ASPS) as dependent variable (one at a time); Second, teacher variables will be entered as predictors and the Average Plausible Score for science and math, one at a time ;and third, the school variables as predictors and the Average Plausible Score for science and math as dependent variables, one at a time.

Student Variables

Prediction of Mathematics Achievement from Student Variables

The following seven variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score as dependent variable:

1. Index of Time Students Spend Doing Mathematics Homework
2. Index of Self-Confidence in Learning Mathematics
3. Index of Students Valuing Math
4. Index of Students' Perception of Being Safe in School
5. Parents Highest Education Level
6. Students' Educational Aspirations Relative to Parents Educational Level
7. Availability of Computer

The results of the stepwise regression analysis are presented in Table 7.1 and graphically in Figure 7.1. Four variables accounted for more than 1% of the variance in the mathematics achievement as measured by Average Mathematics Plausible Score. These are:

1. Index of Self-Confidence in Learning Mathematics (13.2%)
2. Parents Highest Education Level (5.6%)
3. Index of Students' Perception of Being Safe in School (2.2%)
3. Students' Educational Aspirations Relative to Parents Educational Level (1.9%)

It should be noted that the first variable relates to the affective domain of the student while the rest are environmental and belong to the family of the student and school/home environment. On the other hand one variable is mathematics-specific while the others are not. For each of the three variables, the higher the value of the variable, the higher is the mean Average Mathematics Plausible (Table 7.2).

Referring to the definition of each of these variables (Appendix 1), one can identify a likely profile of a student with higher mathematics achievement. A student with higher mathematics achievement is likely:

- To be self-confident in learning mathematics (perceives that he/she usually does well in mathematics, mathematics is easier for him/ her than for many of classmates, mathematics is one of his/her strengths, and perceives that he /she learns things quickly in mathematics),
- To have parents with higher educational level
- To have a feeling of being safe in school (not subject to stealing, bullying, intimidation, ridicule, or neglect by other students);
- To have higher educational aspirations relative to parents educational level,

Table 7.1: R^2 and Proportion of Variance in Average Plausible Math Score due to Significant Student Variables in the Stepwise Regression (Palestine)

Variables	R^2	Proportion of variance[1]
Index Self-Confid Learning Math	0.132	0.132
Parents Highest Education Level	0.188	0.056
Idx Std Prcptn Being Safe School	0.210	0.022
Stds Educ Asprtns Rltv to Prnts Educ Lvl	0.229	0.019
Index of Students Valuing Math	0.236	0.007

[1] Difference in R^2

Figure 7.1: Proportion of Variance in Average Plausible Math Score due to Significant Student Variables (Palestine)
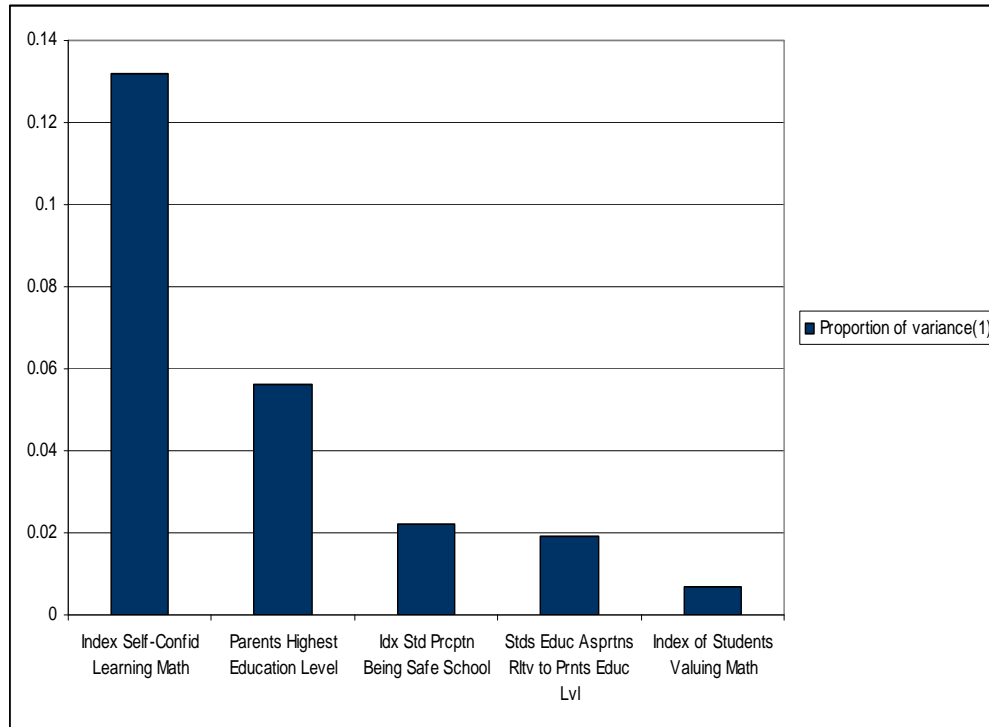
Table 7.2: Means and Standard Deviation of the Average Plausible Math Score by Levels of Significant Student Variables (Palestine)

Variable	Level	Mean	S. D.
Index Self-Confid	- High	428.23	88.34
Learning Math	- Medium	369.68	72.81
	- Low	355.51	68.66
Parents Highest	- Fini univ / equival / higher	426.09	85.37
Education Level	- Fini post-sec voc/techn edu but no univ	400.48	88.72
	- Fini upp sec schooling	396.43	77.86
	- Fini low sec schooling	368.36	77.83
	- No more than prim	337.84	74.20
Idx Std Prcptn	- High	410.75	82.27
Being Safe School	- Medium	387.41	85.37
	- Low	361.43	82.14

Variable	Level	Mean	S. D.
Stds educ asprtns	- Fini univ and either par went to univ	440.02	84.16
rltv to prnts educ lvl	- Fini univ but neither par went to univ	412.98	79.48
	- Not fini univ regardless of par edu	349.42	73.26
	- Do not know regardless of par edu	378.96	76.12
Index of Students	- High	403.86	84.74
Valuing Math	- Medium	354.11	75.91
	- Low	343.66	70.48

Prediction of Science Achievement from Student Variables

The following seven variables were entered in the stepwise multiple regression with the Average Science Plausible Score as a dependent variable:

1. Index of Time Students Spend Doing Science Homework
2. Index of Self-Confidence in Learning Science
3. Index of Students Valuing Science
4. Index of Students' Perception of Being Safe in School
5. Parents Highest Education Level
6. Students' Educational Aspirations Relative to Parents Educational Level
7. Availability of Computer

The results of the stepwise regression analysis are presented in Table 7.3 and graphically in Figure 7.3. Four variables accounted more than 1% of the variance each in the science achievement as measured by Average Science Plausible Score. These are:

1. Index of Self-Confidence in Learning Science (10.3 %)
2. Students' Educational Aspirations Relative to Parents Educational Level (5.5 %)
8. Index of Students' Perception of Being Safe in School (2.2%)
3. Parents Highest Education Level (1.8%)

The first variable relates to the affective domain of the student while the rest of the variables are environmental and belong to the family and/or school environments. On the other hand one variable is science-specific while the others are not. For each of the three variables, the higher the value of the variable, the higher is the mean Average Science Plausible Score (Table 7.4).

Referring to the definition of each of these three variables (Appendix 1), one can identify a likely profile of a student with higher science achievement. A student with higher science achievement is likely

- To be self-confident in learning science (perceives the he/she usually does well in science, science is easier for him/ her than for many of classmates, science is one of his/her strengths, and perceives that he /she learns things quickly in science),
- To have higher educational aspirations relative to parents educational level,
- To have a feeling of being safe in school (not subject to stealing, bullying, intimidation, ridicule, or neglect by other students);
- To have parents with higher educational level.

Table 7.3: R^2 and Proportion of Variance in Average Plausible Science Score due to Significant Student Variables in the Stepwise Regression (Palestine)

Variables	R^2	Proportion of variance[1]
Index Self-Confid Learning Science	0.103	0.103
Stds Educ Asprtns Rltv to Prnts Educ Lvl	0.158	0.055
Idx Std Prcptn Being Safe School	0.180	0.022
Parents Highest Education Level	0.198	0.018
Index of Students Valuing Science	0.206	0.009
Index of Time on Science Homework	0.208	0.002

[1]   Difference in R^2

Figure 7.3: Proportion of Variance in Average Plausible Science Score due to Significant Student Variables (Palestine)
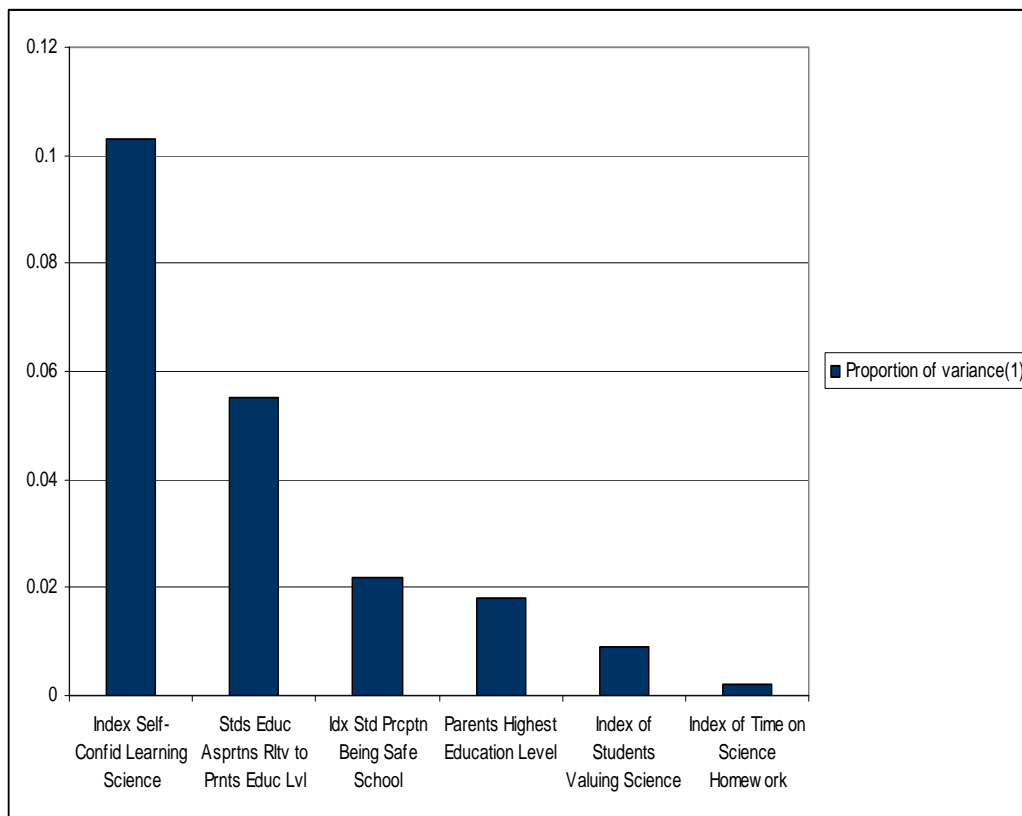
Table 7.4: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant Student Variables (Palestine)

Variable	Level	Mean	S. D.
Index Self-Confid	- High	461.89	82.55
Learning Science	- Medium	408.84	78.05
	- Low	383.48	86.05
Stds educ asprtns	- Fini univ and either par went to univ	483.70	79.59
rltv to prnts educ lvl	- Fini univ but neither par went to univ	458.98	78.01
	- Not fini univ regardless of par edu	393.54	79.03
	- Do not know regardless of par edu	425.77	78.31
Idx Std Prcptn	- High	455.54	78.97
Being Safe School	- Medium	432.54	87.26
	- Low	406.69	89.17
Parents Highest	- Fini univ / equival / higher	469.30	84.16
Education Level	- Fini post- sec voc/techn edu but no univ	442.58	90.99
	- Fini upp sec schooling	441.40	76.83
	- Fini low sec schooling	419.91	81.32
	- No more than prim	382.06	81.78
Index of Students	- High	447.78	82.07
Valuing Science	- Medium	395.55	87.79
	- Low	382.73	91.58
Index of Time on	- High	432.42	83.46
Science Homework	- Medium	442.20	83.81
	- Low	443.74	88.70

Teacher Variables

Prediction of Mathematics Achievement from Mathematics Teacher Variables

The following six variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score for the mathematics teacher as dependent variable:

1. Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations on Instruction due to Student Factors
2. Index of Teachers' Emphasis on Mathematics Homework
3. Index of Mathematics Teachers' Perception of School Climate
4. Index of Mathematics Teachers' Perception of Safety in the Schools
5. Class Size For Mathematics Instruction
6. Math Teacher Has Full License or Certification

The results of the stepwise regression analysis showed that none of the teachers' variables entered in the regression equation when the mathematics achievement each as measured by Average Mathematics Plausible Score was used as dependent variable.

Prediction of Science Achievement from Science Teacher Variables

The following six variables were entered in the stepwise multiple regression with the Average Science Plausible Score for the science teacher as dependent variable:

1. Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors
2. Index of Teachers' Emphasis on Science Homework
3. Index of Science Teachers' Perception of School Climate
4. Index of Science Teachers' Perception of Safety in the Schools
5. Class Size For Science Instruction
6. Math Teacher Has Full License or Certification

The results of the stepwise regression analysis showed that none of the teachers' variables entered in the regression equation when the science achievement each as measured by Average Science Plausible Score:

School Variables

Prediction of Mathematics Achievement from School Variables

The following five variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score for the school as dependent variable:

1. Index of Principals' Perception of School Climate
2. Trends in Index of Good School and Class Attendance
3. Trends in Index of Availability of School Resources for Mathematics Instruction
4. Number Of Hours Of School Per Year
5. Number Of Weeks Of School Per Year

The results of the stepwise regression analysis (Table 7.5) show that one school variable entered the regression equation when the mathematics achievement as measured by Average Mathematics Plausible Score was used as dependent variable:
- Index of Principals' Perception of School Climate (18.5%)

From Table 7.6, one can see that the more favorable the principal's perception of school climate the higher the mathematics achievement of the school.

Referring to Appendix 1, one can see that school climate is defined to include the following categories:

a = Teachers' job satisfaction
b = Teachers' understanding of the school's curricular goals
c = Teachers' degree of success in implementing the school's curriculum
d = Teachers' expectations for student achievement
e = Parental support for student achievement

f = Parental involvement in school activities
g = Students' regard for school property

Table 7.5: R^2 and Proportion of Variance in Average Plausible Math Score due to Significant School Variables in the Stepwise Regression (Palestine)

Variables	R^2	Proportion of variance[1]
Idx Prncpl Percept School Climate	0.185	0.185

[1] Difference in R^2

Table 7.6: Means and Standard Deviation of the Average Plausible Math Score by Levels of Significant School Variables (Palestine)

Variable	Level	Mean	S. D.
Idx Prncpl Percept	- High	414.78	46.00
School Climate	- Medium	389.63	37.93
	- Low	363.37	43.01

Prediction of Science Achievement from School Variables

The following five variables were entered in the stepwise multiple regression with the Average Science Plausible Score for the school as dependent variable:

6. Index of Principals' Perception of School Climate
7. Trends in Index of Good School and Class Attendance
8. Trends in Index of Availability of School Resources for Science Instruction
9. Number Of Hours Of School Per Year
10. Number Of Weeks Of School Per Year

The results of the stepwise regression analysis are presented in Table 6.7. One variable accounted for more than 1% each of the variance in the science achievement as measured by the Average Science Plausible Score:

- Index of Principals' Perception of School Climate (17.1%)

From Table 7.8, one can see that the more favorable the principal's perception of school climate the higher the science achievement of the school.

Referring to Appendix 1, one can see that school climate is defined to include the following categories:

a = Teachers' job satisfaction
b = Teachers' understanding of the school's curricular goals
c = Teachers' degree of success in implementing the school's curriculum
d = Teachers' expectations for student achievement
e = Parental support for student achievement
f = Parental involvement in school activities
g = Students' regard for school property

Table 7.7: R² and Proportion of Variance in Average Plausible Science Score due to Significant School Variables in the Stepwise Regression (Palestine)

Variables	R^2	Proportion of variance[1]
Idx Prncpl Percept School Climate	0.171	0.171

[1]   Difference in R^2

Table 7.8: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant School Variables (Palestine)

Variable	Level	Mean	S. D.
Idx Prncpl Percept	- High	458.97	43.49
School Climate	- Medium	434.77	38.65
	- Low	411.71	36.05

Section 8: the Case of Saudi Arabia

Using the Saudi Arabia TIMSS 2003 student, teacher, and school data files, this section will present the results of the stepwise regression in three main parts: First, student variables will be entered as predictors and the Average Mathematics Plausible Score (AMPS) and Average Science Plausible Score (ASPS) as dependent variable (one at a time); Second, teacher variables will be entered as predictors and the Average Plausible Score for science and math, one at a time ;and third, the school variables as predictors and the Average Plausible Score for science and math as dependent variables, one at a time.

Student Variables

Prediction of Mathematics Achievement from Student Variables

The following seven variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score as dependent variable:

1. Index of Time Students Spend Doing Mathematics Homework
2. Index of Self-Confidence in Learning Mathematics
3. Index of Students Valuing Math
4. Index of Students' Perception of Being Safe in School
5. Parents Highest Education Level
6. Students' Educational Aspirations Relative to Parents Educational Level
7. Availability of Computer

The results of the stepwise regression analysis are presented in Table 8.1 and graphically in Figure 8.1. Four variables accounted for more than 1% of the variance in the mathematics achievement as measured by Average Mathematics Plausible Score. These are:

1. Index of Self-Confidence in Learning Mathematics (11.0%)
2. Parents Highest Education Level (5.1%)
3. Students' Educational Aspirations Relative to Parents Educational Level (1.6%)
4. Index of Time Students Spend Doing Mathematics Homework (1.4%)

It should be noted that the first variable relates to the affective domain of the student while the rest are environmental and belong to the family of the student and school/home environment. On the other hand two variables are mathematics-specific while the others are not. For each of the four variables, the higher the value of the variable, the higher is the mean Average Mathematics Plausible with the exception of index of time spent doing mathematics homework, where the higher the time spent the lower is the mathematics achievement (Table 8.2).

Referring to the definition of each of these variables (Appendix 1), one can identify a likely profile of a student with higher mathematics achievement. A student with higher mathematics achievement is likely:

- To be self-confident in learning mathematics (perceives that he/she usually does well in mathematics, mathematics is easier for him/ her than for many of classmates, mathematics is one of his/her strengths, and perceives that he /she learns things quickly in mathematics),
- To have parents with higher educational level
- To have a higher educational aspirations relevant to parents educational level;
- To spend less time doing mathematics achievement

Table 8.1: R^2 and Proportion of Variance in Average Plausible Math Score due to Significant Student Variables in the Stepwise Regression (Saudi Arabia)

Variables	R^2	Proportion of variance[1]
Index Self-Confid Learning Math	0.110	0.110
Parents Highest Education Level	0.162	0.051
Stds Educ Asprtns Rltv to Prnts Educ Lvl	0.178	0.016
Index of Time on Math Homework	0.192	0.014
Availability of Computer	0.197	0.005
Index of Students Valuing Math	0.199	0.003

[1] Difference in R^2

Figure 8.1: Proportion of Variance in Average Plausible Math Score due to Significant Student Variables (Saudi Arabia)
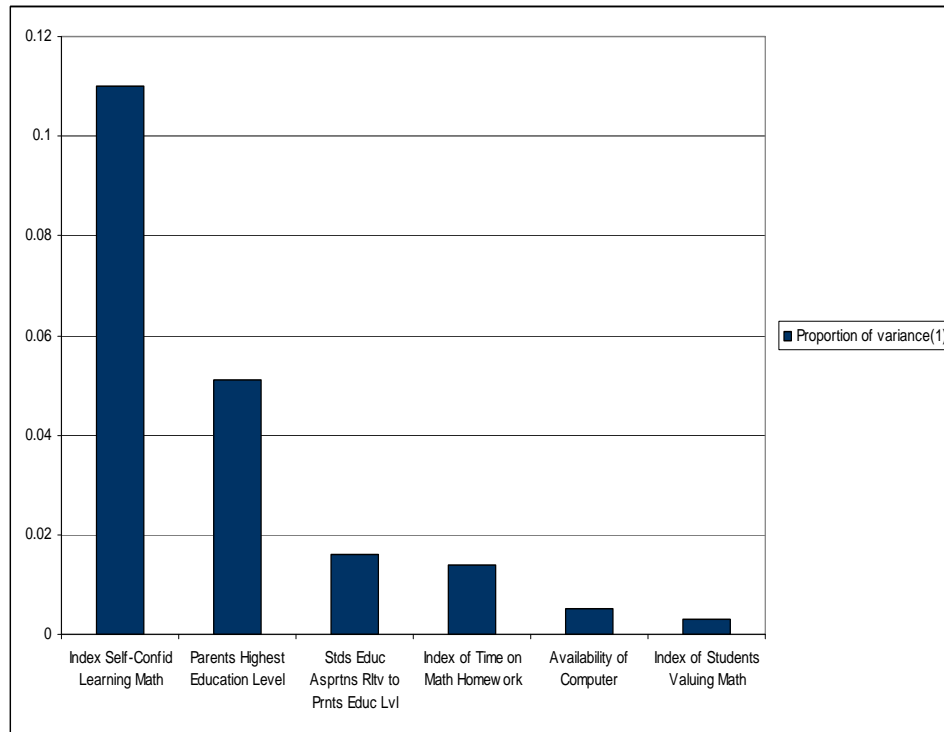
Table 8.2: Means and Standard Deviation of the Average Plausible Math Score by Levels of Significant Student Variables (Saudi Arabia)

Variable	Level	Mean	S. D.
Index Self-Confid	- High	360.86	69.04
Learning Math	- Medium	324.90	59.28
	- Low	307.62	57.17
Parents Highest	- Fini univ / equival / higher	364.67	70.35
Education Level	- Fini upp sec schooling	340.91	67.16
	- Fini low sec schooling	326.01	63.23
	- No more than prim	320.72	62.38
Stds educ asprtns	- Fini univ and either par went to univ	374.67	69.67
rltv to prnts educ lvl	- Fini univ but neither par went to univ	340.55	63.55
	- Not fini univ regardless of par edu	309.00	61.08
	- Do not know regardless of par edu	323.80	61.20

Variable	Level	Mean	S. D.
Index of Time on	- High	320.19	63.46
Math Homework	- Medium	335.87	65.74
	- Low	347.40	70.44
Availability of Computer	- Use computer both at home and school	350.81	73.68
	- Use comp at home but not at school	343.41	67.74
	- Use comp at school but not at home	328.46	66.03
	- Use comp only at places other than home	314.14	66.72
	- Do not use computer at all	322.41	58.43
Index of Students	- High	341.01	67.12
Valuing Math	- Medium	332.53	65.93
	- Low	324.89	59.81

Prediction of Science Achievement from Student Variables

The following seven variables were entered in the stepwise multiple regression with the Average Science Plausible Score as a dependent variable:

1. Index of Time Students Spend Doing Science Homework
2. Index of Self-Confidence in Learning Science
3. Index of Students Valuing Science
4. Index of Students' Perception of Being Safe in School
5. Parents Highest Education Level
6. Students' Educational Aspirations Relative to Parents Educational Level
7. Availability of Computer

The results of the stepwise regression analysis are presented in Table 8.3 and graphically in Figure 8.3. Three variables accounted more than 1% of the variance each in the science achievement as measured by Average Science Plausible Score. These are:

1. Index of Self-Confidence in Learning Science (7.7 %)
2. Parents Highest Education Level (4.0 %)
3. Students' Educational Aspirations Relative to Parents Educational Level (1.3%)

The first variable relates to the affective domain of the student while the rest of the variables are environmental and belong to the family and/or school environments. On the other hand one variable is science-specific while the others are not. For each of the three variables, the higher the value of the variable, the higher is the mean Average Science Plausible Score (Table 7.4).

Referring to the definition of each of these three variables (Appendix 1), one can identify a likely profile of a student with higher science achievement. A student with higher science achievement is likely

- To be self-confident in learning science (perceives the he/she usually does well in science, science is easier for him/ her than for many of classmates, science is

one of his/her strengths, and perceives that he/she learns things quickly in science),

- To have parents with higher educational level
- To have higher educational aspirations relative to parents educational level.

Table 8.3: R^2 and Proportion of Variance in Average Plausible Science Score due to Significant Student Variables in the Stepwise Regression (Saudi Arabia)

Variables	R^2	Proportion of variance[1]
Index Self-Confid Learning Science	0.077	0.077
Parents Highest Education Level	0.117	0.040
Stds Educ Asprtns Rltv to Prnts Educ Lvl	0.130	0.013
Index of Students Valuing Science	0.134	0.004
Idx Std Prcptn Being Safe School	0.135	0.001

[1] Difference in R^2

Figure 8.3: Proportion of Variance in Average Plausible Science Score due to Significant Student Variables (Saudi Arabia)
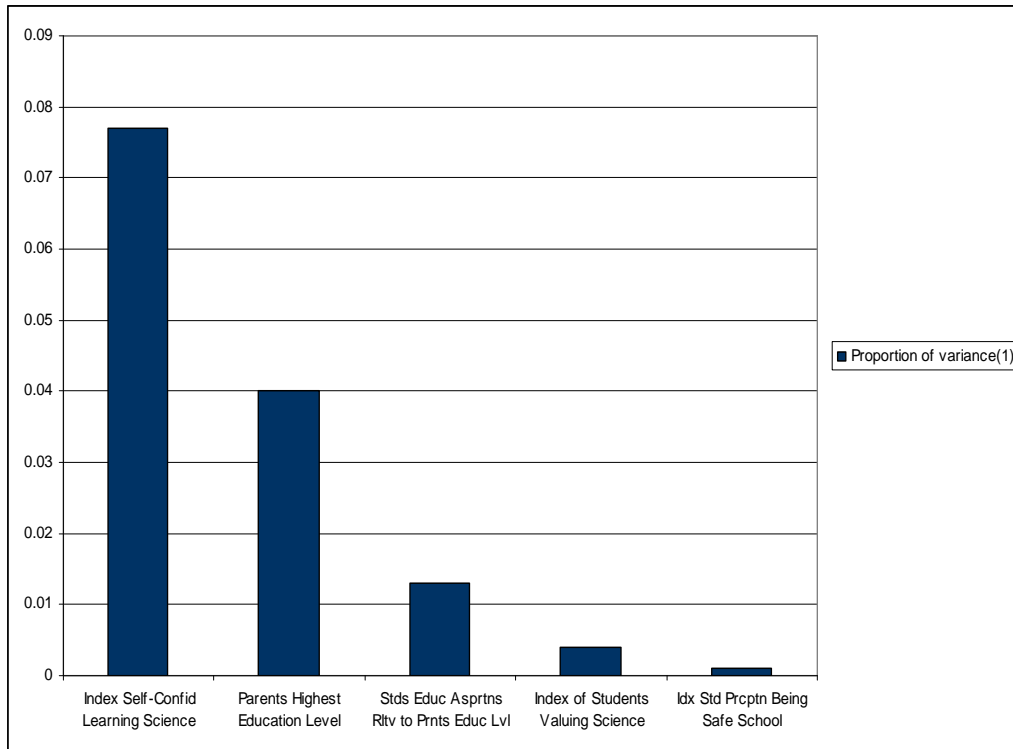
Table 8.4: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant Student Variables (Saudi Arabia)

Variable	Level	Mean	S. D.
Index Self-Confid	- High	417.53	61.75
Learning Science	- Medium	382.15	58.75
	- Low	372.75	58.88
Parents Highest	- Fini univ / equival / higher	425.23	67.37
Education Level	- Fini upp sec schooling	404.57	62.32
	- Fini low sec schooling	390.83	62.19
	- No more than prim	391.55	58.63
Stds educ asprtns	- Fini univ and either par went to univ	433.46	66.83
rltv to prnts educ lvl	- Fini univ but neither par went to univ	406.27	59.12
	- Not fini univ regardless of par edu	380.38	57.80
	- Do not know regardless of par edu	393.69	59.84
Index of Students	- High	403.00	62.95
Valuing Science	- Medium	397.85	64.72
	- Low	397.89	61.20
Idx Std Prcptn Being	- High	403.26	60.23
Safe School	- Medium	404.49	64.70
	- Low	387.62	68.32

Teacher Variables

Prediction of Mathematics Achievement from Mathematics Teacher Variables

The following six variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score for the mathematics teacher as dependent variable:

1. Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations on Instruction due to Student Factors
2. Index of Teachers' Emphasis on Mathematics Homework
3. Index of Mathematics Teachers' Perception of School Climate
4. Index of Mathematics Teachers' Perception of Safety in the Schools
5. Class Size For Mathematics Instruction
6. Math Teacher Has Full License or Certification

The results of the stepwise regression analysis are presented in Table 8.5. One variable accounted for more than 1% of the variance in the mathematics achievement each as measured by Average Mathematics Plausible Score:

1. Index of Mathematics Teachers' Perception of Safety in the Schools (20.6%)

The more favorable the perception of the school safety the mathematics teacher has the more favorable teachers' perception of safety in school (the extent to which the teacher

perceives that the school is located in a safe neighborhood, feeling that the teacher is safe at school, and perception of the sufficiency of school security policies and practices) (Table 8.6 and Appendix 1).

Table 8.5: R^2 and Proportion of Variance in Average Plausible Math Score due to Significant Teacher Variables in the Stepwise Regression (Saudi Arabia)

Variables	R^2	Proportion of variance[1]
Idx Math Tchr Prcptn Schl Safety	0.034	0.034

[1] Difference in R^2

Table 8.6: Means and Standard Deviation of the Average Plausible Math Score by Levels of Significant Teacher Variables (Saudi Arabia)

Variable	Level	Mean	S. D.
Idx Math Tchr	- High	333.58	35.74
Prcptn Schl Safety	- Medium	325.11	27.63
	- Low	307.70	37.11

Prediction of Science Achievement from Science Teacher Variables

The following six variables were entered in the stepwise multiple regression with the Average Science Plausible Score for the science teacher as dependent variable:

1. Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors
2. Index of Teachers' Emphasis on Science Homework
3. Index of Science Teachers' Perception of School Climate
4. Index of Science Teachers' Perception of Safety in the Schools
5. Class Size For Science Instruction
6. Science Teacher Has Full License or Certification

The results of the stepwise regression analysis are presented in Table 8.7. One variable accounted for more than 1% of the variance in the science achievement each as measured by Average Science Plausible Score:

1. Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors (4.0%)

Students whose teachers reported high limitations on instructions due to student factors (students with different academic abilities, students who come from a wide range of backgrounds, students with special needs, uninterested students, low morale among students, disruptive students)have lower science achievement than those who reported low limitations on instructions due to student factors.

Table 8.7: R² and Proportion of Variance in Average Plausible Science Score due to Significant Teacher Variables in the Stepwise Regression (Saudi Arabia)

Variables	R^2	Proportion of variance[1]
Idx Tch Rpt Sc Clss Wo Lim Fctrs	0.040	0.040

[1] Difference in R^2

Table 8.8: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant Teacher Variables (Saudi Arabia)

Variable	Level	Mean	S. D.
Idx Tch Rpt Sc	- High	405.26	34.97
Clss Wo Lim Fctrs	- Medium	397.18	29.15
	- Low	389.46	36.67

School Variables

Prediction of Mathematics Achievement from School Variables

The following five variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score for the school as dependent variable:

1. Index of Principals' Perception of School Climate
2. Trends in Index of Good School and Class Attendance
3. Trends in Index of Availability of School Resources for Mathematics Instruction
4. Number Of Hours Of School Per Year
5. Number Of Weeks Of School Per Year

The results of the stepwise regression analysis show that none of the school variables entered the regression equation when the mathematics achievement as measured by Average Mathematics Plausible Score was used as dependent variable.

Prediction of Science Achievement from School Variables

The following five variables were entered in the stepwise multiple regression with the Average Science Plausible Score for the school as dependent variable:

6. Index of Principals' Perception of School Climate
7. Trends in Index of Good School and Class Attendance
8. Trends in Index of Availability of School Resources for Mathematics Instruction
9. Number Of Hours Of School Per Year
10. Number Of Weeks Of School Per Year

The results of the stepwise regression analysis show that none of the school variables entered the regression equation when the science achievement as measured by Average Science Plausible Score was used as dependent variable.

Section 9: the Case of Tunis

Using the Tunis TIMSS 2003 student, teacher, and school data files, this section will present the results of the stepwise regression in three main parts: First, student variables will be entered as predictors and the Average Mathematics Plausible Score (AMPS) and Average Science Plausible Score (ASPS) as dependent variable (one at a time); Second, teacher variables will be entered as predictors and the Average Plausible Score for science and math, one at a time ;and third, the school variables as predictors and the Average Plausible Score for science and math as dependent variables, one at a time.

Student Variables

Prediction of Mathematics Achievement from Student Variables

The following seven variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score as dependent variable:

1. Index of Time Students Spend Doing Mathematics Homework
2. Index of Self-Confidence in Learning Mathematics
3. Index of Students Valuing Math
4. Index of Students' Perception of Being Safe in School
5. Parents Highest Education Level
6. Students' Educational Aspirations Relative to Parents Educational Level
7. Availability of Computer

The results of the stepwise regression analysis are presented in Table 9.1 and graphically in Figure 9.1. Two variables accounted for more than 1% of the variance in the mathematics achievement as measured by Average Mathematics Plausible Score. These are:

1. Index of Self-Confidence in Learning Mathematics (15.5%)
2. Parents Highest Education Level (6.4%)

It should be noted that the first variable relates to the affective domain of the student while the second belongs to the family environment. On the other hand one variable is mathematics-specific while the second is not. For each of the two variables, the higher the value of the variable, the higher is the mean Average Mathematics Plausible (Table 9.2).

Referring to the definition of each of these variables (Appendix 1), one can identify a likely profile of a student with higher mathematics achievement. A student with higher mathematics achievement is likely:

- To be self-confident in learning mathematics (perceives that he/she usually does well in mathematics, mathematics is easier for him/ her than for many of classmates, mathematics is one of his/her strengths, and perceives that he /she learns things quickly in mathematics),
- To have parents with higher educational level

Table 9.1: R^2 and Proportion of Variance in Average Plausible Math Score due to Significant Student Variables in the Stepwise Regression (Tunisia)

Variables	R^2	Proportion of variance[1]
Index Self-Confid Learning Math	0.155	0.155
Parents Highest Education Level	0.219	0.064
Availability of Computer	0.226	0.008
Index of Students Valuing Math	0.228	0.002
Stds Educ Asprtns Rltv to Prnts Educ Lvl	0.229	0.001

[1]   Difference in R^2

Figure 9.1: Proportion of Variance in Average Plausible Math Score due to Significant Student Variables (Tunisia)
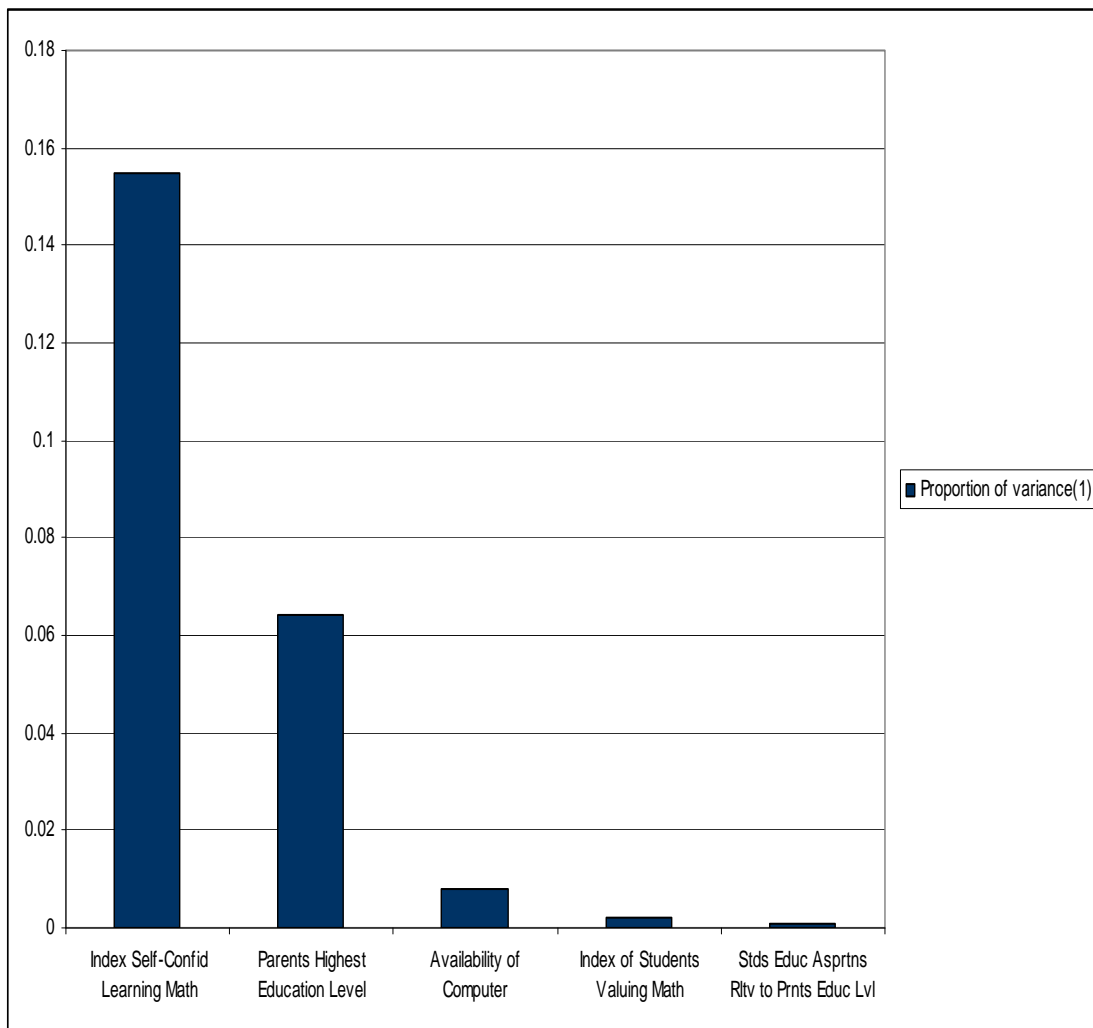
**Table 9.2: Means and Standard Deviation of the Average Plausible Math Score
by Levels of Significant Student Variables (Tunisia)**

Variable	Level	Mean	S. D.
Index Self-Confid	- High	435.86	55.41
Learning Math	- Medium	399.73	48.17
	- Low	383.99	41.35
Parents Highest	- Fini univ / equival / higher	437.06	64.56
Education Level	- Fini post- sec voc/techn edu but no univ	436.56	57.93
	- Fini upp sec schooling	418.79	54.74
	- Fini low sec schooling	405.23	48.75
	- No more than prim	397.60	47.87
Availability of	- Use computer both at home and school	421.79	58.62
Computer	- Use comp at home but not at school	429.84	62.41
	- Use comp at school but not at home	408.47	53.39
	- Use comp only at places other than home	412.66	53.95
	- Do not use computer at all	399.57	47.78
Index of Students	- High	417.51	54.99
Valuing Math	- Medium	395.26	49.05
	- Low	385.70	46.50
Stds educ asprtns	- Fini univ and either par went to univ	452.95	59.85
rltv to prnts educ lvl	- Fini univ but neither par went to univ	416.59	55.23
	- Not fini univ regardless of par edu	396.59	49.64
	- Do not know regardless of par edu	406.22	48.98

Prediction of Science Achievement from Student Variables

The following seven variables were entered in the stepwise multiple regression with the Average Science Plausible Score as a dependent variable:

1. Index of Time Students Spend Doing Science Homework
2. Index of Self-Confidence in Learning Science
3. Index of Students Valuing Science
4. Index of Students' Perception of Being Safe in School
5. Parents Highest Education Level
6. Students' Educational Aspirations Relative to Parents Educational Level
7. Availability of Computer

The results of the stepwise regression analysis are presented in Table 9.3 and graphically in Figure 9.3. Two variables accounted more than 1% of the variance each in the science achievement as measured by Average Science Plausible Score. These are:

1. Parents Highest Education Level (7.1 %)
2. Index of Self-Confidence in Learning Science (3.8 %)

The first variable relates to the family environment while the second relates to the affective domain of the student. On the other hand one variable is science-specific while the others are not. For each of the three variables, the higher the value of the variable, the higher is the mean Average Science Plausible Score (Table 9.4).

Referring to the definition of each of these three variables (Appendix 1), one can identify a likely profile of a student with higher science achievement. A student with higher science achievement is likely:

- To have parents with higher educational level
- To be self-confident in learning science (perceives the he/she usually does well in science, science is easier for him/ her than for many of classmates, science is one of his/her strengths, and perceives that he/she learns things quickly in science),

Table 9.3: R^2 and Proportion of Variance in Average Plausible Science Score due to Significant Student Variables in the Stepwise Regression (Tunisia)

Variables	R^2	Proportion of variance[1]
Parents Highest Education Level	0.071	0.071
Index Self-Confid Learning Science	0.109	0.038
Index of Time on Science Homework	0.117	0.008
Availability of Computer	0.122	0.005
Stds Educ Asprtns Rltv to Prnts Educ Lvl	0.124	0.002
Idx Std Prcptn Being Safe School	0.125	0.001

[1] Difference in R^2

Figure 9.3: Proportion of Variance in Average Plausible Science Score due to Significant Student Variables (Tunisia)
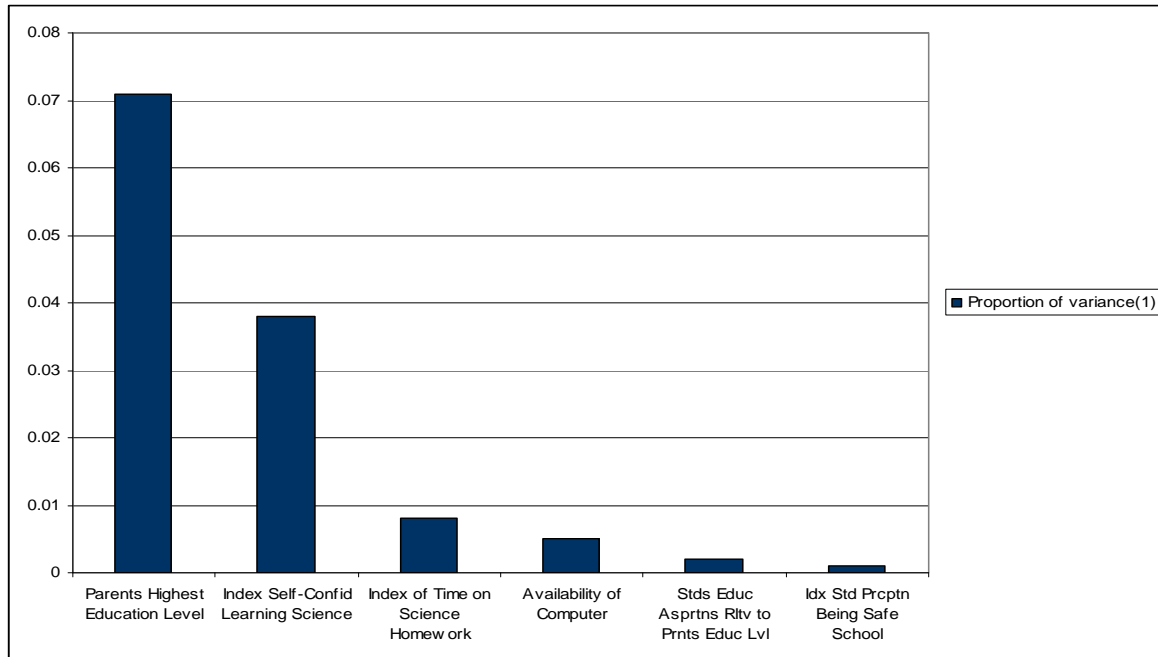
Table 9.4: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant Student Variables (Tunisia)

Variable	Level	Mean	S. D.
Parents Highest	- Fini univ / equival / higher	426.11	67.31
Education Level	- Fini post- sec voc/techn edu but no univ	423.78	59.42
	- Fini upp sec schooling	411.70	53.96
	- Fini low sec schooling	402.39	51.84
	- No more than prim	393.13	49.40
Index Self-Confid	- High	412.61	52.30
Learning Science	- Medium	389.33	50.39
	- Low	382.80	52.05
Index of Time on	- High	397.71	48.27
Science Homework	- Medium	400.17	50.02
	- Low	411.00	55.30
Availability of	- Use computer both at home and school	406.19	54.53
Computer	- Use comp at home but not at school	414.41	57.09
	- Use comp at school but not at home	407.04	53.51
	- Use comp only at places other than home	406.96	54.25
	- Do not use computer at all	396.31	48.42
Stds educ asprtns	- Fini univ and either par went to univ	436.68	56.11
rltv to prnts educ lvl	- Fini univ but neither par went to univ	408.55	53.29
	- Not fini univ regardless of par edu	394.18	50.74
	- Do not know regardless of par edu	402.10	50.66
Idx Std Prcptn	- High	405.03	52.47
Being Safe School	- Medium	402.74	52.82
	- Low	410.29	55.30

Teacher Variables

Prediction of Mathematics Achievement from Mathematics Teacher Variables

The following six variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score for the mathematics teacher as dependent variable:

1. Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations on Instruction due to Student Factors
2. Index of Teachers' Emphasis on Mathematics Homework
3. Index of Mathematics Teachers' Perception of School Climate
4. Index of Mathematics Teachers' Perception of Safety in the Schools
5. Class Size For Mathematics Instruction
6. Math Teacher Has Full License or Certification

The results of the stepwise regression analysis indicates that no variable accounted for more than 1% of the variance in the mathematics achievement each as measured by Average Mathematics Plausible Score.

Prediction of Science Achievement from Science Teacher Variables

The following six variables were entered in the stepwise multiple regression with the Average Science Plausible Score for the science teacher as dependent variable:
1. Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors
2. Index of Teachers' Emphasis on Science Homework
3. Index of Science Teachers' Perception of School Climate
4. Index of Science Teachers' Perception of Safety in the Schools
5. Class Size For Science Instruction
6. Science Teacher Has Full License or Certification

The results of the stepwise regression analysis are presented in Table 9.5. One variable accounted for more than 1% of the variance in the science achievement each as measured by Average Science Plausible Score:
1. Index of Science Teachers' Perception of Safety in the Schools (3.8%)

The difference in science achievement was not consistently related to the teacher's perception of school safety (Table 9.6).

Table 9.5: R^2 and Proportion of Variance in Average Plausible Science Score due to Significant Teacher Variables in the Stepwise Regression (Tunisia)

Variables	R^2	Proportion of variance[1]
Idx Sci Tchr Prcptn School Safet	0.038	0.038

[1] Difference in R^2

Table 9.6: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant Teacher Variables (Tunisia)

Variable	Level	Mean	S. D.
Idx Sci Tchr Prcptn	- High	405.50	24.92
School Safet	- Medium	395.80	21.35
	- Low	403.12	28.11

School Variables

Prediction of Mathematics Achievement from School Variables

The following five variables were entered in the stepwise multiple regression with the Average Mathematics Plausible Score for the school as dependent variable:

2. Index of Principals' Perception of School Climate

3. Trends in Index of Good School and Class Attendance
4. Trends in Index of Availability of School Resources for Mathematics Instruction
5. Number Of Hours Of School Per Year
6. Number Of Weeks Of School Per Year

The results of the stepwise regression analysis (Table 9.7) show that one school variable entered the regression equation when the mathematics achievement as measured by Average Mathematics Plausible Score was used as dependent variable:
- Index of Principals' Perception of School Climate (9.5%)

Table 9.7: R^2 and Proportion of Variance in Average Plausible Math Score due to Significant School Variables in the Stepwise Regression (Tunisia)

Variables	R^2	Proportion of variance[1]
Idx Prncpl Percept School Climate	0.095	0.095

[1] Difference in R^2

Table 9.8: Means and Standard Deviation of the Average Plausible Math Score by Levels of Significant School Variables (Tunisia)

Variable	Level	Mean	S. D.
Idx Prncpl Percept	- High	441.95	39.60
School Climate	- Medium	420.51	27.99
	- Low	404.50	26.43

From Table 9.8, one can see that the more favorable the principal's perception of school climate the higher the mathematics achievement of the school. Referring to Appendix 1, one can see that school climate is defined to include the following categories:

a = Teachers' job satisfaction
b = Teachers' understanding of the school's curricular goals
c = Teachers' degree of success in implementing the school's curriculum
d = Teachers' expectations for student achievement
e = Parental support for student achievement
f = Parental involvement in school activities
g = Students' regard for school property

Prediction of Science Achievement from School Variables

The following five variables were entered in the stepwise multiple regression with the Average Science Plausible Score for the school as dependent variable:

11. Index of Principals' Perception of School Climate
12. Trends in Index of Good School and Class Attendance
13. Trends in Index of Availability of School Resources for Science Instruction

14. Number Of Hours Of School Per Year
15. Number Of Weeks Of School Per Year

The results of the stepwise regression analysis are presented in Table 9.10. One variable accounted for more than 1% each of the variance in the science achievement as measured by the Average Science Plausible Score:
- Index of Principals' Perception of School Climate (17.1%)

From Table 9.11 one can see that the more favorable the principal's perception of school climate the higher the science achievement of the school.

Referring to Appendix 1, one can see that school climate is defined to include the following categories:

a = Teachers' job satisfaction
b = Teachers' understanding of the school's curricular goals
c = Teachers' degree of success in implementing the school's curriculum
d = Teachers' expectations for student achievement
e = Parental support for student achievement
f = Parental involvement in school activities
g = Students' regard for school property

Table 9.10: R^2 and Proportion of Variance in Average Plausible Science Score due to Significant School Variables in the Stepwise Regression (Tunisia)

Variables	R^2	Proportion of variance[1]
Idx Prncpl Percept School Climate	0.089	0.089

[1] Difference in R^2

Table 9.11: Means and Standard Deviation of the Average Plausible Science Score by Levels of Significant School Variables (Tunisia)

Variable	Level	Mean	S. D.
Idx Prncpl Percept	- High	433.68	38.10
School Climate	- Medium	411.84	23.12
	- Low	398.62	23.54

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Section 10: Comparison of the Effect of Context of Factors on Achievement in Mathematics and Science in the Arab Countries

In the previous sections we analyzed TIMSS 2003 data of each country for the relative contribution of student, teacher, and school variables to mathematics and science achievement. In this section we present a comparative analysis of the findings across the eight Arab countries. The comparison will focus on the following themes:

- Comparison of between-student and between-school variations in mathematics and science achievement

- Comparison of variations Accounted for by student-level, teacher-level, and school-level variables in *Toto* and individually.

Comparison of Variances in Mathematics and Science Achievement

Between- Student Variation

Figure 10.1 shows the total between-student variation in mathematics achievement by country. The between student variation reflects the extent of differences in mathematics achievement among students irrespective of their schools. The total between-student variation varies considerably across countries from 8983 in Egypt to 3010 in Tunis. Four Arab countries (Egypt, Bahrain, Palestine, Jordan) have higher between-student variation than the Arab countries average (represented by the horizontal line in the Figure 10.1) whereas, four countries (Saudi Arabia, Lebanon, Morocco, Tunis) have lower between-student variation than the Arab countries average.

Figure 10.2 shows the total between-student variation in science achievement by country. The total between-student variation varies considerably across countries from 9927 in Egypt to 2838 in Tunis. Four Arab countries (Egypt, Lebanon, Palestine, Jordan) have higher between-student variation than the Arab countries average (represented by the horizontal line in the Figure 10.2) whereas, four countries (Bahrain, Saudi Arabia, Morocco, Tunis) have lower between-student variation than the Arab countries average.

Given a more or less homogeneous set of educational provisions across countries, the largest part of the variation in educational performance of students would depend on the student's aptitude and background. This means that the relatively higher between-student variation in one country reflects differences in educational provisions compared to a country that has a lower between student variations. It is not the intention of this study to investigate the nature of the differences in educational provisions that account for differences in between-student variation since the focus of this report is to investigate the educational provisions which account for between-student variation *within* each country through studying the relative contribution of student, teacher, and school factors to between-student variation in mathematics and science achievement.

The ranking in between-student variation in achievement in science and mathematics is the same except for Bahrain and Lebanon. The consistency in ranking reflects similar within-country educational provisions in science and mathematics. On the other hand the discrepancy in Bahrain and Lebanon reflects within-country differences in educational provisions in science and mathematics (Bahrain (Lebanon) was in the top (lower) four

countries in mathematics achievement and in the bottom (top) four countries in science achievement).

Table 10.1 Between-Student Variance in Mathematics Achievement by Country
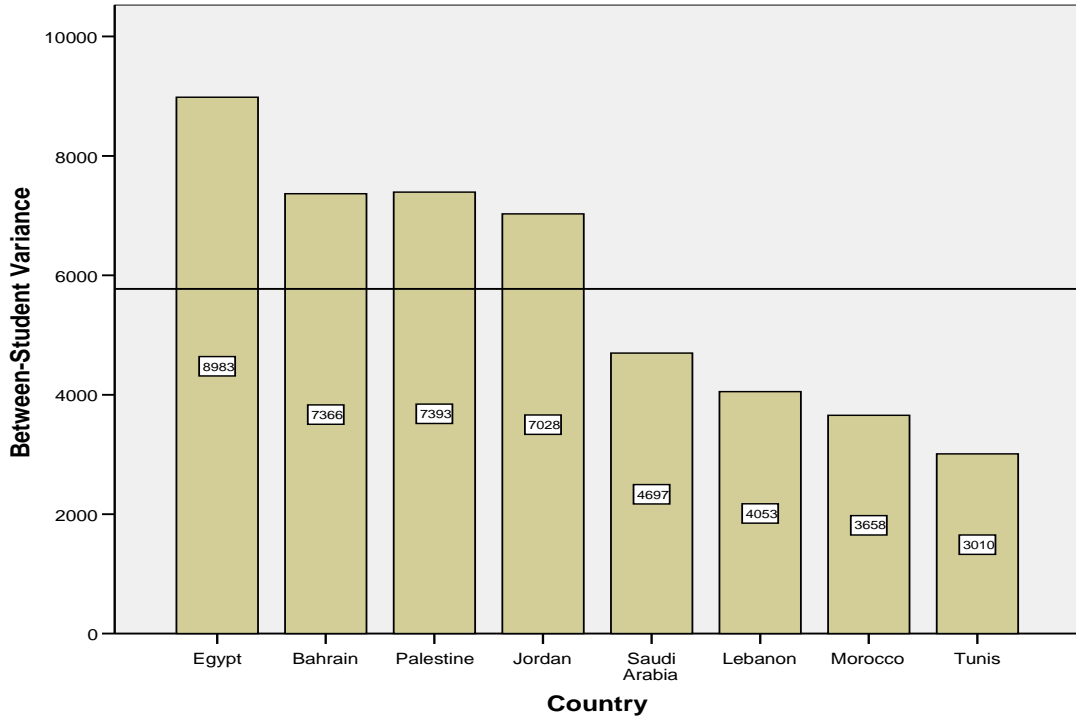
Table 10.2 Between -Student Variance in Science Achievement by Country
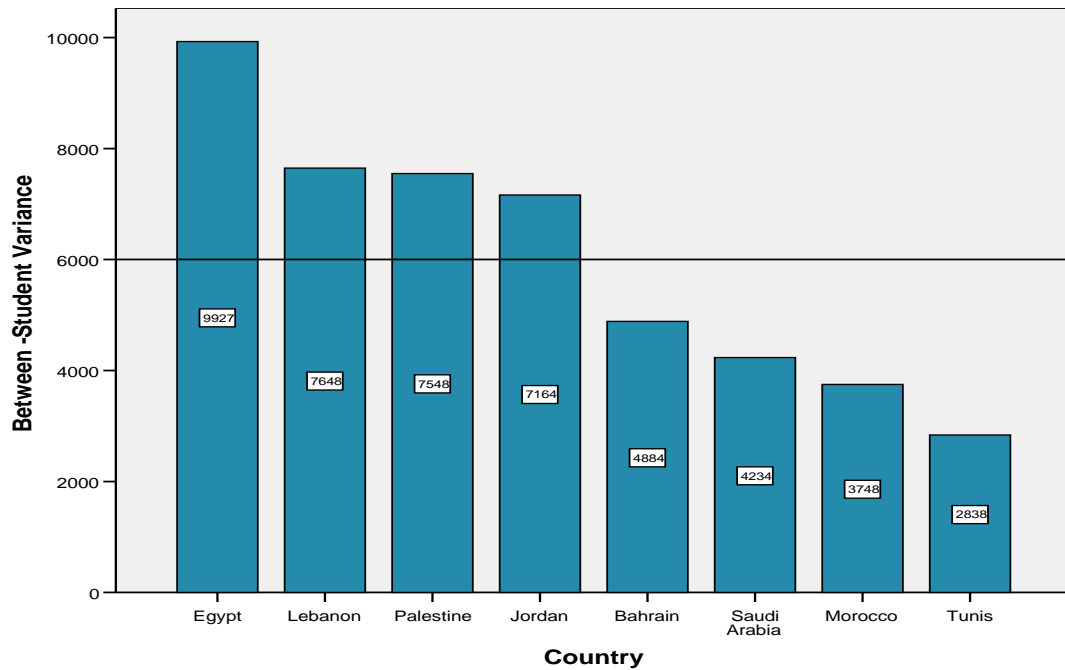
Between-School Variation

The between-school variance indicates how much variation lies among schools. The larger the between-school variance, the more schools contribute to overall performance differences within each country. One way to analyze the role of schools within each country is to simply look at the proportion of variance that can be attributed to schools. The percentage of between-school variation to total variance in mathematics achievement by country is shown in Figure 10.3. The group of countries which has higher percentage between-school variation than the average of the Arab countries (represented by the horizontal line in Figure 10.3) comprises Lebanon and Egypt. Jordan is about the average of the Arab countries, whereas, Tunis, Saudi Arabia, Palestine, Bahrain, and Morocco are below the Arab countries average.

The percentage of between-school variation to total variance in science achievement by country is shown in Figure 10.4. Lebanon and Egypt have higher percentage in science achievement than the Arab countries average (represented by the horizontal line in Figure 10.4) whereas the other remaining six countries lower percentage than the Arab countries average.

Table 10.1 represents the Spearman correlation matrix for the ranks of average of mathematics and science achievement, between-school variance, and between student-variance for the eight Arab countries. The only significant correlation coefficient is the positive correlation between average mathematics achievement and percentage of between-school variance. The between-school variance in mathematics or science achievement is an indicator of equity in educational provisions in the country concerned, whereas the average mathematics or science achievement score is an indicator of quality in these two subjects. The results show that there is a positive relationship between equity and quality in mathematics achievement whereas no such relationship exists for science achievement. The interpretation of the author of this result is that the relationship between equity and quality is a complex one and depends on country specific factors such educational provisions in science and mathematics in the country as well as student related cognitive and background factors.

Table 10.1: Spearman Correlations between the Rankings of Arab Countries in Between –Student Variance, % Between-School Variance, Achievement average in TIMSS 2003

	Between-student variance		%Between-school variance		Average Achievement	
	Math	Science	Math	Science	Math	Science
Between-student variance	1	1	.071	.453	-.071	.143
%Between-school variance	.071	.452	1	1	.762*	-.333
Average Achievement	-.071	.143	.762*	-.333	1	1

$*p < .05$

Table 10.3 % of Between-School Variance to Total Variance in Mathematics Achievement by Country
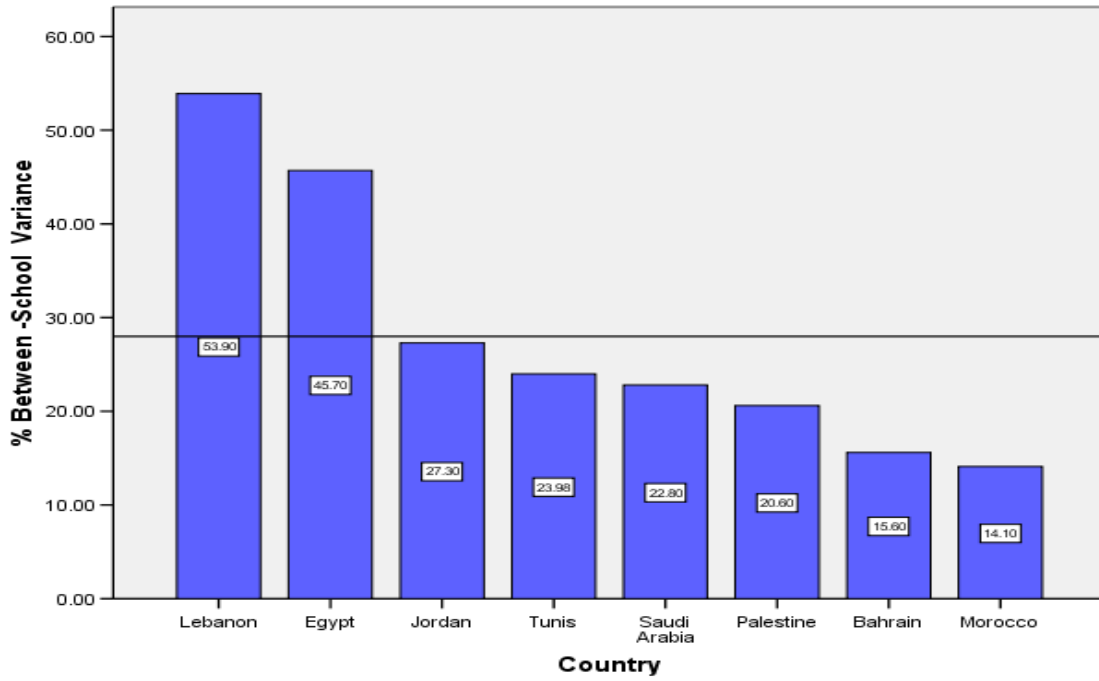
Table 10.4 % of Between-School Variance to Total Variance in Science Achievement by Country
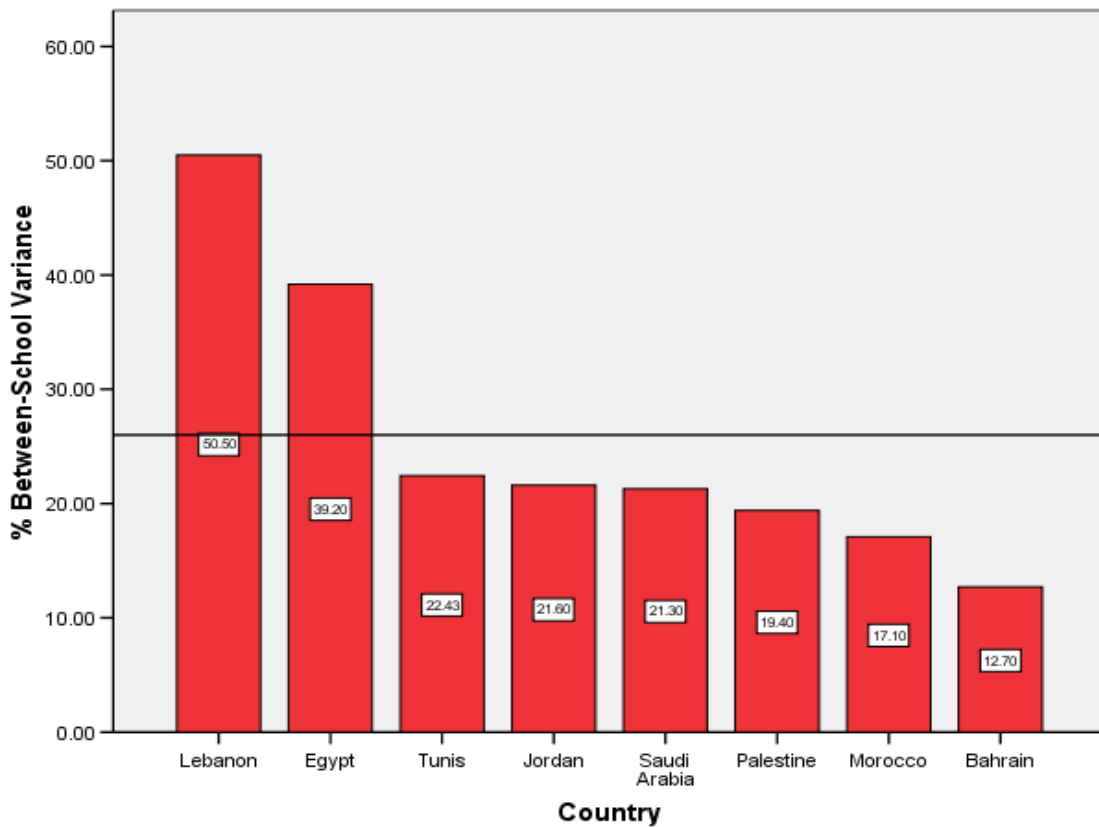
Comparison of Variations Accounted for
Aggregate Variations Accounted for by Student-, Teacher-, and School-level Variables

In this section we compare the total variances accounted for by student-level, teacher-level, and school-level variables. First, the overall variance accounted for by the variables at each of the three levels (student, teacher, school) will be compared across the Arab countries. Second, the within-country relative contribution of the variables in each source to the total variance will be compared across the Arab countries.

Table 10.2 and Figure 10.5 show the proportion of overall variance in mathematics achievement accounted for by the variables in each of the three sources: student, teacher, and school. The mathematics achievement variance accounted for by student-level variables varied across the Arab countries from a high of 36.5 % (Lebanon) and 36.4 % (Egypt) to 14.5 in Morocco. This indicates that impact of student aptitude and background on mathematics achievement varies among the Arab countries, the highest impact being in Lebanon and Egypt and the lowest in Morocco. The variance in mathematics achievement accounted for by teacher-level variables varied across the Arab countries from a high of 29.6 % in Bahrain to 0% (Morocco, Palestine, Tunisia) to 29.6 % in Bahrain. Though it is difficult to explain the zero variance accounted for in Morocco, Palestine, and Tunisia, one would conjecture that this is probably related to the homogeneity in teachers' responses to the questionnaire. The variance in mathematics achievement accounted for by school-level variables varied across the Arab countries from a high of 0 % (Morocco and Saudi Arabia) to 19.2 % in Bahrain. The zero variance in Morocco and Saudi Arabia is probably related to the homogeneity in principals' responses to the questionnaire, reflecting homogeneity in schools.

Compared to teacher-level and student-level variables, the student-level variables' relative contribution to the within-country variance in mathematics achievement was the highest in all countries except Bahrain in which the contribution of the teacher-level variables' was the highest. Again the lowest relative contribution to within-country variance In mathematics achievement came from teacher-level variables for all countries except in Bahrain where the contribution of the school-level variables was the lowest.

Table 10.3 and Figure 10.6 show the proportion of overall variance in science achievement accounted for by student, teacher, and school variables. The science achievement variance accounted for by student-level variables varied across the Arab countries from a high of 40.1 % (Lebanon) to 12.5 % in Tunisia. The variance in science achievement accounted for by teacher-level variables varied across the Arab countries from a high of 34.1 in Bahrain to 0 % in Palestine. The variance in science achievement accounted for by school-level variables varied across the Arab countries from a high of 23.7 % in Bahrain to 0 % in Saudi Arabia.

Compared to teacher-level and student-level variables, the student-level variables' relative contribution to the within-country variance in science achievement was the highest in all countries except Bahrain in which the contribution of the teacher-level variables' was the highest. The lowest relative contribution to within-country variance in science achievement came from teacher-level variables in four countries (Palestine, Morocco, Saudi Arabia, Tunisia) and from school-level variables in the remaining four countries (Lebanon, Egypt, Bahrain, Jordan).

Table 10.2: Proportion of Total Variance in Mathematics Achievement Accounted for by the Predictors by Category (Student, Teacher, School) and by country
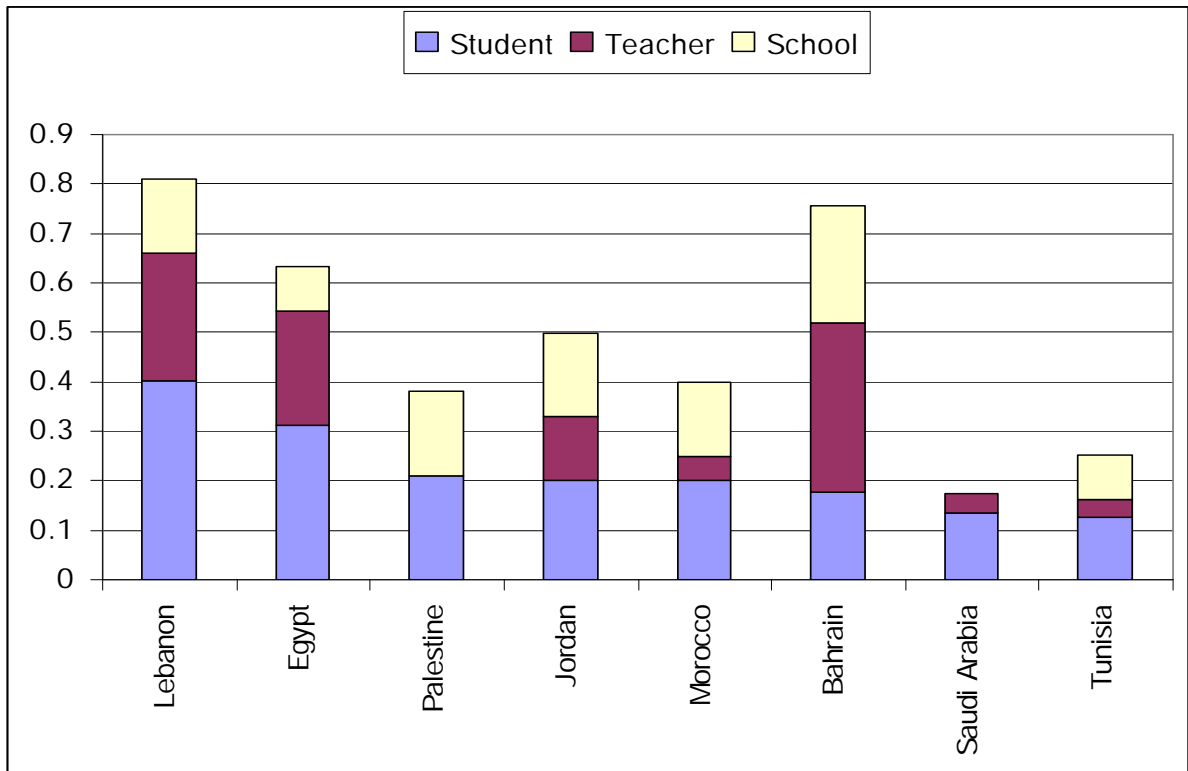
Country	Total Variance		
	Student	**Teacher**	**School**
Bahrain	0.279	0.296	0.192
Egypt	0.364	0.144	0.142
Jordan	0.216	0.134	0.184
Lebanon	0.365	0.093	0.155
Morocco	0.145	-	-
Palestine	0.236	-	0.185
Saudi Arabia	0.199	0.034	-
Tunisia	0.230	-	0.095

Figure 10.5: Proportion of Total Variance in Mathematics Achievement Accounted for by the Predictors by Category (Student, Teacher, School) and by country

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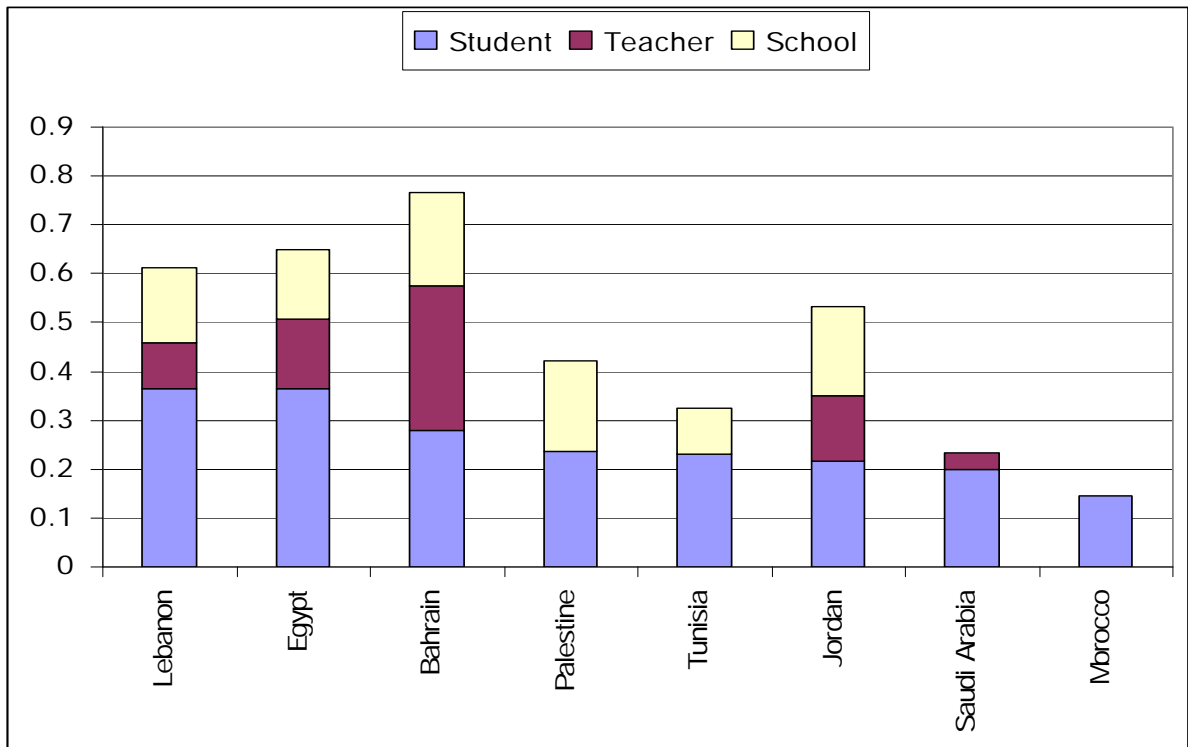
Table 10.3: Proportion of Total Variance in Science Achievement Accounted for by the Predictors by Category (Student, Teacher, School) and by country

Country	Total Variance		
	Student	Teacher	School
Bahrain	0.177	0.341	0.237
Egypt	0.312	0.230	0.091
Jordan	0.202	0.129	0.167
Lebanon	0.401	0.260	0.148
Morocco	0.202	0.048	0.149
Palestine	0.209	-	0.171
Saudi Arabia	0.135	0.040	-
Tunisia	0.125	0.038	0.089

Figure 10.6: Proportion of Total Variance in Science Achievement Accounted for by the Predictors by Category (Student, Teacher, School) and by country

Comparisons of Variations in Mathematics Achievement
Accounted for by Student- level Variables

In this section we compare the total variance in mathematics achievement accounted for by each student-level variable across the Arab countries. For each country, the first three student-level variables which entered in the stepwise regression and the proportion of variance each contributed were selected. Table 10.5 and Figure 10.7 show the proportion of variance in mathematics achievement accounted for by each of the student-level variables in each of the eight Arab countries.

Table 10.4: The order of Entry of Student-level Variables
in the Regression Equation by Country

| Variable	Countries in which the variable entered		
	First	**Second**	**Third**
Index of Self-Confidence in Learning Mathematics	-Bahrain -Jordan -Lebanon -Palestine -Saudi Arabia -Morocco -Tunisia	-Egypt	
Parents Highest Education Level	-Egypt	-Lebanon -Palestine -Saudi Arabia -Morocco -Tunisia	-Jordan
Students' Educational Aspirations Relative to Parents Educational Level	-	-Bahrain -Jordan	-Saudi Arabia
Index of Students' Perception of Being Safe in School			-Palestine -Egypt -Lebanon -Bahrain
Availability of Computer			-Tunisia -Morocco

Table 10.4 indicates that in the seven of the eight countries, an affective student-level variable entitled "Index of Self-Confidence in Learning Mathematics" entered first in the stepwise regression analysis and consequently accounted for the largest proportion of variance in mathematics achievement. The variable "Index of Self-Confidence in Learning Mathematics" is defined by TIMSS 2003 as "student perceives that he/she usually does well in mathematics, mathematics is easier for him/ her than for many of classmates, mathematics is one of his/her strengths, and perceives that he /she learns things quickly in

mathematics". One of two student level variables related to student home environment ("Parents Highest Education Level" or "Students' Educational Aspirations Relative to Parents Educational Level") entered second in the regression equation in seven of the eight countries. The variable "Index of Students' Perception of Being Safe in School" entered third in four of the eight countries. This last variable was defined by TIMSS 2003 TO "have a feeling of being safe in school (not subject to stealing, bullying, intimidation, ridicule, or neglect by other students The "Availability of Computer" entered third in only two countries.

Table 10.5: Proportion of Total Variance in Mathematics Achievement Accounted for by Student-level Variables by Country

Country / Variable	BAH	EGY	JOR	LEB	MOR	PAL	S.ARAB	TUN
-Idx Self-Confid Learning Math	0.179	0.060	0.136	0.162	0.108	0.132	0.110	0.155
-Stds Educ Asprtns Rltv to Prnts Educ Lvl	0.073		0.055				0.016	
-Idx Std Prcptn Being Safe School	0.015	0.041		0.070		0.022		
-Parents Highest Education Level		0.246	0.016	0.089	0.017	0.056	0.051	0.064
-Availability of Computer					0.015			0.008

Figure 10.7: Proportion of Total Variance in Mathematics Achievement Accounted for by Student-level Variables by Country

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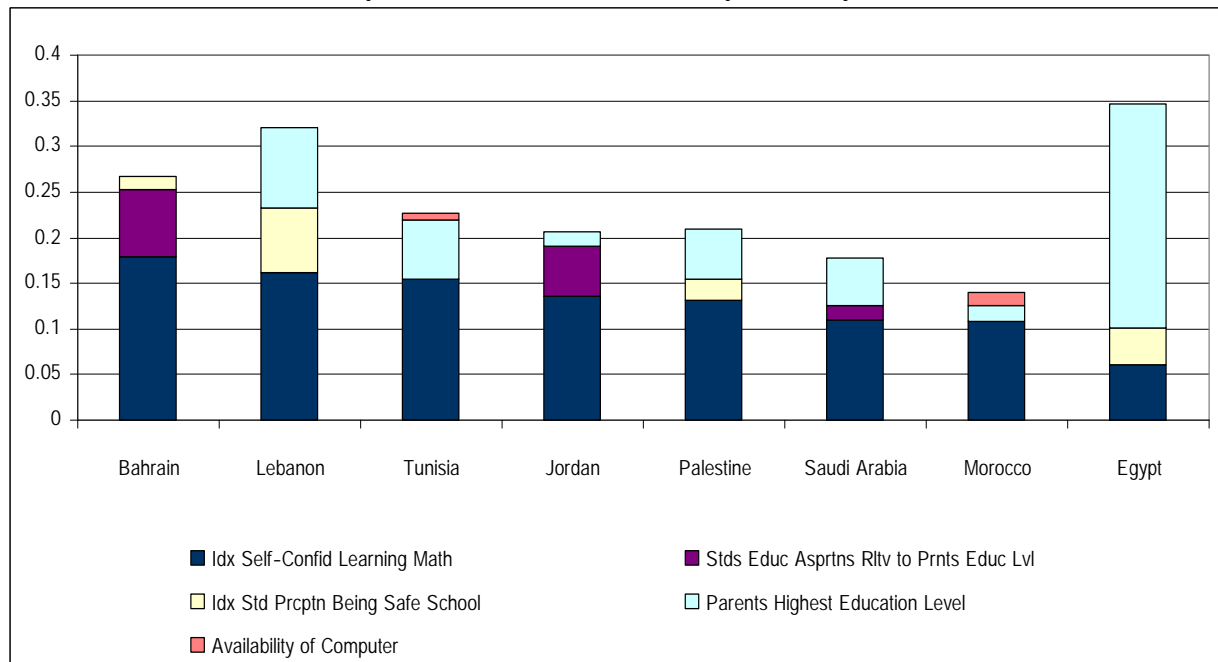
Comparison of Variations in Science Achievement Accounted for by Student- level Variables

In this section we compare the total variance in science achievement accounted for by each student-level variable across the Arab countries. For each country, the first three student-level variables which entered in the stepwise regression and the proportion of variance each contributed were selected. Table 10.7 and Figure 10.8 show the proportion of variance in science achievement accounted for by each of the student-level variables in each of the eight Arab countries.

**Table 10.6: The order of Entry of Student-level Variables
in the Regression Equation by Country**

Variable	Countries in which the variable entered		
	First	**Second**	**Third**
Index of Self-Confidence in Learning Science	-Jordan -Palestine -Saudi Arabia -Morocco	-Egypt -Bahrain -Tunisia	-Lebanon
Parents Highest Education Level	-Egypt -Tunisia	-Saudi Arabia -Lebanon	-Jordan -Morocco
Students' Educational Aspirations Relative to Parents Educational Level	-Bahrain	-Jordan -Palestine	-Saudi Arabia
Index of Students' Perception of Being Safe in School	-Lebanon		-Palestine -Egypt -Bahrain
Availability of Computer		-Morocco	

The same student-level variables entered that entered in the regression equation for science achievement entered also for science achievement. However, the order of entry of the variables differed somewhat. Table 10.6 shows that the first variable to enter the regression equation was either "Index of Self-Confidence in Learning Science" (four countries) or one of the two related variables "Parents Highest Education Level" or "Students' Educational Aspirations Relative to Parents Educational Level"(three countries).The order was reversed for the variable that entered second where the variable "Parents Highest Education Level" or "Students' Educational Aspirations Relative to Parents Educational Level" entered second in four countries and the variable "Index of Self-Confidence in Learning Science" entered second in three countries. The third variable to enter the regression equation was the same as in science achievement, namely "Index of Students' Perception of Being Safe in School"

Table 10.7: Proportion of Total Variance in Science Achievement Accounted for by Student-level Variables by Country

Country / Variable	BAH	EGY	JOR	LEB	MOR	PAL	S.ARAB	TUN
-Stds Educ Asprtns Rltv to Prnts - Educ Lvl	0.102		0.057			0.055	0.013	
-Idx Self-Confid Learning Science	0.045	0.061	0.111	0.057	0.054	0.103	0.077	0.038
-Idx Std Prcptn Being Safe School	0.016	0.041		0.148		0.022		
-Parents Highest Education Level		0.194	0.017	0.104	0.014		0.040	0.071
-Availability of Computer					0.029			

Figure 10.8: Proportion of Total Variance in Science Achievement Accounted for by Student-level Variables by Country

101
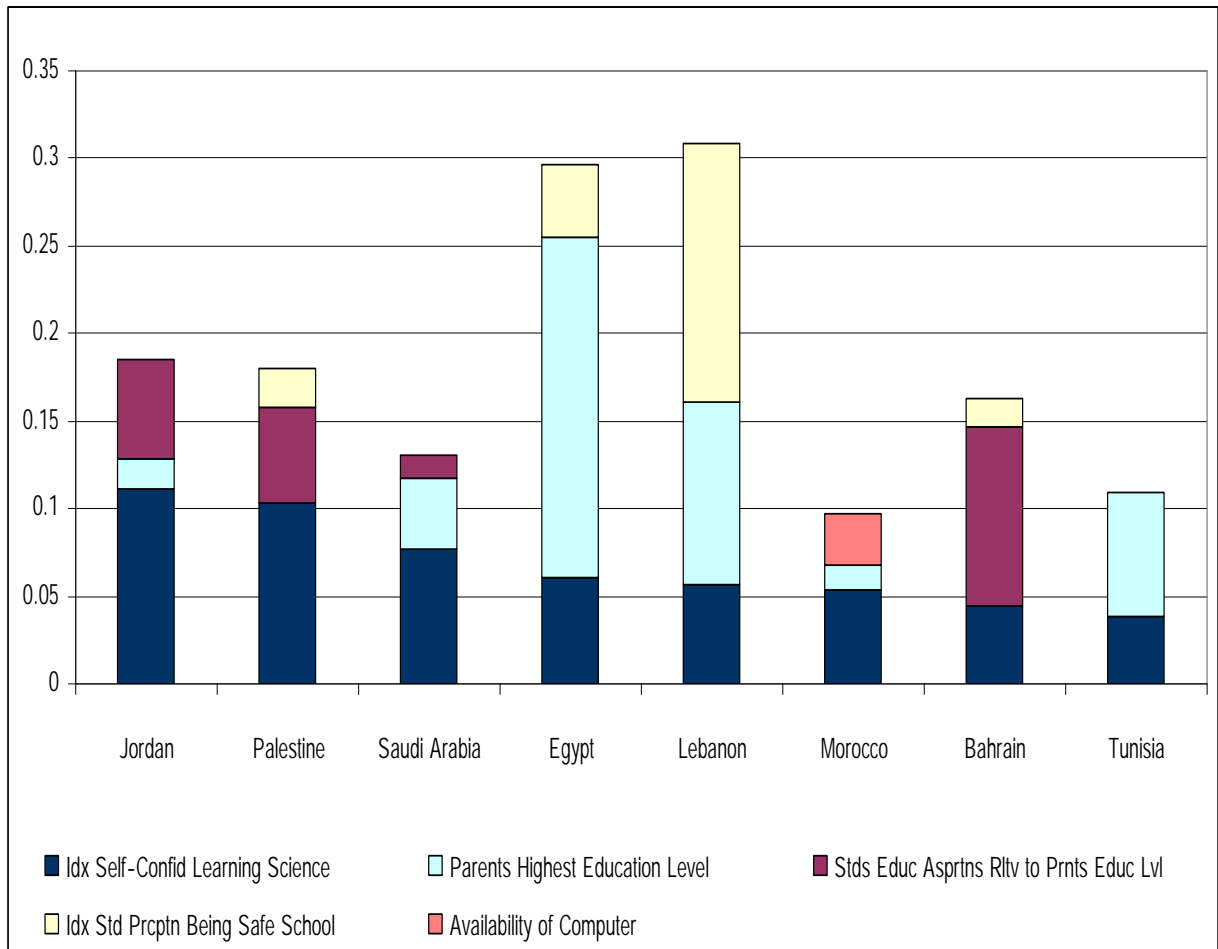
Comparisons of Variations in Mathematics Achievement
Accounted for by Teacher- level Variables

In this section we compare the total variance in mathematics achievement accounted for by each teacher-level variable for mathematics teachers across the Arab countries. For each country, the first three student-level variables that entered in the stepwise regression and the proportion of variance each contributed were selected. Table 10.8 and Figure 10.9 show the proportion of variance in mathematics achievement accounted for by each of the mathematics teacher-level variables in each of the eight Arab countries.

Figure 10.9 shows that in three countries (Tunis, Morocco, Palestine), no mathematics teacher-level variable entered the stepwise multiple regression, indicating the weak contribution of teacher-level variables to mathematics achievement. In the five countries in which one or more teacher-level variable entered the regression equation, three such variables seem to compete for the first place in the order of entry of the variables: "Index of Principals' Perception of School Climate" (in Egypt and Jordan), "Index of Mathematics Teachers' Perception of Safety in the Schools" (in Lebanon and Saudi Arabia), and "Class Size For Mathematics Instruction" in Bahrain. In TIMSS 2003 (Appendix 1), the "Index of Principals' Perception of School Climate" variable is defined as the extent to which the teacher perceives favorably "the school climate (teachers' job satisfaction, teachers' understanding of the school's curricular goals, teachers' degree of success in implementing the school's curriculum, teachers' expectations for student achievement, parental support for student achievement, parental involvement in school activities, students' regard for school property, students' desire to do well in school)".The more favorable the perception of the mathematics teacher of the school climate, the higher the mathematics achievement is. The "Index of Mathematics Teachers' Perception of Safety in the Schools" is defined as the extent to which the mathematics teacher perceives "that there are no or few limitations on instruction due to student factors (students with different academic abilities, students who come from a wide range of backgrounds, students with special needs, uninterested students, low morale among students, disruptive students)". The more favorable the perception of the mathematics teacher of school safety, the higher the mathematics achievement is.

The teacher-level variable "Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations on Instruction due to Student Factors" entered in the regression equation in Jordan (second in the order of entry) and in Egypt (third in the order of entry).The fewer the limitations due to student factors reported by the teacher, the higher the student achievement in mathematics. The other variables that entered the regression equation in Bahrain only are "Class Size For Mathematics Instruction" "Math Teacher Has Full License or Certification".

Table 10.8: Proportion of Total Variance in Mathematics Achievement Accounted for by Teacher-level Variables by Country

Country ╲ Variable	Bahrain	Egypt	Jordan	Lebanon	Saudi Arabia
Class Size for Mathematics Instruction	0.195				
Math teacher has Full License or Certif	0.063				
Idx Tch Rpt Mth Clss Wo Lim Fctrs	0.038		0.042		
Idx Math Tchr Prcptn Schl Climate		0.144	0.092		
Idx Math Tchr Prcptn Schl Safety				0.093	0.034

Figure 10.9: Proportion of Total Variance in Mathematics Achievement Accounted for by Teacher-level Variables by Country
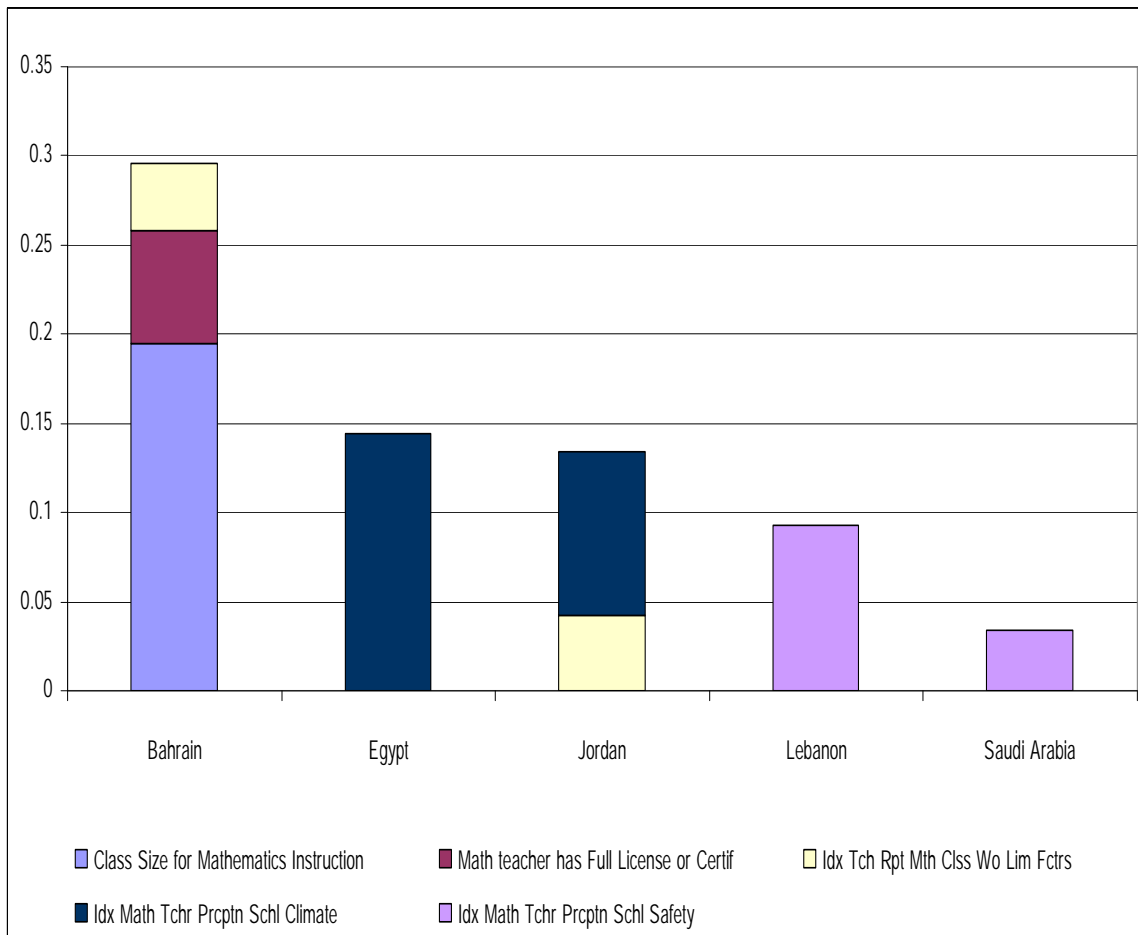
Comparisons of Variations in Science Achievement Accounted for by Teacher- level Variables

In this section we compare the total variance in science achievement accounted for by each teacher-level variable for science teachers across the Arab countries. For each country, the first three student-level variables that entered in the stepwise regression and the proportion of variance each contributed were selected. Table 10.9 and Figure 10.10 show the proportion of variance in science achievement accounted for by each of the science teacher-level variables in each of the eight Arab countries.

Figure 10.9 shows that in Palestine, no science teacher-level variable entered the stepwise multiple regression, indicating the weak contribution of teacher-level variables to science achievement. In the seven countries in which one or more teacher-level variable entered the regression equation, three such variables seem to compete for the first place in the order of entry of the variables: "Index of Principals' Perception of School Climate" (in Bahrain and Jordan), "Index of Science Teachers' Perception of Safety in the Schools" (in Lebanon, Morocco, and Tunisia), and "Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors" (in Egypt and Saudi Arabia). In TIMSS 2003 (Appendix 1), the "Index of Principals' Perception of School Climate" variable is defined as the extent to which the teacher perceives favorably "the school climate (teachers' job satisfaction, teachers' understanding of the school's curricular goals, teachers' degree of success in implementing the school's curriculum, teachers' expectations for student achievement, parental support for student achievement, parental involvement in school activities, students' regard for school property, students' desire to do well in school)".The more favorable the perception of the science teacher of the school climate, the higher the science achievement is. The "Index of Science Teachers' Perception of Safety in the Schools" is defined as the extent to which the science teacher perceives "that there are no or few limitations on instruction due to student factors (students with different academic abilities, students who come from a wide range of backgrounds, students with special needs, uninterested students, low morale among students, disruptive students)". The more favorable the perception of the science teacher of school safety, the higher the science achievement is. The "Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors" is defined as the extent to which the science teacher reported that no or few limitations due to student factors. The fewer the limitations due to student factors reported by the teacher, the higher the student achievement in science

The other variables that entered the regression equation are "Class Size For Science Instruction" (Bahrain and Lebanon) "Math Teacher Has Full License or Certification" (Egypt).

Table 10.9: Proportion of Total Variance in Science Achievement Accounted for by Teacher-level Variables by Country

Country / Variable	BAH	EGY	JOR	LEB	MOR	SAR	TUN
Idx Science Tchr Prcptn Schl Climate	0.206	0.042	0.129	0.031			
Class Size for Science Instruction	0.104			0.033			
Idx Tch Rpt Mth Clss Wo Lim Fctrs	0.031	0.120				0.040	
Sci teacher has Full License or Certif		0.039					
Idx Science Tchr Prcptn Schl Safety				0.174	0.048		0.038

Figure 10.10: Proportion of Total Variance in Science Achievement Accounted for by Teacher-level Variables by Country

105
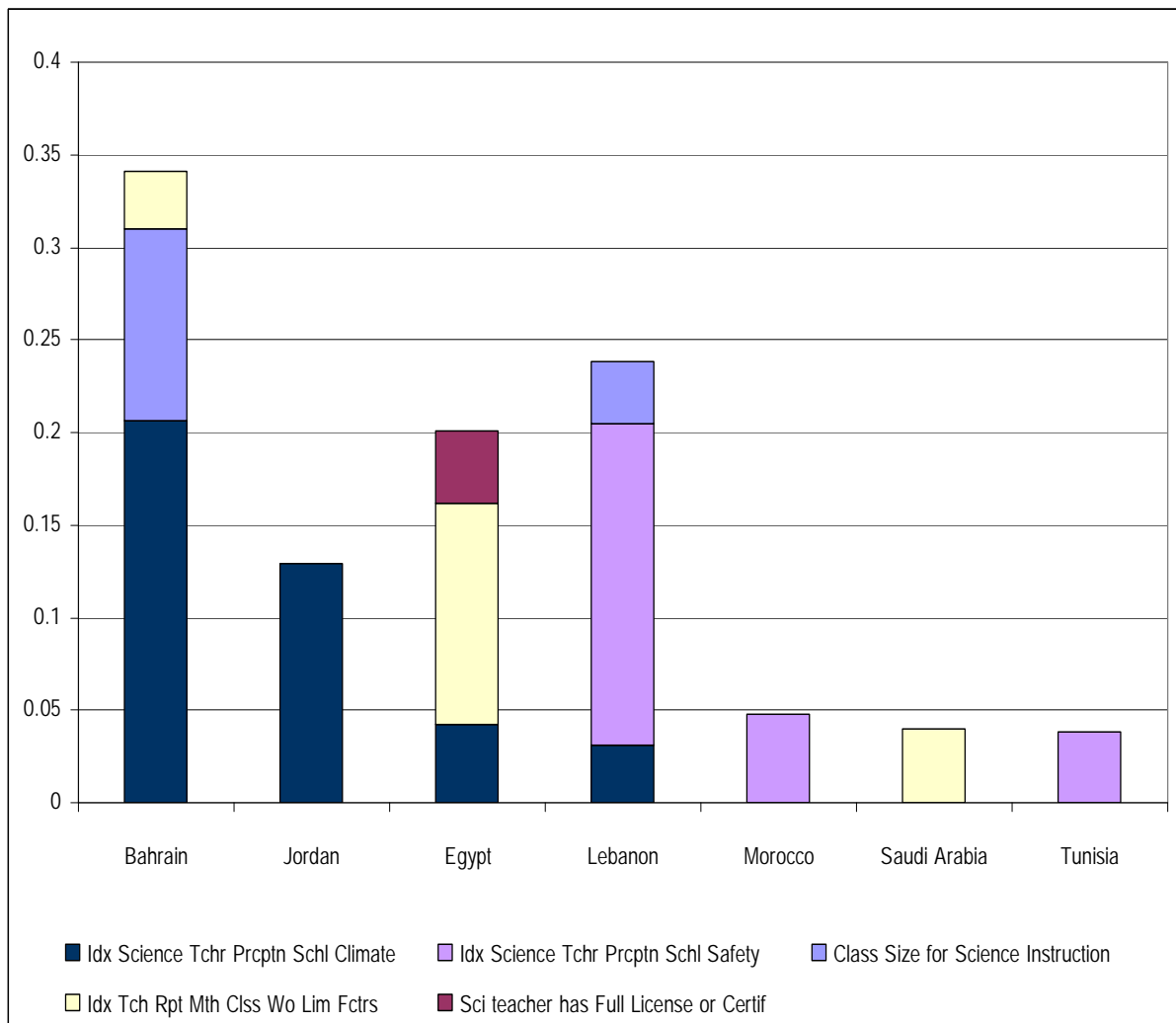
Comparisons of Variations in Mathematics Achievement
Accounted for by School- level Variables

In this section we compare the total variance in mathematics achievement accounted for by each school-level variable across the Arab countries. The first three school-level variables that entered in the stepwise regression were selected.

Table 10.10 and Figure 10.11 show the proportion of variance in mathematics achievement accounted for by each of the mathematics school-level variables in each of the eight Arab countries. Figure 10.11 shows that in two countries (Morocco, Saudi Arabia), no school-level variable entered the stepwise multiple regression, indicating the weak contribution of school -level variables to mathematics achievement in those two countries. In the six countries in which one or more school-level variable entered the regression equation, variable "Index of Principals' Perception of School Climate" entered first in the regression equation in all countries except Bahrain. The variable "Index of Principals' Perception of School Climate" is defined by TIMSS 2003 (see Appendix 1) as the extent the principal of the school has a favorable perception of the school climate which includes "the school teachers' job satisfaction, teachers' understanding of the school's curricular goals, teachers' degree of success in implementing the school's curriculum, teachers' expectations for student achievement, parental support for student achievement, parental involvement in school activities, students' regard for school property, students' desire to do well in school". The more favorable the principal's perception of school climate the higher is the mathematics achievement of the students in the school.

Only in Egypt and Jordan, a second variable entered the regression equation and in both h of them, this variable was "Trends in Index of Availability of School Resources for Mathematics Instruction". This variable is defined as the extent to which the principal of the school perceives "math resources for instruction are more available. Math resources include the following categories: instructional materials (e.g., textbook); budget for supplies (e.g., paper, pencils); school buildings and grounds; heating/cooling and lightening systems; instructional space (e.g., classrooms); computers for mathematics instruction; computer software for mathematics instruction; calculators for mathematics instruction; library materials relevant to mathematics instruction; audio-visual resources for mathematics instruction. The more available the resources for mathematics instruction are, the higher the mathematics achievement of the students in the school. The variable "Trends in Index of Good School and Class Attendance" entered third only in Jordan

Comparisons of Variations in Science Achievement
Accounted for by School- level Variables

The pattern for school-level variables' contribution to science achievement is very similar to that of science achievement. Figure 10.12 shows that in Saudi Arabia, no school-level variable entered the stepwise multiple regression, indicating the weak contribution of school -level variables to science achievement in that country. In the seven countries in which one or more school-level variable entered the regression equation, variable "Index of

Principals' Perception of School Climate" entered first in the regression equation in all countries except Bahrain and Morocco and it entered second in Bahrain.

The variable "Trends in Index of Availability of School Resources for Science Instruction" entered first in Morocco and Bahrain. The variable "Trends in Index of Good School and Class Attendance" entered third only in Jordan. The definitions and interpretations of these three variables are the same as in science achievement.

Table 10.10: Proportion of Total Variance in Mathematics Achievement Accounted for by School-level Variables and Country

Country \ Variable	Bahrain	Egypt	Jordan	Lebanon	Palestine	Tunisia
Idx Avlbl Schl Rsrcs Math Instr	0.192	0.031	0.069			
Idx Prncpl Percept School Climate		0.111	0.078	0.155	0.185	0.095
Idx Good School / Class Attendance			0.037			

Figure 10.11: Proportion of Total Variance in Mathematics Achievement Accounted for by School-level Variables and Country

107
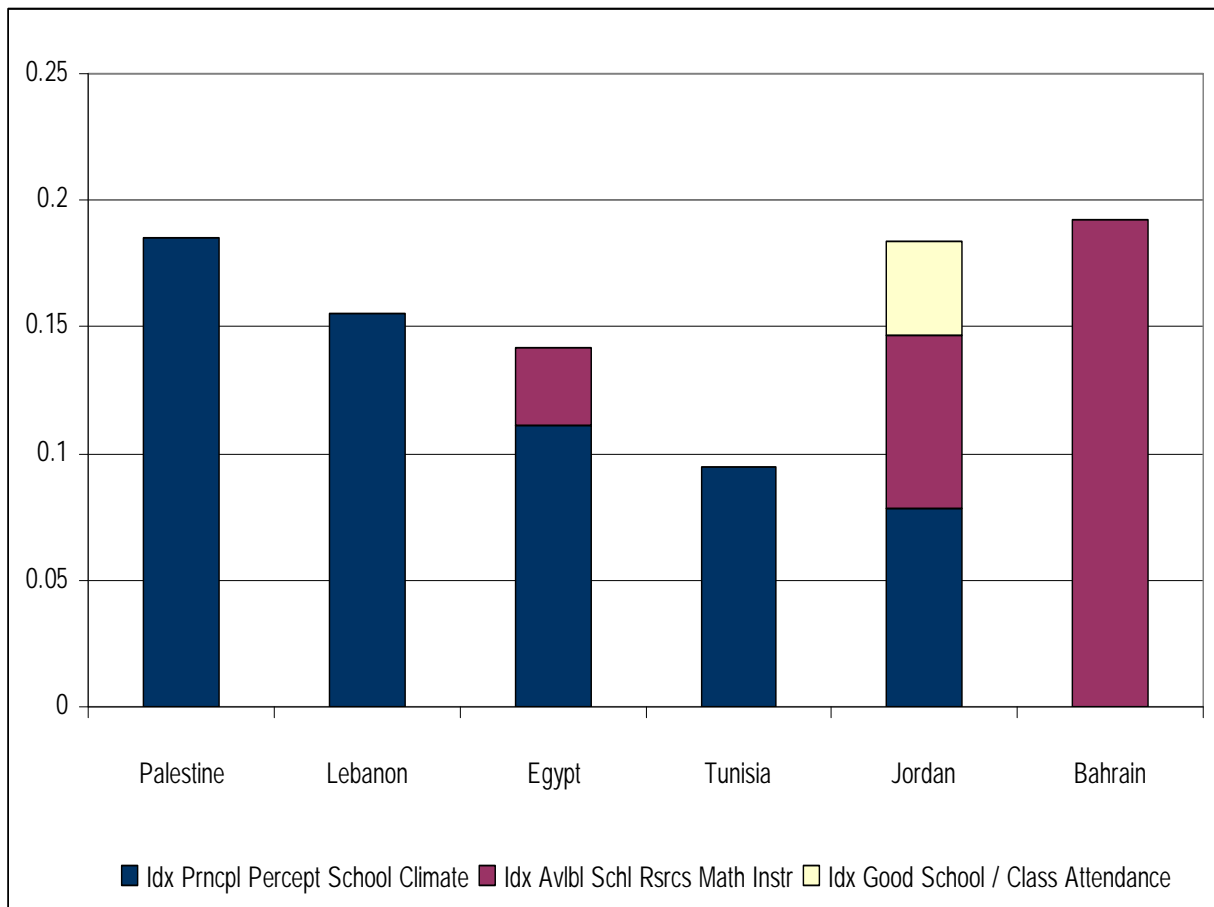
Table 10.11: Proportion of Total Variance in Science Achievement Accounted for by School-level Variables and Country

Country \\ Variable	BAH	EGY	JOR	LEB	MOR	PAL	TUN
Idx Avlbl Schl Rsrcs Sci Instr	0.169		0.055		0.148		
Idx Prncpl Percept School Climate	0.068	0.091	0.084	0.148		0.171	0.089
Idx Good School / Class Attendance			0.028				

Figure 10.12:   Proportion of Total Variance in Science Achievement Accounted for by School-level Variables and Country
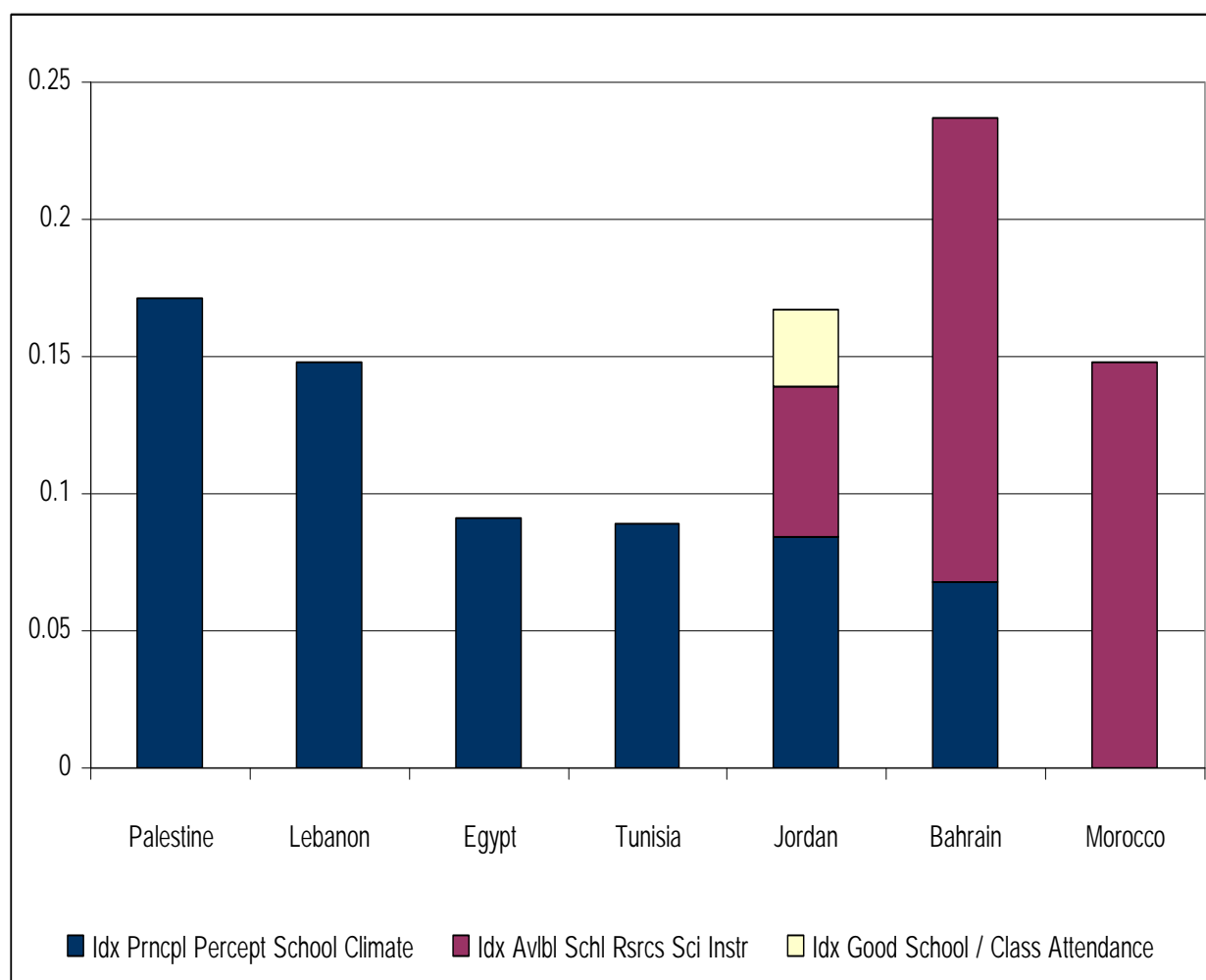
Section 11: Conclusions and Recommendations

In this section we present a summary of the results in the form conclusions under the headings: Between school variation, accounting for total variation, variance accounted for by student-level variables, variance accounted for by teacher-level variables, variance accounted for by school-level variables. Under each of these headings we rationalize and present the relevant recommendations.

In our discussion we shall distinguish between two kinds of characteristics or factors: Policy amenable factors and practice-amenable factors. Policy-amenable characteristics are those factors under the control of national educational policy or school management, and refer to substantive educational policy measures in areas such as curriculum, governance, accountability, professional teacher development and other school-level characteristics that are believed to improve teaching. Practice- amenable factors are aspects that are under the control of the school and its teachers and refer to action measures in teaching and learning as well as in school decisions.

Between-School Variation

The between-school variance indicates how much variation lies among schools. The larger the between-school variance, the more schools contribute to overall performance differences within each country. The group of countries which has higher percentage between-school variation than the average of the Arab countries comprises Lebanon and Egypt. Jordan is about the average of the Arab countries, whereas, Tunis, Saudi Arabia, Palestine, Bahrain, and Morocco are below the Arab countries average.

The percentage of between-school variation to total variance in science is higher in Lebanon and Egypt than the Arab countries average whereas the other remaining six countries lower percentage than the Arab countries average.

Conclusion 1:

The Arab countries vary in equity in provisions for each of mathematics education and science education as reflected in the variation of the proportion of between-school variance to total variance. Lebanon and Egypt have the highest proportions, while the other remaining five countries have lower proportions.

Recommendation 1:

In countries where there is high inequity in provisions for mathematics education or science education, we recommend further study of this issue with a view to identifying country- specific factors which contribute to this inequity, and consequently consider policies and measures to decrease this inequity without compromising quality as measured by achievement measures.

Accounting for Total Variation

The combined impact of student-, teacher-, and school variables on either mathematics or science achievement varies among the Arab countries as reflected by the

overall variance in mathematics or science achievement accounted for by the three sources, the highest impact being in Lebanon and Egypt and the lowest in Morocco.

The impact of the student aptitude and background on mathematics or science achievement was higher than the impact of the teacher variables in all eight Arab countries except Bahrain as evidenced by relative contribution to the within-country variance in mathematics or science achievement. The pattern in the relative impact of the teacher and school variables on mathematics achievement was not consistent.

Conclusion 2:

The combined impact of student-, teacher-, and school variables on mathematics or science achievement varies among the Arab countries, the highest impact being in Lebanon and Egypt and the lowest in Morocco. The impact of the student aptitude and background on mathematics or science achievement was higher than the impact of the teacher variables in all eight Arab countries except Bahrain. However, there was no consistency regarding the comparison of the impact of teacher and school variables on mathematics achievement.

Variance Accounted for by Student-level Variables

The first variable to enter the regression equation in all countries except Bahrain is "Index of Self-Confidence in Learning" in both mathematics and science. This variable is defined by TIMSS 2003 as "student perceives that he/she usually does well in mathematics (science), mathematics (science) is easier for him/ her than for many of classmates, mathematics (science) is one of his/her strengths, and perceives that he /she learns things quickly in mathematics (science)". One of two student level variables related to student home environment ("Parents Highest Education Level" or "Students' Educational Aspirations Relative to Parents Educational Level") entered second in the regression equation in seven of the eight countries. The variable "Index of Students' Perception of Being Safe in School" entered third in four of the eight countries. This last variable was defined by TIMSS 2003 to "have a feeling of being safe in school (not subject to stealing, bullying, intimidation, ridicule, or neglect by other students).

Conclusion 3:

The student-level variables that impact mathematics achievement are listed below in descending order of their contribution to the prediction of mathematics achievement:

> **(1) Index of Self-Confidence in Learning Mathematics**
> **(2) Parents Highest Education Level**
> **(3) Students' Educational Aspirations Relative to Parents Educational Level**
> (4) **Index of Students' Perception of Being Safe in School**

Some of the four variables are policy-amenable, some are practice-amenable, and some are neither. The variable "Index of Self-Confidence in Learning Mathematics (Science)" is an affective student-level variable. According to the definition it involves self-perception on the part of the student regarding doing well in mathematics (science), ease of the subject, strength in the subject, and pace of learning the subject. Obviously, this index is

not amenable to be changed by changing policies. Rather it may amenable by considering changes in classroom teaching and learning practices by sensitizing the teachers of mathematics and science to adopting practices that will enhance self-confidence in learning science and mathematics. Teaching skills that target enhancement of self-confidence in learning science and mathematics ought to become a component of teacher education programs as well as professional development in-service programs and activities.

Recommendation 4:

It is recommended that measures be taken to sensitize the teachers of mathematics and science to the importance of enhancing self-confidence in learning science and mathematics. Furthermore, teaching skills that target the enhancement of self-confidence in learning science and mathematics ought to become a component of teacher education programs as well as professional development in-service programs and activities.

The two variables "Parents Highest Education Level" and "Students' Educational Aspirations Relative to Parents Educational Level" are neither policy-amenable nor practice amenable. These two variables are linked to macro-level long-term complex social and economic changes. Since these two variables are closely related to the variable "Index of Self-Confidence in Learning Mathematics (Science)", one could speculate that a positive change, in the latter which is somewhat under the possible control of the school, may minimize the negative effect of low parental educational level.

Though the variable "Index of Students' Perception of Being Safe in School" is a student- level variable, it is closely related to the school environment and hence is policy amenable as well as practice amenable. This variable relates to self-perception on the part of the student regarding stealing, bullying, intimidation, ridicule, or neglect by other students in school. It seems that these activities, particularly bullying and intimidation are relatively prevalent in the eight Arab schools and affects negatively the academic achievement in both mathematics and science. Increasing students' perception of safety in school by controlling and reducing bullying and intimation ought to be targeted by ministries of education policies as well as by school practices and control.

Recommendation 5:

To enhance achievement in mathematics and science, it is recommended to take the necessary measures at the ministries of education and school levels to increase students' perception of safety in school by controlling and reducing bullying and intimation in school.

Variance Accounted for by Teacher-level Variables

The impact of teacher-level variables on mathematics achievement was not consistent across the eight countries. In the five countries in which one or more teacher-level variable entered the regression equation, three such variables seem to compete for the first place in the order of entry of the variables: "Index of Principals' Perception of School Climate" (in Egypt and Jordan), "Index of Mathematics Teachers' Perception of Safety in the Schools" (in Lebanon and Saudi Arabia), and "Class Size For Mathematics Instruction" in

Bahrain. The variable "Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations on Instruction due to Student Factors" entered second in Jordan and third in Egypt.

The impact of teacher level variables on science achievement was more pronounced and consistent than on mathematics education. In the seven countries in which one or more teacher-level variable entered the regression equation, three such variables seem to compete for the first place in the order of entry of the variables: "Index of Principals' Perception of School Climate" (in Bahrain and Jordan), "Index of Science Teachers' Perception of Safety in the Schools" (in Lebanon, Morocco, and Tunisia), and "Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors" (in Egypt and Saudi Arabia).

Conclusion 4:

Though there are some discrepancies in the impact of teacher-level variables on science and mathematics, there is a general trend that the teacher-level variables which impact mathematics and science achievement are:

- **Index of Principals' Perception of School Climate**
- **Index of Mathematics (Science) Teachers' Perception of Safety in the Schools**
- **Index of Teachers' Reports on Teaching Mathematics (Science) Classes with Few or No Limitations on Instruction due to Student Factors.**

All three variables are policy-amenable. In TIMSS 2003 (Appendix 1), the "Index of Principals' Perception of School Climate" variable is defined as the extent to which the teacher perceives favorably teachers' job satisfaction, teachers' understanding of the school's curricular goals, teachers' degree of success in implementing the school's curriculum, teachers' expectations for student achievement, parental support for student achievement, parental involvement in school activities, students' regard for school property, students' desire to do well in school. The more favorable the perception of the science teacher of the school climate, the higher the science achievement is. The "Index of Mathematics (Science) Teachers' Perception of Safety in the Schools" is defined as the extent to which the teacher perceives that the school is located in a safe neighborhood, feeling that the teacher is safe at school, and perception of the sufficiency of school security policies and practices. The more favorable the perception of the science teacher of school safety, the higher the science achievement is. The "Index of Teachers' Reports on Teaching Mathematics (Science) Classes with Few or No Limitations on Instruction due to Student Factors" is defined as the extent to which the mathematics (science) teacher perceives that there are no or few limitations on instruction due to student factors (students with different academic abilities, students who come from a wide range of backgrounds, students with special needs, uninterested students, low morale among students, disruptive students). The fewer the limitations due to student factors reported by the teacher, the higher the student achievement in science.

Recommendation 6:

To enhance mathematics and science achievement, it is recommended that the ministries of education as well as school administrations adopt policies and measures that would:

- improve the school climate by improving teachers' job satisfaction, teachers' understanding of the school's curricular goals, teachers' degree of success in implementing the school's curriculum, teachers' expectations for student achievement, parental support for student achievement, parental involvement in school activities, students' regard for school property, students' desire to do well in school.
- improve safety in schools by improving the sufficiency of school security policies and practices.
- reduce, as much as possible, limitations on science and mathematics instruction due to student factors.

Variance Accounted for by School-level Variables

In the six countries in which one or more school-level variable entered the regression equation, variable "Index of Principals' Perception of School Climate" entered first in the regression equation for predicting mathematics achievement in all countries except Bahrain. Only in Egypt and Jordan, the variable "Trends in Index of Availability of School Resources for Mathematics Instruction" entered second. This variable is defined as the extent to which the principal of the school perceives "math resources for instruction are more available. Math resources include the following categories: instructional materials (e.g., textbook); budget for supplies (e.g., paper, pencils); school buildings and grounds; heating/cooling and lightening systems; instructional space (e.g., classrooms); computers for mathematics instruction; computer software for mathematics instruction; calculators for mathematics instruction; library materials relevant to mathematics instruction; audio-visual resources for mathematics instruction. The more available the resources for mathematics instruction are, the higher the mathematics achievement of the students in the school.

In the seven countries in which one or more school-level variable entered the regression equation for predicting science achievement, the variable "Index of Principals' Perception of School Climate" entered first in the regression equation in all countries except Bahrain and Morocco and it entered second in Bahrain. The variable "Trends in Index of Availability of School Resources for Science Instruction" entered first in Morocco and Bahrain.

Conclusion 5:

The school-level variable that impact mathematics and science achievement are the following listed in the order of their importance:
- **Index of Principals' Perception of School Climate**
- **Trends in Index of Availability of School Resources for Mathematics (Science) Instruction.**

Since the teachers and principals agree on the importance of school climate, we reiterate our earlier recommendation in this regard. In addition we recommend the importance of availing instructional resources in mathematics and science.

Recommendation 7:

To enhance mathematics and science achievement, it is recommended that the ministries of education as well as school administrations adopt policies and measures that would avail instructional mathematics and science resources.

Appendix 1

I. STUDENT DERIVED VARIABLES AND INDICES

Highest Level of Education of Either Parent (BSDGEDUP)

Derived variable is computed from students' response to the following two separate questions:
1. What is the highest level of education completed by your mother (or stepmother or female guardian)?
2. What is the highest level of education completed by your father (or stepfather or male guardian)?

For the derived variable BSDGEDUP, the education categories were combined into five reporting categories which are computed as follows:

1. Finish University or Equivalent or Higher
2. Finish Post-secondary Vocational/Technical Education But Not University
3. Finish Upper Secondary Schooling
4. Finish Lower secondary Schooling
5. No More than Primary Schooling

Students' Educational Aspirations Relative to Parents' Educational Level (**BSDGASP**)

Derived variable is computed from students' response to the following three questions:

1. What is the highest level of education completed by your mother (or stepmother or female guardian)?
2. What is the highest level of education completed by your father (or stepfather or male guardian)?
3. How far in school do you expect to go?

The derived variable BSDGASP is reported with four categories as follows:

1: Student Finish University and Either Parent Went to University or Equivalent
2: Student Finish University and Neither Parent Went to University or Equivalent
3: Student Not Finish University Regardless of Parents' Education
4: Students Do Not Know (Regardless of Parents' Education

Use of Computer (BSDGCVAL)

Derived variable is computed from students' responses to the following questions with a Yes/No response.

1. Do you ever use a computer? (do not include PlayStation, GameCube, Xbox, or other TV/video game computers
2. Where do you use a computer? The question (SQ2_14B or SQ2s_27B) has following six options:

a) At home, b) At school, c) At a library, d) At a friend's home, e) At an Internet Cafe, f) Elsewhere

The derived variable BSDGCVAL is reported with five categories based on following definitions:

1. Use Computer Both at Home and at School
2. Use Computer at Home but Not at School
3. Use Computer at School but Not at Home
4. Use Computer Only at Places Other than Home and School
5. Do Not Use Computer at All

Index of Time Students Spend Doing Mathematics Homework (TMH) in a Normal School Week (BSDMHW)

The index is computed from students' responses to the following two questions regarding mathematics homework.

1. How often your teacher gives you homework in mathematics?
2. When your teacher gives you mathematics homework, how many minutes are you usually given?

The index BSDMHW has three levels defined as follows:

1 = High: Students who responded that they are given mathematics homework at least 3 or week AND they are given at least 31 minutes of mathematics homework
3 = Low: Students who responded that they are given homework at most 1 or 2 times a week AND they are given at most 30 minutes of mathematics homework
2 = Medium: All other combinations.

Index of Time Students Spend Doing Science Homework (TMH) in a Normal School Week (BSDSHW)

The index is computed from students' responses to the following two questions regarding science homework

1. How often your teacher gives you homework in science?
2. When your teacher gives you science homework, how many minutes are you usually given?

The index BSDSHW has three levels defined as follows:

1 = High: Students who responded that they are given science homework at least 3 or 4 times a week and they are given at least 31 minutes of science homework
3 = Low: Students who responded that they are given homework at most 1 or 2 times a week AND they are given at most 30 minutes of science homework
2 = Medium: All other combinations.

Index of Time Students Spend Doing Science Homework (TSH) in a Normal School Week (BSDBHW)

The index is computed from students' responses to the following two questions regarding biology homework.

1. How often your teacher gives you homework in biology? (SQ2S_32Ab)
2. When your teacher gives you biology homework, how many minutes are you usually given?

The index BSDBHW has three levels defined as follows:

1 = High: Students who responded that they are given biology homework at least 3 or 4 times a week and they are given at least 31 minutes of biology homework

3 = Low: Students who responded that they are given homework at most 1 or 2 times a week AND they are given at most 30 minutes of biology homework

2 = Medium: All other combinations.

Index of Time Students Spend Doing Science Homework (TSH) in a Normal School Week (BSDCHW)

The index is computed from students' responses to the following two questions regarding chemistry homework:

How often your teacher gives you homework in chemistry?

When your teacher gives you chemistry homework, how many minutes are you usually given?

The index BSDCHW has three levels defined as follows:

1 = High: Students who responded that they are given chemistry homework at least 3 or 4 times a week and they are given at least 31 minutes of chemistry homework

3 = Low: Students who responded that they are given homework at most 1 or 2 times a week AND they are given at most 30 minutes of chemistry

2 = Medium: All other combinations.

Index of Time Students Spend Doing Science Homework (TSH) in a Normal School Week (BSDPHW)

The index is computed from students' responses to the following two questions regarding physics homework:.

How often your teacher gives you homework in physics?

When your teacher gives you physics homework, how many minutes are you usually given?

The index BSDPHW has three levels defined as follows:

1 = High: Students who responded that they are given physics homework at least 3 or 4 times a week and they are given at least 31 minutes of physics homework

3 = Low: Students who responded that they are given homework at most 1 or 2 times a week AND they are given at most 30 minutes of physics homework

2 = Medium: All other combinations.

Index of Students' Self-Confidence in Learning Mathematics (SCM) (BSDMSCL)

The index is computed from students' responses to the following questions regarding mathematics on a 4-point Likert scale of 1) Agree a lot, 2) Agree a little, 3) Disagree a little, 4) Disagree a lot:

1) I usually do well in mathematics
2) Mathematics is more difficult for me than for many of my classmates (Reversed)
3) Mathematics is not one of my strengths
4) I learn things quickly in mathematics

Index BSDMSCL is based on the average of responses to the above statements. The index has three categories:

1 = High: Average is less than or equal to 2.
2 = Medium: Average is greater than 2 and less than 3.
3 = Low: Average is greater than or equal to 3.

Index of Students' Self-Confidence in Learning Science (SCS) (BSDSSC)

The index is computed from students' responses to the following questions regarding science on a 4-point Likert scale of 1) Agree a lot, 2) Agree a little, 3) Disagree a little, 4) Disagree a lot:

1) I usually do well in science
2) Science is more difficult for me than for many of my classmates (Reversed)
3) Science is not one of my strengths
4) I learn things quickly in science

Index BSDSSCL is based on the average of responses to the above statements. The index has three categories:

1 = High: Average is less than or equal to 2.
2 = Medium: Average is greater than 2 and less than 3.
3 = Low: Average is greater than or equal to 3.

Index of Students' Self-Confidence in Learning Science (SCS) (BSDSCL)

The index is computed from students' responses to the following questions regarding biology on a 4-point Likert scale of 1) Agree a lot, 2) Agree a little, 3) Disagree a little, 4) Disagree a lot:

1) I usually do well in biology
2) Biology is more difficult for me than for many of my classmates (Reversed)
3) Biology is not one of my strengths
4) I learn things quickly in biology

Index BSDSCL is based on the average of responses to the above statements. The index has three categories:

1 = High: Average is less than or equal to 2.
2 = Medium: Average is greater than 2 and less than 3.
3 = Low: Average is greater than or equal to 3.

Index of Students' Self-Confidence in Learning Science (SCS) (BSDCSCL)

The index is computed from students' responses to the following questions regarding chemistry on a 4-point Likert scale of 1) Agree a lot, 2) Agree a little, 3) Disagree a little, 4) Disagree a lot:

1) I usually do well in chemistry
2) Chemistry is more difficult for me than for many of my classmates (Reversed)
3) Chemistry is not one of my strengths
4) I learn things quickly in chemistry

Index BSDCSCL is based on the average of responses to the above statements and has three categories:

1 = High: Average is less than or equal to 2.
2 = Medium: Average is greater than 2 and less than 3.
3 = Low: Average is greater than or equal to 3.

Index of Students' Self-Confidence in Learning Science (SCS) (BSDPSCL)

The index is computed from students' responses to the following questions regarding physics on a 4-point Likert scale of 1) Agree a lot, 2) Agree a little, 3) Disagree a little, 4) Disagree a lot:

1) I usually do well in physics
2) Physics is more difficult for me than for many of my classmates (Reversed)
3) Physics is not one of my strengths
4) I learn things quickly in physics

Index BSDPSCL is based on the average of responses to the above statements and has three categories:

1 = High: Average is less than or equal to 2.
2 = Medium: Average is greater than 2 and less than 3.
3 = Low: Average is greater than or equal to 3.

Index of Students' Valuing Mathematics (SVM) (BSDMSV)

The index is computed from students' responses to the following seven questions regarding mathematics on a 4-point Likert scale of 1) Agree a lot, 2) Agree a little, 3) Disagree a little 4) Disagree a lot:

1) I would like to take more mathematics in school
2) I enjoy learning mathematics.
3) I think learning mathematics will help me in my daily life.
4) I need mathematics to learn other school subjects.
5) I need to do well in mathematics to get into the university of my choice.
6) I would like a job that involved using mathematics.
7) I need to do well in mathematics to get the job I want.

Index BSDMSV is based on the average of responses to the above statements and has three categories:

1 = High: Average is less than or equal to 2.

2 = Medium: Average is greater than 2 and less than 3.
3 = Low: Average is greater than or equal to 3.

Index of Students' Valuing Science (SVS) (BSDSSV)

The index is computed from students' responses to the following seven questions regarding science on a 4-point Likert scale of 1) Agree a lot, 2) Agree a little, 3) Disagree a little, 4) Disagree a lot:

1) I would like to take more science in school;
2) I enjoy learning science;
3) I think learning science will help me in my daily life;
4) I need science to learn other school subjects;
5) I need to do well in science to get into the university of my choice;
6) I would like a job that involved using science;
7) I need to do well in science to get the job I want.

Index BSDSSV is based on the average of responses to the above statements and has three categories:

1 = High: Average is less than or equal to 2.
2 = Medium: Average is greater than 2 and less than 3.
3 = Low: Average is greater than or equal to 3.

Index of Students' Valuing Science (SVS) (BSDBSV)

The index is computed from students' responses to the following seven questions regarding biology on a 4-point Likert scale of 1) Agree a lot, 2) Agree a little, 3) Disagree a little, 4) Disagree a lot:

1) I would like to take more biology in school.
2) I enjoy learning biology.
3) I think learning biology will help me in my daily life.
4) I need biology to learn other school subjects.
5) I need to do well in biology to get into the university of my choice .
6) I would like a job that involved using biology.
7) I need to do well in biology to get the job I want.

Index BSDBSV is based on the average of responses to the above statements and has three categories:

1 = High: Average is less than or equal to 2.
2 = Medium: Average is greater than 2 and less than 3.
3 = Low: Average is greater than or equal to 3.

Index of Students' Valuing Science (SVS) (BSDCSV)

The index is computed from students' responses to the following seven questions regarding chemistry on a 4-point Likert scale of 1) Agree a lot, 2) Agree a little, 3) Disagree a little, 4) Disagree a lot:

1) I would like to take more chemistry in school;
2) I enjoy learning chemistry;

3) I think learning chemistry will help me in my daily life;
4) I need science to learn other school chemistry (SQ2S_21b);
5) I need to do well in chemistry to get into the university of my choice;
6) I would like a job that involved using chemistry;
7) I need to do well in chemistry to get the job I want.

Index BSDCSV is based on the average of responses to the above statements and has three categories:

1 = High: Average is less than or equal to 2.
2 = Medium: Average is greater than 2 and less than 3.
3 = Low: Average is greater than or equal to 3.

Index of Students' Valuing Science (SVS) (BSDPSV)

The index is computed from students' responses to the following seven questions regarding physics on a 4-point Likert scale of 1) Agree a lot, 2) Agree a little, 3) Disagree a little, 4) Disagree a lot:

1) I would like to take more physics in school.
2) I enjoy learning physics.
3) I think learning physics will help me in my daily life.
4) I need physics to learn other school subjects.
5) I need to do well in physics to get into the university of my choice.
6) I would like a job that involved using physics.
7) I need to do well in physics to get the job I want.

Index BSDPSV is based on the average of responses to the above statements and has three categories:

1 = High: Average is less than or equal to 2.
2 = Medium: Average is greater than 2 and less than 3.
3 = Low: Average is greater than or equal to 3.

Index of Students' Perception of Being Safe in the Schools (SPBSS) (BSDGPSS)

The index is computed from students' responses to the following question:
In school, did any of this things happen during the last month
The international version of the questionnaire has following five categories with a Yes/No option:

a = Something of mine was stolen
b = I was hit or hurt by other student(s) (e.g., shoving, hitting, kicking)
c = I was made to do things that I didn't want to do by other students
d = I was made fun of or called names
e = I was left out of activities by other students

Index BSDGPSS is assigned to three levels as follows:

1 = High: Average is less than or equal to 2.
2 = Medium: Average is greater than 2 and less than 3.
3 = Low: Average is greater than or equal to 3.

II. TEACHER DERIVED VARIABLES AND INDICES MATHEMATICS

Class Size for Mathematics Instruction (BTDMSTUD)

Based on the teachers' responses for the following question regarding number student in TIMSS class:

How many students are in the TIMSS class?

The derived variable BTDMSTUD has four categories

1. 1-24 Students;
2. 25-32 Students;
3. 33-40 Students.

Derived variable is computed from the teachers' responses for the following two question(s):

Do you have a teacher license or certificate? (Yes/No) (Code 1/ Code 2) (TQM2_8A)

Mathematics Teachers' Certification (BTDGTELC)

What type of license or certificate do you hold?(TQM2_8B)

The international version of question TQM2_8B has following options

1) Full certificate
2) Provisional Certificate
3) Emergency Certificate
4) Others.

The derived variable BTDGTELC has two categories:

1. Yes
2. No.

Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations on Instruction due to Student Factors (MCFL) (BTDMLT)

Based on mathematics teachers' responses to the following six statements on a 5-point Likert scale of 1) Not applicable, 2) Not at all, 3) A little, 4) Some, 5) A lot :

1) Students with different academic abilities
2) Students who come from a wide range of backgrounds
3) Students with special needs
4) Uninterested students
5) Low morale among students
6) Distruptive students .

Index BTDMLT is based on the average of responses to the six statements and has three categories:

1 = High: Average is less than or equal to 2.
2 = Medium: Average is greater than 2 and less than 3.
3 = Low: Average is greater than or equal to 3.

Index of Teachers' Emphasis on Mathematics Homework (EMH) (BTDMH)

The index is computed from teachers' responses to the following three question(s) regarding mathematics homework:

Do you assign mathematics homework to the TIMSS class?

How often do you usually assign mathematics homework to the TIMSS class?

When you assign mathematics homework to the TIMSS class, about how many minutes do you usually assign? (Consider the time it would take an average student in your class.)

Index BTDMH is assigned to three categories according to the following definitions:

1 = High
3 = Low
2 = Medium

Index of Mathematics Teachers' Perception of School Climate (TPSC) (BTDMCH)

The index is computed from teachers' responses to the following question regarding their school climate using five point likert scale (1 = very high, 2 = high, 3 = medium, 4 = low, 5 = very low):

How would you characterize each of the following within your school?)

The international version of the question has following eight categories

a = Teachers' job satisfaction
b = Teachers' understanding of the school's curricular goals
c = Teachers' degree of success in implementing the school's curriculum
d = Teachers' expectations for student achievement
e = Parental support for student achievement
f = Parental involvement in school activities
g = Students' regard for school property
h = Students' desire to do well in school

Index was calculated by averaging the response given by teachers for these categories Index BTDMCH is assigned to three levels as follow:

1 = High: Average is less than or equal to 2.
2 = Medium: Average is greater than 2 and less than 3.
3 = Low: Average is greater than or equal to 3.

Index of Mathematics Teachers' Perception of Safety in the Schools (TPSS) (BTDMCH)

The index is computed from teachers' responses to the following question concerning security in their schools using four point likert scale (1 = agree a lot, 2 = agree, 3 = disagree, 4 = disagree a lot):

Thinking about your current school, indicate the extent to which you agree or disagree with each of the following statements:

b = This school is located in a safe neighborhood
c = I feel safe at this school
d = This school's security policies and practices are sufficient

Index BTDMCU is assigned to three levels as follow:

1 = High: Code 1 or 2 to all three statements
3 = Low: Code 3 or 4 to all three statements
2 = Medium: All other combinations

SCIENCE

Class Size for Science Instruction (BTDSSTUD)

Based on the teachers' responses for the following question regarding number student in TIMSS class:

How many students are in the TIMSS class?
The derived variable BTDSSTUD has four categories

1. 1-24 Students;
2. 25-32 Students;
3. 33-40 Students.

Derived variable is computed from the teachers' responses for the following two question(s):

Do you have a teacher license or certificate? (Yes/No) (Code 1/ Code 2) (TQM2_8A)

Science Teachers' Certification (BTDSTELC)

What type of license or certificate do you hold?(TQM2_8B)

The international version of question TQM2_8B has following options

1) Full certificate
2) Provisional Certificate
3) Emergency Certificate
4) Others.

The derived variable BTDSTELC has two categories:

1. Yes
2. No.

Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors (MCFL) (BTDSLT)

Based on science teachers' responses to the following six statements on a 5-point Likert scale of 1) Not applicable, 2) Not at all, 3) A little, 4) Some, 5) A lot :

1) Students with different academic abilities
2) Students who come from a wide range of backgrounds
3) Students with special needs
4) Uninterested students
5) Low morale among students
6) Distruptive students .

Index BTDSLT is based on the average of responses to the six statements and has three categories:

1 = High: Average is less than or equal to 2.
2 = Medium: Average is greater than 2 and less than 3.
3 = Low: Average is greater than or equal to 3.

Index of Teachers' Emphasis on Science Homework (EMH) (BTDSH)

The index is computed from teachers' responses to the following three question(s) regarding mathematics homework:
Do you assign mathematics homework to the TIMSS class?
How often do you usually assign science homework to the TIMSS class?
When you assign mathematics homework to the TIMSS class, about how many minutes do you usually assign? (Consider the time it would take an average student in your class.)

Index BTDSH is assigned to three categories according to the following definitions:

1 = High
3 = Low
2 = Medium

Index of Science Teachers' Perception of School Climate (TPSC) (BTDSCH)

The index is computed from teachers' responses to the following question regarding their school climate using five point likert scale (1 = very high, 2 = high, 3 = medium, 4 = low, 5 = very low):

How would you characterize each of the following within your school?)

The international version of the question has following eight categories

a = Teachers' job satisfaction
b = Teachers' understanding of the school's curricular goals
c = Teachers' degree of success in implementing the school's curriculum
d = Teachers' expectations for student achievement
e = Parental support for student achievement
f = Parental involvement in school activities
g = Students' regard for school property
h = Students' desire to do well in school

Index was calculated by averaging the response given by teachers for these categories

Index BTDSCH is assigned to three levels as follow:

1 = High: Average is less than or equal to 2.
2 = Medium: Average is greater than 2 and less than 3.
3 = Low: Average is greater than or equal to 3.

Index of Science Teachers' Perception of Safety in the Schools (TPSS) (BTDSCH)

The index is computed from teachers' responses to the following question concerning security in their schools using four point likert scale (1 = agree a lot, 2 = agree, 3 = disagree, 4 = disagree a lot):

Thinking about your current school, indicate the extent to which you agree or disagree with each of the following statements:

b = This school is located in a safe neighborhood
c = I feel safe at this school
d = This school's security policies and practices are sufficient

Index BTDSCU is assigned to three levels as follow:

1 = High: Code 1 or 2 to all three statements
3 = Low: Code 3 or 4 to all three statements
2 = Medium: All other combinations

III. SCHOOL VARIABLES

Trends in Index of Availability of School Resources for Mathematics Instruction (ASRMI) (BCDMST)

The index is computed from principals' responses to questions regarding shortages or inadequacies that can affect instruction in their school on a four point likert scale (1 = none, 2 = a little, 3 = some, 4= a lot) :

Is your school capacity to provide instruction affected by a shortage or inadequacy of any of the following?

a = Instructional materials (e.g., textbook);
b = Budget for supplies (e.g., paper, pencils);
c = School buildings and grounds;
d = Heating/cooling and lightening systems;
e = Instructional space (e.g., classrooms);
g = Computers for mathematics instruction;
h = Computer software for mathematics instruction;
i = Calculators for mathematics instruction;
j = Library materials relevant to mathematics instruction;
k = Audio-visual resources for mathematics instruction.

Index BCDMST is assigned to three levels as follow:

1 = High: Average value of a-e is less than 2 AND the average value of g-k is less than 2;
3 = Low: Average value of a-e is greater than or equal to 3 AND the average value of g-k is greater than or equal to 3;
2 = Medium: All other combinations.

Trends in Index of Availability of School Resources for Science Instruction (ASRSI) (BCDSST)

The index is computed from principals' responses to questions regarding shortages or inadequacies that can affect instruction in their school on a four point likert scale (1 = none, 2 = a little, 3 = some, 4= a lot) :

Is your school capacity to provide instruction affected by a shortage or inadequacy of any of the following?

a = Instructional materials (e.g., textbook);
b = Budget for supplies (e.g., paper, pencils);
c = School buildings and grounds;
d = Heating/cooling and lightening systems;
e = Instructional space (e.g., classrooms);
l = science laboratory equipment and materials;
m = Computers for science instruction;
n = Computer software for science instruction;
o = Calculators for science instruction;
p = Library materials relevant to science instruction;
q = Audio-visual resources for science instruction.

Index BCDSST is assigned to three levels as follow:

1 = High: Average value of a-e is less than 2 AND the average value of g-k is less than 2;
3 = Low: Average value of a-e is greater than or equal to 3 AND the average value of g-k is greater than or equal to 3;
2 = Medium: All other combinations.

Index of Principals' Perception of School Climate (PPSC) (BCDGCH)

The index is computed from principals' responses to eight questions regarding school climate using a four point likert scale (1 = very high, 2 = high, 3 = medium, 4 = low, 5 = very low)

How would you characterize each of the following within your school?

The international version of the question has following eight categories

a = Teachers' job satisfaction
b = Teachers' understanding of the school's curricular goals
c = Teachers' degree of success in implementing the school's curriculum
d = Teachers' expectations for student achievement
e = Parental support for student achievement
f = Parental involvement in school activities
g = Students' regard for school property
h = Students' desire to do well in school

Index is calculated by averaging the responses for the above eight categories

Index BCDGCH is assigned to three levels as follow:

1 = High: Average value is less than or equal to 2
2 = Medium: Average value is greater than 2 AND less than or equal to 3
3 = Low: Average value is greater than 3

Trends in Index of Good School and Class Attendance (GSCA) (BCDGSP)

The index is computed from principals' responses to two questions concerning the problem behaviors of students in their schools:

How often each of the following behavior occur among eighth grade students in your school? using a 5 point likert scale: 1) Never, 2) Rarely, 3) Monthly, 4) Weekly 5) Daily If the behavior occurs, how severe a problem does it present? using a 3-point likert scale: 1) Not a problem, 2) Minor problem, 3) Serious problem

The international version of both the question have following three problem behavior categories

a = Arriving late at school
b = Absenteeism (i.e., unjustified absences)
c = Skipping class <hours/periods>

Index BCDGSP is assigned to three levels as follow:

1 = High
3 = Low
2 = Medium