Examining Elements of Social Injustice in Females’ Science Education in Schools: A Case Study

A Project Presented to the Lebanese American University in Beirut Faculty of the Education and Social Science Division

In Partial Fulfillment of the Requirements for the degree of Master in Education

by

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To the two most precious gifts
God has given me in life, to my children
Mazen and Jad
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Abstract

The purpose of this study was to explore factors that discouraged female students from choosing the scientific academic track at the secondary level in a private school with two branches in Lebanon. This was done through examining the role of schools, parents and society in addition to other factors that contributed to females’ gender inequity in education. The sample consisted of all female students of grade 10 and the science and mathematics teachers of the same grade level. The instruments that were used were closed-itemed female students’ questionnaires, semi-structured science and mathematics teachers’ interviews as well as parents’ phone interviews and observations of teacher-student-interactions in science and mathematics classes. The results showed discrepancies between what students and teachers said about gender equity and practices in classrooms and the strong gender bias in Lebanese Baccalaureate science and mathematics textbooks that students were exposed to. Results also indicated that teachers were not aware of their hidden biased beliefs. In other words, gender inequity existed in this school due to discouraging factors such as teachers’ attitudes, parents’ socialization, gender bias in textbooks and female students’ lack of self confidence. On the other hand, female students’ abilities and achievements and the diminishing influence of social stereotypes on their attitude toward science were promising factors that might give hope for a brighter future.
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Examining Elements of Social Injustice in Females’ Science Education in Schools: A Case Study

Rula Hallab

Lebanese American University
CHAPTER ONE

Introduction

Examining Elements of Social Injustice in Females’ Science Education in Schools: A Case Study

Context of the study

Social justice is equivalent to social equality. According to Scrace (1997), equality does not only mean the fair distribution of resources, but equal opportunity for everyone to participate in society’s major institutions and to be socially supported to develop their capacity. In education, anything that limits the chances for learning and success can be grouped under social injustice. Educators seek social justice to remove social and educational inequalities that some groups of students suffer from, and consider this as a moral and ethical responsibility. Of all the forms of discrimination by religion, social class, gender, poverty and language, gender inequity is the focus of this study.

One component of social injustice in education is gender inequity. Gender equity in education has been defined as getting an equal chance at learning, developing, achieving, preparing for future education and careers and having equitable treatment and outcomes in school and beyond (Scrace, 1997). Females suffer from the seeds of gender inequity that are planted early in life, cultivated at home and school and observed at the workplace (Ayalon, 2003). Women have suffered denial of equal educational and employment opportunities because of many factors that are highlighted in this study.

Purpose of the study

Young females experienced barriers to development of interest in science. James and Smith (1985) found that girls’ achievement in science and mathematics in the elementary grades
was similar to that of male peers; yet as they reached the secondary level, their grades started to decrease. Gilbert (2001) argued that despite the tremendous progress in the participation and achievement of female students in science programs, the dilemma of gender and science education had not been resolved. The main purpose of this study was to investigate the factors that discouraged a selected group of females from choosing the scientific academic track at the secondary level in a selected private school with two branches in Greater Beirut.

Significance of the study

Females are suffering from unequal opportunities in science classrooms as well as in occupations of scientific background. Women are under-represented in such occupations and this under representation is obvious in any female’s life journey, from childhood to academic progress and finally to choosing a career (Ayalon, 2003). Lebanese literature on this issue is scarce so this study will help researchers examine the factors that discourage a selected group of females from choosing the scientific academic track at the secondary level. Moreover, the study will familiarize teachers, parents and female students with these factors in order to be aware of them and avoid them as much as possible. The researcher understands the significance of this study as part of any teacher’s professional development and any female student’s and parent’s gender-awareness raising. Educational opportunities and experiences have to be reexamined and thoughtful intervention strategies should be developed to design an effective science classroom and improve science teachers’ attitudes toward females in these classrooms.

Literature review

In the USA, Joyce & Farenga (2000) examined the intended majors of university students and found that the ratio of males to females seeking a degree in physical science, computer science, mathematics or engineering was three males to one female and that it was only in
biological sciences and health profession fields that the number of females exceeded that of males. These differences demonstrated that large gender discrepancies existed in the study of science. A review of literature revealed certain stereotypes perpetuated by society, school and family (Ayalon, 2003; Farenga & Joyce, 1997). The factors behind such gender gaps in a selected school with two branches in Greater Beirut were presented in the study. The literature presented some of the factors such as students’ interests and characteristics, teachers’ gender and characteristics, teachers’ attitudes and behaviors, family socialization and expectations, family’s socio-economic status, image of science in society, gender-bias in curriculum textbooks and many other factors to be discovered and elaborated later (Blickenstaff, 2005; Debacker & Nelson, 2000; Joyce & Farenga, 2000; Schwartz & Hanson, 1992).

In this study, the researcher tried to answer some key questions. These research questions addressed the purpose of the study and stemmed from the literature review. The first research question was: what is the role of the school in females’ gender inequity? The second was: what is the role of parents and society in females’ gender inequity? The third was: what are the other factors that play a role in females’ gender inequity in schools?

Methods and instruments

This study is a descriptive case study in which a school (X) has been selected. Data were collected from two branches X1 and X2 of this selected school. The schools are located in the suburbs of Beirut with English as the main language of instruction in both. School X1 is larger, has more students and provides two programs: The Lebanese Baccalaureate Program and the American High School Preparatory Program, whereas school X2 provides only the American High School Preparatory Program. Moreover, the American Preparatory Program teaches mathematics and biology as scientific subjects at grade 10 and leaves physics and chemistry to
be taken as electives at higher secondary levels, thus, grades 11 and 12, whereas the Lebanese Baccalaureate Program teaches mathematics, physics, chemistry and biology as obligatory scientific subjects.

This is a case study that observes characteristics of a single unit which is school X. This study relies on both qualitative and quantitative methodology where the researcher uses different research tools. Secondary one class is chosen in each school because in this class students choose their academic track, either the scientific or the literary sections with four possible choices: general science, life science, economical science or humanities for the final year. In each school, a questionnaire was administered by the researcher to all females in all the sections of that class (see Appendix A). In school X1, a group interview was conducted with four science and mathematics teachers whereas in school X2 two teachers of biology and mathematics were interviewed separately due to the absence of one of them the first day and because only these two subjects were taught as scientific subjects (see Appendix B). Audiotapes were used for recording the interviews after getting the permission of the interviewees and assuring them of total confidentiality for ethical purposes.

Quota or phone interviews with a sample of parents from both schools were conducted (see Appendix C). Only six questions were asked to get more feedback on the role of parents. Quota interviews were used to save time (Walliman, 2001).

A third tool that was used was observing science and mathematics sessions using observation checklists to record teachers’ and students’ interactions (see Appendix D). Six observation sessions were conducted in school X1 for the Lebanese Baccalaureate Program and the American High School Preparatory Program and two observation sessions in school X2 for
the American High School Preparatory Program because only biology and mathematics were taught as scientific subjects in this branch.

Data Analysis

Concerning the questionnaires, descriptive statistics were used to analyze the data and come up with conclusions. Concerning the interviews, the information of each interview was transformed into a transcript file and an analytical file. The transcript file included all the details mentioned during the interviews and the analytical file was the basis of data analysis. The data of the interviews were categorized, subcategorized and coded in the analytical file. The categories and subcategories were presented in appendix E and were analyzed.

Data from the observation checklists were categorized to answer the research questions. Finally, the results were compared and contrasted with the findings of the literature to identify the factors that discouraged females from choosing the scientific track at the secondary level.

Expected Results

An expected finding is the existence of discrepancies in treatment of females in science classes despite the improvement in females' achievement in science according to the literature. This study will encourage educators to address the issue of social injustice in females' education and develop intervention strategies that help draw more females into scientific fields by changing teachers' practices and the negative attitudes of females toward science to make science fun to learn.

Organization of the study

Chapter one introduced the purpose and significance of the study and the research questions that were addressed. Chapter two presented the literature review. Chapter three discussed the methodology and instruments that were used for data collection and data analysis.
Chapter four presented the data that were collected from the teachers’ interviews, students’ questionnaires and observation checklists. Chapter five compared and contrasted the findings of the study with the findings of the literature. Finally chapter six presented the conclusion, limitations and suggestions for further research.
CHAPTER TWO

Literature Review

Introduction

Females are suffering from unequal opportunities in science classes as well as in occupations of scientific background (Ayalon, 2003). The number of females majoring in scientific fields are less than that of males especially in physical sciences, showing that large gender discrepancies still exist in the study of science (Ayalon, 2003; Farenga & Joyce, 1997). This study focuses on factors that discourage females from choosing the scientific academic track. Important and relevant research studies are reviewed and presented in the chapter.

Literature Review

By providing considerable numbers of schools, governments are satisfied that they have met their social justice requirements. Schools that teach students, with little consideration to issues of what actually takes place in the school in terms of curriculum content or interactions between students and teachers, have superficial views of what the term 'social justice' implies. Social justice in education has to do with fairness, rights and equal opportunities of participation for both sexes and takes into consideration the views and needs of students. It is required of education to achieve economic development and greater social justice for populations, but this goal is hard to achieve when half of any society's population is under-represented in schools, universities and the workplace (Searse, 1997).

Women are under-represented in occupations of scientific background (Ayalon, 2003). This discrimination by gender in education means fewer girls choosing the scientific track in the secondary level and universities, lower rates of employment, and lower wages. The absence of women in the sciences is an indication of a much deeper issue; social injustice in education
(Scrase, 1997). The normal image of a scientist is a middle/upper class nerd male. Scientists are expected to be rational, objective, unemotional and competitive and society implies that females lack these qualities that are exclusive to males. Society has limited the role of women as females and created special categories for people who are scientists (Francis, 2000). The literature presents some of the factors that affect females’ academic choices such as students’ interests and characteristics (Debacker & Nelson, 2000; Schwarts & Hanson, 1992), teachers’ gender and characteristics, teachers’ attitudes and behaviors in classrooms (Blickenstaff, 2005; Gilbert, 2001; Kennedy & Parks, 2000), family socialization and expectations, family’s socio-economic-status (Joyce & Farenga, 2000; Lupart, Pyryt & Cannon, 2001; Tinklin, Croxford & Ducklin & Frame, 2005), image of science in society, gender-bias in curriculum and universities’ textbooks as well as other factors (Schwarts & Hanson, 1992; Zittleman & Sadker, 2002).

2.3 Family socialization and expectations

The formation of future personality is influenced by childhood experiences. Kahle (1990) mentioned parents’ socialization process of young children as a factor that leads boys’ achievement, interest and approach toward science. Parents are the child’s first and most influential teachers who play a central role in the creation of his/her views (Farenga & Joyce, 1997). Parents tend to treat children differently according to their gender; but this attitude is very dangerous for its consequences will continue throughout the life of each child. Most of the time, parents are not aware of their behaviors that discourage their daughters from studying mathematics, physics and science. For example, parents buy technical toys for their sons and dolls for their daughters. Girls are asked to help mothers in the kitchen, boys are asked to help fathers in technical work in the house or garden. Boys are encouraged to use tools as hammers and saws whereas girls are warned not to touch them and hurt themselves (Kennedy & Parks,
2000; Lupart et al., 2001; Schwartz & Hanson, 1992). This difference in treatment will show later in schools. Students who come from homes with previous science experiences, because of playing with educational toys that match the school’s curriculum, participate better and in a more efficient way. So girls will have fewer opportunities in science classes because they lack such experiences (Farenga & Joyce, 1997; Schewedes, 1997). In later stages, parents might even think that it is very hard for their daughters to choose a scientific track and get the same learning results as males.

One study showed that females were more interested in life science than physical science (Joyce & Farenga, 2000), but another study had different findings (Johnson, 1999). According to the second study, the young girls exhibited similar levels of interest using similar number of science process skills and cognitive levels in both sciences. Girls lacked the experience only and early exposure to such fields, due to their parents who were not aware of their daughters’ interest in physical science and did not expose them enough to physical science activities at home as they did to biological science activities (Johnson, 1999).

Parents’ occupation, educational background and direct participation in their daughters’ education developed gender-role stereotyped behaviors (Abtan, 1993; Kennedy & Parks, 2000; Tinklin et al., 2005). Studies found that a lack of parental expectations and encouragement for females to excel in scientific subjects resulted in lower performance (Lupart et al., 2001). Parents must be aware of providing science-related opportunities to their daughters and not to limit these chances to boys. Parents have to change their attitudes about what girls can do.

*Teachers’ gender and characteristics*
Studies had focused on teachers’ gender as a factor affecting females’ achievement. The methods teachers used in teaching had direct effects on how students perceived the subject (Blickenstaff, 2005). Marshall and Reinhartz (1997) identified gender and characteristics of science teachers as: male science teachers were subject-oriented, more dominant, more authoritarian in their approach, preferred lecturing and created a highly organized environment, which was teacher controlled whereas female science teachers were more indirect, student-centered and created a warmer instructional environment. Unfortunately, Blickenstaff (2005) found that most science teachers at the secondary level were men and the majority of students were boys, and male science teachers’ approaches did not match females’ learning styles.

*Teachers’ attitudes and behaviors*

As mentioned above, females’ achievement in science and mathematics decreased in the secondary levels (Blickenstaff, 2005; Farenga & Joyce, 1997; Lupart et al., 2001). Even at universities, more males than females seeked a degree in physical science, computer science, mathematics or engineering (Joyce & Farenga, 2000; Tinklin et al., 2005). These differences showed that large discrepancies existed in the study of science (Gilbert, 2001; Joyce & Farenga, 2000). The gender-bias of science teachers’ behavior favored boys in that they were treated differently in classes (Lupart et al., 2001). Boys were called on and by name more frequently, were given more opportunities to ask questions, were given longer wait time to answer questions, received more reinforcement and encouragement and more eye contact; whereas girls received fewer opportunities to ask or answer questions, to use science equipment or to participate in science activities (Ayallon, 2003; Bailey, Seantlebury & Letts, 1997; Blickenstaff, 2005; Kennedy & Parks, 2000; Lupart et al., 2001; Schwartz & Hanson, 1992). Moreover, teachers were accused of expressing strange admiration for boys’ achievement. For example, some
teachers commented that although boys behaved badly and disrupted classes yet their work was more original than that of girls or that some boys did not do their daily assignments yet they still passed the exam. Girls were complemented for neatness whereas boys were complemented for achievement (Blickenstaff, 2005).

This discrimination by gender started early in the preschool where teachers unintentionally reinforced stereotypes that children brought with them from their homes. Teachers reinforced discrimination by seating girls on one side and boys on the other side or by setting up class competitions of boys versus girls. This concept that boys and girls were on opposite sides infected children’s ideas of both sexes (Blickenstaff, 2005; Sanders, 1997). The problem was that teachers were unaware of their biased behaviors through verbal interactions, eye contact and body language (Sanders, 1997). Spear (1987) added that teachers did not only treat boys differently, but deeply believed that science was more important for the boys’ than it was for girls’ future.

Rayman (1994) blamed science teachers for teaching science in an imperfect and insufficient way that is, not showing the relevance or practicality of learning these subjects in students’ daily lives. These actions in class prevented females from enjoying aspects of scientific discovery. Although universities provided student teachers with the knowledge and skill to engage issues of gender in classes, many student teachers set boundaries between theory and practice, diminishing the theoretical concepts they had learnt in universities especially novice teachers who focused on control issues. An example was a teacher who asked many questions to disruptive groups (usually boys) neglecting all other students for management purposes (Bailey et al., 1997). Furthermore, research showed that females complained of the overuse of competitive grading systems that limited co-operative work among students instead of improving
their understanding and learning and created a competitive environment (Blickenstaff, 2005; Rayman, 1994; Sanders, 1997). As a result of teachers' attitudes in classrooms, girls received the message that males' contribution in science class was much more important than theirs so they gave up and left for an environment that appreciated their contributions (Blickenstaff, 2005).

Parents' socio-economic-status

Another factor that affected females' choice of academic track was the socio-economic-status of females' families. Research indicated that this factor created barriers to participation of female students in the fields of science at the higher educational level. Many studies showed that females of high economic status completed more science courses than those of low economic status (Abtan, 1993; Kennedy & Parks, 2000). Moreover, parents' occupation and educational background were factors that played a role in females' interests and choices. Children of educated parents received more encouragement than those of uneducated parents (Abtan, 1993; Tinklin et al., 2005).

Students' interests and characteristics

Researchers mentioned other factors that affect females' academic choices such as students' abilities, learning styles, levels of confidence and attitudes toward science. Ong (1981) mentioned that females approached learning from a different way and preferred a style that encouraged group work and built ideas on top of each other; whereas males learnt through argument and individual activity. Unfortunately, most classes accommodated male learning styles. Moreover, Schwartz and Hanson (1992) found that boys focused on concepts rather than details, understood new ideas quickly, answered more questions, gave better answers and were more competitive than girls; whereas girls were passive learners, spent more time on details and memorizing and worked better in groups. In addition, males responded to questions more
confidently, quickly and freely, regardless of the quality of their responses. Females waited longer to respond to a question because they reflected on the question and constructed an answer before speaking. They chose their words carefully. Another point of difference was that females were very sensitive; if they were interrupted, they got the message that their contribution was not welcome and hesitated in joining future discussions (Blickenstaff, 2005). Educators have to use various learning styles and approaches in classrooms to contribute to the academic success of all their students, especially females.

Another contributing factor to females’ academic choices was females’ abilities and confidence level. Debacker & Nelson (2000) found that females were less confident in their abilities than males. When receiving a bad grade on an exam, a female believed that she was not intelligent, became less confident of her production and blamed herself, whereas a male blamed the professor for such an exam and placed responsibility external to himself. So females attributed their success to luck while males attributed their success to ability. Boys ranked higher than girls in their perceived ability while girls did not show their abilities. This explained the lower self-confidence, in spite of the high performance of many girls in schools (Kennedy & Parks, 2000; Sanders, 1997). In fact, the loss of self-confidence rather than any differences in abilities was the reason behind females’ avoidance of science (Alper & Gibbons; 1993; Blickenstaff, 2005; Brainard & Carlin, 2001). Ramos and Lambating (1996) explained that males showed higher levels of motivation and confidence in mathematics achievement because they were more ready to take risks than females. Boys were risk takers and blamed the challenges they encountered on external factors while girls always blamed themselves (Manning, 1998). Most mathematical and scientific problems have more than one solution, that is why taking risks is a positive quality for success in such subjects (Chaplin & Manske, 2005; Martin, 2003).
Weinburgh (1995) found that boys had a more positive attitude towards science than girls because girls believed that science was irrelevant and not useful in their lives. Girls were more interested in life science than physical science because they believed that life science had more social and ethical implications as a desire to care for people. Females were more interested in people, which might explain why they majored in organic sciences such as biology, nutrition and psychology, whereas boys were more interested in matter and things which might explain why they majored in inorganic fields such as physics, mathematics and engineering (Schewedes, 1997). A study revealed that women who continued in science majors usually were those who maintained a feeling of interest in scientific subjects and a sense of doing academically well (Brainard & Carlin, 2001).

Social stereotypes and image of science in society

Science had been traditionally represented as a masculine domain. Masculinity of science was one of the greatest impediments to young girls who wanted to be seen as ‘feminine’ while pursuing their study. Francis Bacon created a metaphor whereby he equated nature with femininity and science with masculinity, with science as a force that could conquer nature (Schwedes, 1997). Bacon’s metaphor resulted in dichotomization. Examples of the constructed dichotomies were respectively: “science/male was rational, objective, active, the mind, hard and public whereas nature/female was emotional, subjective, passive, matter, soft and private” (Schwedes, 1997, p.9). So science was an instrument of male power and control over the universe.

Gender differences in mathematics and science were due to stereotypes sustained by society. Social pressures and stereotypes as ‘girls can not do mathematics’ or ‘mathematics is unfeminine’ affected females’ education and career choices (National Research Council, 1989,
Most females turned from science careers because of social stereotypes and views toward mathematics and science education for girls. Scientists were viewed as obsessed with science and did nothing more in life. Negative and narrowly defined images of scientists were presented by society and the media. Most students think of a scientist as a nerd male with beard, glasses and a dirty laboratory coat (Alper & Gibbons, 1993). From birth, girls received different messages about their abilities and expectations than boys, and then teachers reinforced these signals in schools (Abtan, 1993; Alper & Gibbons, 1993; Blickenstaff, 2005; Lupart et al., 2001). So a female scientist had to deal with a dual identity, to be a woman, she had to be unscientific and to be a scientist, she had to be unfeminine (Kennedy & Parks, 2000).

**Discrimination by gender in textbooks**

Textbooks were gender stereotyped with more pictures of males as scientists (Lupart et al., 2001; Schwartz & Hanson, 1992). Most of the people presented in science textbooks were males, but even if females were presented, they appeared as passive observers of science such as recording data while males were experimenting in the laboratories (Blickenstaff, 2005). Bias was obvious in the language, content and illustrative pictures in science textbooks. Moreover, no attention was paid to the contributions of female scientists (Blickenstaff, 2005; Sanders, 1997).

Zittleman and Sadker (2002) analyzed 23 education textbooks that were published between the years 1998 and 2001, and found that many promoted gender inequity and sex-bias stereotypes. So it was evident that bias in education texts persisted. The books lacked topics teaching gender equity or practical strategies to eliminate gender bias in schools. Moreover, a chapter on pioneers in education, in the textbook, ‘Foundations in Education’ (Ornstein & Levine, 2003), mentioned nine males and one female (Maria Montessori) revealing a shallow role of females in education and leadership role of males in education.
Lack of role models in the field of science

Females needed exposure to more female role models in the field of science (Haynie, 2005). Only few female teachers of scientific subjects at the secondary level in schools and few female faculty members and deans of scientific departments in universities served as role models in the science environment (Kennedy & Parks, 2000; Sanders, 1997). Furthermore, many school staff had males as administrators and principals showing that administration was a male domain (Zittleman & Sadker, 2002). Shortage of female role models teaching advanced mathematics and science courses in schools and universities was a contributing factor that discouraged females in this issue.

Although work has become an important feature of females’ lives and in spite of the fact that great progress has been made concerning gender equity, there is still a long trip before equal chances are provided in education. A study that explored the views of young people on gender roles showed that although they believed in equal opportunities for both sexes in theory, yet their views were incorporated with opposite facts they saw around in their work and their own families (Tinklin et al., 2005). Change must start at homes, schools and society. A large part of the battle must begin at the elementary and high school levels (Abtan, 1993). The additional support provided by the school is very necessary to compensate for home and society socialization effects. Parents and teachers have to work collaboratively to decrease the gender gap in education. It is hopeful to keep in mind that changes may occur with time to witness mathematically oriented careers. An example of this change is the presence of females who invade prestigious male careers such as medicine.

The stereotyping of mathematics and science as male activities and the influence of other factors like parents’ socialization and teachers’ practices are discouraging factors that cause girls
to exhibit little confidence in their abilities, create less positive attitudes to science and as a consequence, make them avoid science education and careers of scientific background (Debacker & Nelson, 2000). Females have to be encouraged to add scientific majors to their fields of study to decrease the gender gap in schools and universities.

The following chapter presents in detail the methodology and instruments that were used to collect data.
CHAPTER THREE

Methodology

Introduction

This project was designed to explore factors that discouraged females from choosing the scientific academic track at the secondary level. This chapter presents the methodology and instruments that were used to gather data.

Case Study Methodology

In a case study, the researcher observes a single unit, for example, a student, a class, a school or event (Burns, 2000). The purpose of using a case study is to gain in depth understanding of the factors that influence females’ academic choices at the secondary level in a selected private school. This is a descriptive case study in which a school X has been selected deliberately for the probability of finding practices that reflect gender inequity, so the focus of the study is “on a particular organization or some aspect of the organization” (Cohen & Manion, 1994, p. 63).

The design is a non-random purposive sampling where the researcher usually uses “personal judgments to select a sample based on previous knowledge of a population and the specific purpose of the research” (Fraenkel & Wallen, 2003, p. 100). The problem with this kind of sampling is that it may lead to false generalization, but this is not a problem in a case study situation because in a case study the researcher’s intent is not to generalize but rather to use the case as a base for future research (Burns, 2000).

This study relies on both qualitative and quantitative methodology where the researcher uses different research tools. Although both types of research differ in their approaches, they can be used together to complement one another (Burns, 2000). In this study, quantitative data is
collected through questionnaires and qualitative data is collected through quota and group
interviews and observations.

Methods and Instruments

Data were collected from two branches X1 and X2 of the selected school. Secondary one
class is chosen in each school because in this class students choose their academic track, either
the scientific or the literary sections with four possible choices: general science, life science,
economical science or humanities for the final year.

Questionnaires

In both schools, questionnaires were administered by the researcher to all females (17 out
of 19 female students) in the Lebanese Baccalaureate Program and the American High School
Preparatory Program of this class (grade 10). Questionnaires were used because they saved time,
were cheaper than any other method and allowed data collection from larger samples (Tuckman,
1999). Items of the questionnaire were formulated based on the main points of the literature
review and the research questions. They were closed items that allowed the respondent to choose
from two or more alternatives. The advantage of closed items was that they established greater
uniformity of measurement, greater reliability and were more easily coded (Burns, 2000). The
only disadvantage was the possibility that the participant’s true response might not be listed
among the alternatives (see Appendix A).

Interviews

Interviews with science and mathematics teachers were the second instrument used in
this study. In school X1, a group interview was conducted with the mathematics and science
teachers (chemistry and biology) of grade 10. In school X2, separate interviews were conducted;
one with the biology teacher and the other with the mathematics teacher because they only
taught these two scientific subjects. The teachers were informed of the interviews by the
directors of the schools and were very cooperative. So the result was three teachers’ interviews
for data analysis. Cohen & Manion (1994) stated that the advantage of group interviewing was
that it included the potential for discussions thus bringing together people with different opinions
and yielding wide range of responses. Moreover, “participants can hear the views of others and
consider their own views accordingly” (Fraenkel & Wallen, 2003, p. 461). These advantages of
group interview were the main reason for using this tool in this study (see Appendix B). These
interviews were semi-structured interviews and were audio taped upon the permission of the
interviewees. Semi structured interviews were used for this method allowed more flexibility in
questioning the subjects who had the freedom of expressing their ideas but within the focus of
the asked questions (Cohen & Manion, 1994). An example of such questions was, “do you think
that the teacher’s gender affects a female student’s academic choice?” The questions of the
interview stemmed mainly from the main points in the literature review and the research
questions. Teachers were assured of total confidentiality for ethical purposes.

A pilot interview with a secondary mathematics teacher in another school was conducted.

Pilot interviews are very important “to test some practical aspects of the discussion” as the
quality of questions, the recorded sound and the participants’ reactions to these questions
(Litoselliti, 2003, p.31). Moreover, a pilot study “anticipates any problem of comprehension or
other sources of confusion” (Walliman, 2001, p. 238). The pilot interview was useful in this
study for some questions were modified and elaborated more to become clearer during the
interview. For example, the question “do you think girls have specific learning styles that affect
their academic choices?” was modified to include an elaborated part which is “for example, girls
prefer group work whereas boys learn through arguments; girls need longer wait time to answer
questions whereas boys answer more quickly'. This elaboration made the question clearer and easier to answer.

All the 17 female students wrote their phone numbers on the questionnaires. Each number was written on a separate paper and folded. The papers were placed in a bowl and the researcher drew out eight papers. This was a simple random sample where every family had an equal and independent chance of being selected. Only six families were available and quota or telephone interviews were conducted with them. In addition, only six questions about parents' educational background, socio-economic-status, the kind of toys they used to buy for their daughters and their preferred tracks for their daughters, were asked to get more feedback on the role of parents (see Appendix C). The advantage of quota interview was that it saved time and problems related to contacting people personally, especially if the questionnaire was short (Walliman, 2001).

*Observation Checklists*

Another method of data collection was observation of student-teacher interaction in science classes. In school X1, six science and mathematics teacher-student observation sessions were conducted for the Lebanese and the American programs, and in school X2 two sessions were observed. For this purpose, checklists were formulated based on the main points of the literature review. The checklists had eighteen items but during the first observation session four items were directly added by the researcher for their importance as observed or practiced behaviors, for example, the frequency of a male or a female student conducting an experiment, or the frequency of questions asked by the teacher to a male or a female student (see Appendix D). So the final result was eight observation sessions that produced eight observation checklists. The researcher observed the student-teacher interaction with the following focus: who received
more attention, as in how often a male was addressed versus how often a female was addressed, who received more feedback, who was encouraged more, as in how often a female received praise versus how often a male received one. Other issues of comparison were the type of questions males received versus the type of questions females received from science teachers. The researcher checked the frequency of being called on to solve problems on board or the frequency of girls versus boys who asked questions in science classes and so on. An observation checklist was prepared for this reason and filled by the researcher during the observation sessions. This was a non-participant observation that involved merely watching participants’ behavior and recording events without any intervention with participants (Burns, 2000). The main advantage of this method was that the researcher did not participate in the interactions “to focus attention unobtrusively on the stream of events” (Burns, 2000, p. 413).

Data Analysis

Concerning the questionnaires, descriptive statistics were used to analyze the data. Percentages of the responses helped analyze the questionnaires numerically. Circle or “pie graphs were used to show percentages” and results of the questionnaires (American Psychological Association, 2002, p. 179) (see Appendix H). The results were linked to the developed themes to give an idea of the effect of school and parents as well as other factors on females’ choices, thus answering the research questions of the study.

The interviews were analyzed by transforming the content into a transcript file to make data accessible for later use. The process started by reading several times the transcribed texts from tapes to classify data into major themes of the research questions. Then the main themes or categories were coded and subcategories were developed. Data from the interviews were classified under appropriate categories and subcategories by cutting and pasting using index
cards (Burns, 2000) (see Appendix E). At the end, all data under the categories and subcategories of the index cards were linked to the main research questions to be explained and elaborated. This was the basis of the grounded theory, which was very important in the development of qualitative analysis. The theory had to do with extracting concepts out of data by using the developed codes in creating concepts and “finding interconnections between the categories and their theoretical implications” (Walliman, 2001, p. 259).

Concerning the observation sessions, the final product was eight checklists. During each session, the researcher marked tallies near the items observed; some items remained empty because the behavior was not seen or noted. Tallies were marked only when the designated behaviors were present. The result was eight checklists with tallies near the observed items. To analyze the data later, a new checklist was prepared and on the empty side eight vertical columns were developed. On each column, the name of the subject was written and underneath it the number of tallies from all checklists (see last page of Appendix I). At the end, the tallies were added aside for each item and numbers were compared to get the final conclusion. Data from the observation checklists were coded and placed under categories and themes, that were previously formulated by the researcher from the literature, and were used to answer the research questions.

Data analysis from the interviews, questionnaires and the observations complemented one another and were compared and contrasted to the findings of the literature.

**Triangulation**

Triangulation means the use of three methods of data collection (Cohen & Manion, 1994). Questionnaires, interviews and observation checklists were the three instruments used in this study to assure triangulation. The three methods of data collection helped obtain depth in
research questions and the information from the three instruments was double checked against each other.

Validity

"Validity is the drawing of correct conclusions based on the data obtained from an assessment" (Fraenkel & Wallen, 2003, p. 158). As external validity is concerned with the extent to which the findings can be generalized beyond the immediate case, this study cannot be externally valid for, in a case study, the results cannot be generalized beyond the studied case (Burns, 2000). Internal validity has to do with controlling variables, not directly related to the study, that may cause a threat to the results. Also, internal validity is related to the assurance that only the independent variables cause the differences in the dependent variables. In a qualitative study that does not explain relationships among variables, internal validity is somehow irrelevant. What really matters is to control variables that cause a threat to the study (Fraenkel & Wallen, 2003). Checking subject characteristics of this study, some of the threats that might affect the internal validity of the results might be the English proficiency of female participants and whether they would understand the vocabulary of the questionnaire. This threat was controlled by using very simple vocabulary. Another threat could be the attitude of the researcher, yet this was controlled by an objective recording of the data as it was even if it did not match the researcher's views to avoid bias. A third threat could be the possible low reading ability of the subjects. The researcher checked with the advisor of the class the reading ability level of the participants in order to deal with such problems. In the case of telephone interviews with parents, language could be a threat with parents of low educational level. So the researcher was aware of this issue and translated the questions into the Arabic language. To increase validity in this study, the design was based on triangulation, that was, the use of various
instruments to collect data. Data were collected through multiple sources that included questionnaires, interviews and observations.

Reliability

Reliability refers to consistency of findings (Burns, 2000). In this study reliability is assured through triangulation. It can be increased by observing a setting over a long period of time or by interviewing persons more than once (Fraenkel & Wallen, 2003) but unfortunately these could not be practically applied due to shortage of time.

The goal of reliability is to minimize the errors and bias in a study. A prerequisite to increase reliability in any study is “to document the procedures followed in a study” (Yin, 2003, p. 38). All the documents of this study, the transcribed teachers’ interviews, the transcribed parents’ interviews, the observation checklists and their sum up and the results of the questionnaires, are presented in appendices to increase reliability.

Researcher’s bias

An important consideration in qualitative research is researcher’s bias. To control for such a threat, triangulation is used. Other possibilities could be checking the researcher’s description of something against another informant’s description of the same thing, or through external auditing, that is, asking an individual outside the study to review and evaluate it (Fraenkel & Wallen, 2003) but unfortunately some of these could not be practically applied for the lack of volunteers and shortage of time.

Conclusion

In conclusion, the case study methodology was useful in that it helped collecting data from the participants by using three various instruments, questionnaires, interviews and observations. Information from the three instruments was double checked against each other.
Data that were collected from questionnaires, interviews and observation checklists will be presented in the next chapter.
CHAPTER FOUR

Results

This section presents data collected by means of interviews, questionnaires and observation checklists. In this chapter, the results of the study are placed under categories and subcategories of the three main research questions and presented.

The final product of data collection was 17 questionnaires filled by 17 female students of grade 10 from both branches of school X, 3 interview sessions with mathematics’ and science teachers and 6 phone interviews with 6 families. Finally, 8 observation checklists were filled by the researcher during observing student-teacher interactions in mathematics and science classes in both branches of school X.

The results of the interviews, questionnaires and observation checklists were categorized according to the three research questions: what is the role of the school in females’ gender inequity? what is the role of parents and society in females’ gender inequity? and what are the other factors that play a role in females’ gender inequity? Information from the three instruments was placed under these questions and categories. The main categories with their codes and subcategories with their respective codes are shown in appendix E.

What is the role of the school in females’ gender inequity?

The interviewed teachers in school X with its two branches stated that the number of male and female students was the same in their sections. After the observation sessions, this was somehow true in school X1 but not in school X2 where the number of male students doubled that of female students.
Teachers' gender and characteristics:

The interviewed female chemistry and mathematics teachers insisted that the gender of the teacher did not make a difference and that which really mattered was whether the teacher made the students like the subject or not. According to them, the teaching approach of the teacher affected more than his/her gender, especially at the secondary level, and the gender factor might play a role at the elementary level where most of the teachers were females but not at high secondary levels. Most of the teachers commented that they had a balance of female and male teachers teaching scientific subjects at their school with an exception for the male physics teacher. The male biology teacher added that the physics teacher was always male at the secondary level and this would "probably and psychologically make a difference for a female student who will think that physics is for males and not females".

Students' questionnaires revealed that 47% of the female students stated that the majority of their science teachers were males, 41% answered that the majority of science teachers were females and 12% answered that the majority of science teachers from both sexes were equal in number. Another question concerning the teaching approach of male and female teacher revealed that 100% of the female students believed that there was no difference in the approaches between the two sexes.

The results of the 8 observation sessions, for the Lebanese Baccalaureate Program and the American High School Preparatory Program of grade 10 in the two branches, revealed that in science and mathematics classes, there were 4 male teachers and 4 female teachers for the scientific subjects with the physics teacher being a male, thus indicating a balance of male and female teachers for these subjects except for the physics subject.
Teachers' attitudes and behaviors:

The interviewed teachers answered that they did not differentiate between male and female students and tried as much as possible to be fair with all in treatment. The female chemistry teacher who taught grades 6 and 10 said that she faced this problem with grade 6 students who had the idea that female teachers preferred girls and gave them more chances to solve problems on the board, so she worked hard to make the balance in such classes but not at high secondary levels as grade 10. Only the mathematics teacher said that boys were more vocal whereas girls were quieter and calmer by nature and character, so teachers had the tendency to pay more attention to boys and discuss topics with them not because they were males but because of the fact that girls were quieter. The female mathematics coordinator referred this unbiased attitude to the culture of the school that did not differentiate between sexes in treatment and to the teachers who were aware of the importance of treating the students equally.

The female students' questionnaires revealed that 100% of the female students did not think that boys were given more opportunities than girls in science classes and that 100% thought there was no difference in treatment or encouragement by male and female teachers.

The observation checklists that were used during the observation sessions of science and mathematics classes reflected the attitude and behaviors of the teachers and their interactions with students. The checklists showed results that totally contradicted those of the two previously used instruments the teachers' interviews and the students' questionnaires. The observation sessions revealed that more male than female students were called by name by the teacher either to be asked a question or to pay more attention. Even after being called by name, more male students were asked questions related to the subject than female students who were asked to read paragraphs from the book (biology) or to tell the page and number of mathematics exercises to
be solved. Moreover, male students were more verbal in classroom interactions for they asked and answered more questions than female students.

In addition, more male students were asked to solve problems on the board (mathematics) or conduct an experiment in front of other students (chemistry). In one mathematics session, the teacher asked six male students to solve and correct exam problems on the board and only one female student. It was noted that he called some boys who were not paying enough attention and were disturbing the class to move to the board and solve a problem after giving them a remark about their behavior as this was his policy of controlling and managing the class. Furthermore, more male students were given encouragement and praise remarks on ability than female students. In the same observed mathematics class, the male students who solved problems on the board were encouraged by terms as ‘bravo’ or ‘very good’ whereas the girl who solved the problem correctly was told ‘ok’. After interviewing the mathematics teacher the researcher knew that this girl was the brightest student in mathematics in her class.

Another point that was observed in a biology class was that male students were asked more challenging and difficult questions as ‘explain a process’ or ‘analyze a picture in the text’ than female students who were asked questions that needed a single word or term answer.

Finally, in another session, and as a reaction to a wrong answer given by a male student, the teacher wrote the right answer on the board without any comment, whereas the reaction to a wrong answer by a female student was ‘why’ and ‘walaw’, which reflected sarcasm.

Gender bias in textbooks

Most interviewed teachers agreed that gender bias in science and mathematics textbooks did not exist in the American books, some of which, they added, showed pictures of females driving airplanes. In the Lebanese Baccalaureate mathematics book, one of the teachers said that
there were more names of males than females and in the science books more male pictures than females. The male biology teacher added that the books avoided using ‘he’ or ‘she’ and used ‘research was done’ or ‘we did’ but sometimes mentioned more male scientists for their discoveries than females. In general, most believed there was no gender bias in the school textbooks.

One item in the questionnaire revealed that 94% of the female students thought that their science and mathematics books had equal presentations of both sexes versus 6% who thought that males were presented more. The result of a question about an important female scientist showed that 65% did not know any name of a female scientist versus 35% who mentioned a single name of a female scientist.

The textbooks that were published by the Center of Educational Research and Development for the Lebanese Baccalaureate Program showed the following. In the Lebanese mathematics textbook for grade 10, the first chapter on statistics was introduced with a picture of a male teacher writing on the board and only male students in the class. In the same chapter and in the exercise section, 3 separate exercises had male teachers as professors. Only in another chapter, an exercise about pilots mentioned three males with a single female pilot, Dima.

Moreover, the chemistry textbook for grade 10 showed portraits of 10 male scientists with a brief paragraph of the contribution of each in chemistry without mentioning a single female scientist in the whole book. In addition, in the biology textbook, an exercise about a student asked ‘can you help him find the error that he has committed while experimenting?’ The three checked books reflected gender bias in the Lebanese science and mathematics textbooks and the problem was tremendous for teachers were not aware of this bias and mentioned the presence of ‘some gaps’ only in these textbooks.
Summary of the results for research question 1

The school played an important role in females’ choices through many factors such as teachers’ attitudes and behaviors, teachers’ gender, and presentations of male and female pictures or language and content of textbooks. Based on the above data, the gender of the teacher did not influence the choices of female students at the secondary level in school X. The teaching approach of any teacher was more important than his/her gender for this was the factor that encouraged the student to like the subject or not. A discouraging fact is that the physics teacher was always male and this might psychologically cause females to look at physics as a ‘masculine subject’. Moreover, the findings showed that there was a balance of male and female science teachers in this school. In addition, two instruments, the questionnaires and interviews, revealed no differentiation between students by teachers in treatment and encouragement in mathematics and science classes, yet the observation sessions of such classes showed some discrepancies in treatment as more male students solved problems on the board or conducted experiments and were even asked more challenging questions by the teachers. Finally, while teachers admitted that there was no gender bias in the American and Lebanese Baccalaureate mathematics and science books in spite of some gaps in the Lebanese books, these books, when checked by the researcher, strongly reflected gender bias and the problem was that teachers were unaware of this fact.

What is the role of parents and society in females’ gender inequity?

Family socialization and expectations

The interviewed teachers agreed that parents started exerting pressure on their children concerning their tracks even from grade 9. The mathematics coordinator spoke of a class she taught the previous year where all of the students were females except for two male students and
added that all the parents of these students insisted that their children should join the scientific section although the students were not qualified for this section, so the teachers and students faced a lot of difficulties. The teachers continued that parents interfered in their children’s choices, for both sexes. A teacher added that parents interfered even in the future majors of their children and commented that “our students are realizing their parents’ dreams”. The biology teacher spoke of parents who told him to help their daughters to pass these grades, regardless of their low level performance, just to get the secondary degree, for ‘at the end they will marry and become housewives’. Another opinion was given by the mathematics teacher who added that parents exerted more pressure on their sons to choose majors that would help them earn more money and gave their daughters more freedom in choosing their academic track. So in general parents tried to push their daughters either to choose academic tracks they did not like or were very lenient with their daughters for they believed that girls would marry at the end so it was worthless troubling themselves with such issues.

The female students’ questionnaires revealed that 88% of the female students’ parents encouraged them to choose the scientific track versus 12% whose parents encouraged them to choose the literary track. Furthermore, 34% of the females’ parents bought them entertaining toys at younger ages as dolls and their equipment, 24% bought educational toys, 20% bought craft toys, 14% bought toys related to life science and 4% bought mechanical toys.

The parents’ interviews showed that all the interviewed parents encouraged their daughters to do what they liked except for one mother who preferred her daughter to choose the scientific track despite her average grades because this track had wider specializations, according to the mother. The interviews also revealed that most parents used to buy entertaining toys as a first choice for games followed by educational toys as a second choice. Most of the parents
answered that both the mother and father encouraged their daughters to choose their preferred academic track except for two families who admitted it was the mother who did this.

*Parents' socio economic status and educational level*

Two interviewed teachers thought that coming from a rich family developed in students an attitude of laziness and carelessness for they took it for granted that their family business was awaiting for them after graduation, so most sought a business degree to run their families' business. The teachers added that in spite of the fact that students sought a business degree, they and their parents prefer to have access to this degree through the scientific track. One teacher stated that parents of low socio economic status would push their children to choose the scientific track to get better jobs and better salaries. But the teacher asked if such a father had a son and a daughter “whom do you think will he encourage more?” of course, ‘his son’, the teacher answered.

The students' questionnaires revealed that most of the mothers had at least an intermediate or a secondary degree and that most of the fathers had a university degree. Moreover, 62% of the females' parents had a high financial situation, 25% were average and 13% low financial situation. So in general, most of the parents were educated, from average and high economic status and encouraged their daughters to choose the scientific academic track.

The parents' interviews showed that most female students' parents were educated and their financial situations ranged between average and high. They assured that they gave their daughters the freedom of choice between the scientific and literary academic tracks except for one mother who insisted on the scientific track for her daughter because of its wider specializations.
Social stereotypes and image of science in society:

Concerning Bacon’s metaphor which compared science to masculinity, many interviewed teachers agreed that this was true in the past but not nowadays. A male mathematics teacher mentioned societies that had freedom and money yet they still face such gender problems and asked the same questions as ‘why are our females not choosing the scientific track?’ and answered ‘it’s simply because they don’t like it’. He believed that ‘humans are disobeying God and asking women to be like men by forcing issues on females, as becoming scientists, but the result is that they end up messing their families and the whole world around them for Adam and Eve have to complement each other and not to be equal to each other’.

The female students’ questionnaire revealed that 100% of the female students did not believe in Bacon’s metaphor nowadays. Moreover, 82% of them did not believe that scientists were nerds whereas 18% believed that scientists were nerds.

Summary of the results for research question 2

Based on the above data, the results revealed that parents were interfering in their daughters’ choices of academic tracks for ‘students are realizing their parents’ dreams’. Parents exerted pressure on their daughters to choose the scientific track for they believed it had wider specializations: Few parents gave their daughters the freedom to choose their tracks in spite of the fact that, through the phone interviews, many mothers denied their interference in their daughters’ choices and insisted that they gave them the freedom of choice, so this showed that parents’ expectations still influence females’ choices at the secondary level. Moreover, the data showed that parents influenced their daughters informally and unintentionally since childhood by buying them mostly entertaining games as dolls. Another factor to be considered was the economic status of females’ parents. Data showed that most parents were educated, from average
and high economic status and encouraged their daughters to choose the scientific track. This showed that high educational and economic status of parents meant more encouragement for their daughters to choose the scientific academic track. A third factor was the influence of society. Data showed that Bacon’s metaphor which compared science to masculinity did not influence females’ choices nowadays for this was true in the past. The image of scientists as nerds is no longer the dominant impression of scientists in students’ minds.

What are the other factors that play a role in females’ gender inequity?

Females’ interests

A male teacher commented that female students were not interested in scientific subjects because they were not interested in careers of scientific background. Another teacher stated that one always finds ladies as hostesses in airplanes and not as pilots because ladies are soft and choose careers as teachers, nutritionists, psychologists and nurses because this suits their character and the instinct God has put in their hearts and blessed them with, especially that of being future mothers. He commented that ‘it is the fault of the prejudiced society that wants to force women to do things they actually do not like, and as a result the society messes up nature’. The teacher added that girls were quiet in classes because ‘it’s not their passion yet for once you show someone his passion you see him talking’ that is, they were quiet because they lacked interest in science. He believed that ladies were more interested in clothes, design and home decoration and excelled in majors related to these fields.

The students’ questionnaires revealed that 43% of the female students had chosen biology as their preferred subject, 24% chose mathematics, 19% chose languages and 14% chose chemistry but none had chosen physics.
Females’ abilities and achievements

The interviewed science and mathematics teachers agreed that females’ abilities and achievements could be the leading factor in determining the track they chose and their future careers, and that the best students in scientific subjects were females in most classes. One male teacher added that although the best students in scientific subjects were females, but in general boys had more abilities and better achievements in scientific subjects. On the other hand, the female mathematics coordinator believed that girls nowadays are highly motivated to continue in the scientific track and that there is no difference in abilities between the two sexes.

The students’ questionnaires revealed that 35 % of the female students had good achievement in scientific subjects, 29 % had excellent results, 18 % very good, 12 % average and 6 % poor. Another question revealed that 88 % of the female students would choose the scientific track whereas 12 % would choose the literary track. A third item revealed that 88 % of the female students believed that male students and female students had equal achievements in scientific subjects whereas 12 % believed that female students were better in science but none of them believed that male students were better in science.

Females learning styles

Teachers believed that females did not have specific learning styles. One of them asked ‘but why should they have specific learning styles? just because they are females? they all like group work, even the boys did, and this was related to the culture of the school regardless of the gender’.

The questionnaire showed that 71 % of the female students liked both individual and group work versus 29 % who preferred group work only.
Females’ confidence level

All the interviewed teachers (except for the mathematics teacher) agreed that females lacked self confidence. A teacher stated that this was due to the girls’ character; they were shy and even if they had the information, they rarely shared it with others unless they were pushed to participate or answer. They were afraid to be teased by boys especially if their answer was wrong. They needed more time to prepare their answers and they needed to be 100% sure that their answer was right. Moreover, they did not try to guess whereas boys could give answers quickly. Only the mathematics teacher disagreed with this opinion and stated that sometimes this was not true, because girls by nature were quieter than boys who were more vocal and this was not due to lack of confidence.

Females’ attitude toward science

The biology teacher stated that this lack of motivation to study science was a problem that faced both sexes and mentioned that when he asked his students about the reason for their lack of motivation in studying biology, they answered they would not get any financial benefit out of studying this subject in the future, specifically some topics as genetic engineering, so why trouble themselves doing this. The mathematics coordinator and chemistry teacher contradicted this view and insisted that ‘girls nowadays are more motivated to study mathematics and science’.

The questionnaires showed that 100% of the females thought that studying science was important in their lives.

Lack of role models in the field

The interviewed teachers agreed that females teaching scientific subjects were fewer in number than male teachers at the secondary level especially for physics and added that male and
female science and mathematics teachers were somehow equal in number in other scientific subjects. One of them commented ‘we still need math teachers for the secondary level, and out of every 10 teachers may be one is a woman’. Another asked about the number of lady pilots or engineers in the society. The female mathematics coordinator spoke of her previous experience as a mathematics teacher of the secondary level in a boys’ school only and added that whenever school principals found a qualified person they employed him/her regardless of their gender.

The students’ questionnaires revealed that 47% of the female students answered that the majority of their science teachers were males, 41% answered that the teachers were mostly females and 12% answered that male and female teachers were equal in number.

**Lack of opportunities**

Only the mathematics teacher spoke of the lack of opportunities for both sexes, especially females. He added that if Lebanon had more opportunities then parents would encourage everybody to choose the scientific track. He concluded that even if society encouraged a female to follow the scientific track and choose a career of scientific background, she would not find a job in Lebanon because even men were not finding jobs and opportunities.

**Summary of the results for research question 3**

Other than the effect of schools, parents and society on females’ choices of academic tracks, many factors have to be considered such as females’ interests, abilities, learning styles, confidence level, attitude towards science, and lack of role models and job opportunities in society.

The results revealed that female students who chose majors of scientific background mainly chose careers related to life science as teachers, nutritionists, nurses and doctors which were careers that reflected the instinct of love and care that God had blessed them with.
Moreover, girls supposedly had other interests as fashion, interior design, art and decoration in which they excelled for such careers reflected their real passion. Yet, a promising fact emerged from the current data which revealed that females' abilities and achievements in scientific subjects were improving, for it appeared that the best students in these subjects were girls and the majority of other female students in school X got good results in scientific subjects. Moreover, the data indicated no differences in abilities and achievements of male and female students in scientific subjects. There were no specific learning styles for female students and the data showed that female students liked individual work and not only group work due to the culture of the school that encouraged both styles. Most female students lacked self-confidence in their abilities for even if they knew answers to questions asked in the class, they did not answer unless they were asked to participate. Another promising finding was related to females' attitude toward science which showed that female students thought that science was relevant to their lives.

Furthermore, the current data showed that the number of male and female teachers for scientific subjects was somehow equal. Finally, lack of job opportunities was among the factors that influenced females' choices. Even men with careers of scientific background were immigrating or working in jobs not related to their university majors, so with this obstacle that hindered female choices, will parents, society and schools encourage females to choose such tracks?

Conclusion

The above data showed differences in treatment of male and female students in science classes as well as parents' interference in their daughters' choices of academic tracks, not only at the secondary classes, but even earlier. Gender bias in Lebanese science and mathematics textbooks was so evident yet teachers were not aware of it for they assured the presence of some gaps only in these textbooks. Additional factors had influences on females' choices such as
females' lack of self confidence in their abilities, the lack of female role models in the field such as female physics teachers and finally, the absence of job opportunities in Lebanon for both sexes.

The next chapter includes a discussion of the data presented in the current chapter.
Discussion of Findings

This section discusses the findings from data that were collected from teachers’ interviews, female students’ questionnaires, parents’ phone interviews and observations of science and mathematics classes by comparing and contrasting the results of this study to the findings of the literature. In addition, it includes some suggestions for teachers to eliminate gender bias in classes.

What is the role of the school in females’ gender inequity?

Findings of this study showed that the gender of the teacher did not influence the choices of female students (Chapter 4, p. 29). This finding contradicted the findings of Marshall and Reinhartz (1997) who spoke of the characteristics of teachers according to their gender.

Another study finding indicated that there was a balance of male and female science teachers in school X in spite of the fact that the physics teacher was always a male (Chapter 4, p. 29). This contradicted the finding of Blickenstaff (2005) that most science teachers at the secondary level were males. The need for female physics teachers matched the findings of Haynie (2005) and Sanders (1997) that more female role models in the field were needed.

A striking finding was the one related to the attitudes of teachers and their interactions with students in science and mathematics classes. Two instruments, the students’ questionnaires and teachers’ interviews revealed no differentiation in the treatment of students by teachers in classes, yet the observation sessions of such classes showed discrepancies in treatment as more male students were asked to solve problems on the board or conduct experiments, more male students were called by name and more male students were asked challenging questions (Chapter 4, p. 30 & 31). The findings of the observation sessions actually matched those of Ayalon (2003) and Kennedy and Parks (2000) that boys were treated differently and better than girls in science
classes. Moreover, these findings matched that of Sanders (1997) that teachers were unaware of their biased behaviors through verbal interactions, eye contact and body language. Sadker (2000) called this ‘gender blindness’ (p. 80).

Finally, according to teachers, no gender bias was evident in science and mathematics books except for ‘some gaps’ in the Lebanese books. Actually, checking the science and mathematics books reflected strong gender bias in three Lebanese textbooks for grade 10 and the dilemma was that teachers were unaware of this bias (Chapter 4, p.32). This finding matched the findings of Lupart, Pyryt and Cannon (2001) that textbooks were gender stereotyped. The gaps mentioned in science books actually matched the results of a question about female scientists, where 65% of the female students did not know the name of a female scientist and only 35% of the students mentioned a single name of a female scientist. Teachers have to fill these gaps and deficiencies in textbooks by providing supplementary texts of female scientists.

Gender bias in education is still rampant in classrooms today. Although many teachers denied gender bias and treating male and female students differently and referred this unbiased attitude to the culture of the school yet gender bias was evident in the views of some teachers during interviews as the mathematics teacher who believed that ladies were more interested in fashion, design and decoration and would excel most in these fields. Another biased view was that of a male teacher who said that although the best students in scientific subjects were females but in general boys had more abilities in these subjects than girls.

Teachers have to be aware of gender practices and attitudes in science classes to help females build a positive attitude towards science, to succeed in science and to become scientifically literate citizens. To improve gender equality in science, a study addressed teachers to adopt ‘the New 3 Rs of Gender Equity’, that was recognizing the problem, reevaluating
teaching methods and finally reconstructing classrooms accordingly (Sneller, 2001). So the teacher had to be aware of the problem first, then he/she could work with a colleague to observe his/her interactions with students in class and then worked with the colleague and brainstormed ways to change. One suggestion for assuring equity in class by Sneller (2001) was to keep a set of cards with students' names on them and picked a card randomly during questions and answers sessions and placed the chosen cards aside in a drawer for several sessions to assure that all students participated equally. Another suggestion by Sadker, Sadker and Stulberg (1993) was that teachers increased the girls' wait time for answers, for usually boys were quicker in giving answers. Schools and teachers are challenged to help in the elimination of gender bias in classes for it is the school’s role to diagnose such attitudes and change them to provide a healthy instructional environment.

*What is the role of parents and society in females' gender inequity?*

The findings of this study indicated that parents interfered in their daughters’ choices of academic tracks and most exerted pressure on their daughters to choose the scientific track so ‘students are realizing their parents’ dreams’ (Chapter 4, p.33 & 34). This finding matched the findings of Farenga and Joyce (1997) that parents did not only play a central role in their children’s choices but also interfered in these choices.

Moreover, the finding which showed that parents influenced their daughters’ choices since childhood by buying them mostly entertaining toys as dolls matched the findings of Lupart, Pyryt and Cannon (2001) that parents limited their daughters’ exposure to various toys, the use of which would later match the school curriculum.

In addition, another study finding showed that most parents were educated, had average and high economic status and encouraged their daughters to choose the scientific track. This
finding was in harmony with the findings of Abtan (1993) and Kennedy and Parks (2000) that females of high economic status completed more science courses than those of low economic status.

A final finding showed that Bacon's metaphor does not influence females' choices nowadays, for this was true in the past. This finding did not match the findings of Gilbert (2001) and Manning (1998) that social stereotypes affected females' education and career choices.

A striking finding was that most parents denied their influence on their daughters and insisted that they gave them the freedom of choice whereas two instruments, the teachers' interviews and female students' questionnaires showed the influence of parents on their daughters' interests and academic choices. This denial had to do with the culture and society for parents tend to be affected by the social stereotypes and beliefs that the scientific track might be more prestigious and they would be more proud to tell that their daughters would major in scientific fields.

Parents unconsciously encouraged their sons to be independent whereas they expected their daughters to conform to accepted norms. Parents have to support and encourage their daughters to pursue science since childhood through buying scientific toys and games especially those related to physical and life science for these promote science learning readiness. Finally, parents have to be aware of behaviors that influence their daughters' characters, choices and careers in life.

*What are the other factors that play a role in females' gender inequity?*
This study showed a teacher’s belief that female students who chose scientific majors mainly chose careers related to life science as teachers, nutritionists, nurses and doctors which were careers that reflected the instinct of love and care that God had blessed them with (Chapter 4, p.37). This matched the findings of Schwedes (1997) that girls were more interested in life science than physical science because of the ethical and social implications of life science that suited their nature and character.

Findings showed no differences in abilities between male and female students and that the majority of female students got good results on scientific subjects (Chapter 4, p. 38). These findings matched that of Blickenstaff (2005) that females did not leave science because of differences in abilities but because of other factors.

The study of Schwartz and Hanson (1992) indicated that female students approached learning from a different perspective and that they preferred group work to individual work. This was not in harmony with the findings of this study which showed that there were no specific learning styles for female students who liked individual work as well as group work due to the culture of the school that provided and encouraged both styles.

A discouraging finding in the study showed that most female students lacked self-confidence in their abilities for even if they knew answers to questions asked in class, they did not answer unless they were asked to participate, as in the case of the brightest girl who was quiet all the time during the mathematics session. This finding was in harmony with the findings of Debacker and Nelson (2000) that girls attributed their success to luck and not to ability because they lacked self-confidence.

A final promising factor showed that females had a positive attitude towards science for they believed science was important in their lives (Chapter 4, p.39). This finding contradicted
that of Blickenstaff (2005) that female students believed science was irrelevant and useless in their lives.

**Conclusion**

The chapter discussed and presented the study findings and compared them to those of the literature. The researcher recommends higher gender awareness in schools, homes and society at large. Teachers and parents need to change their attitudes toward their daughters. Teachers have to promote cooperative environments rather than competitive ones and should examine their hidden beliefs concerning equal treatments of male and female students in classrooms. They have to become more knowledgeable about this hidden bias, to modify it and learn how to change their practices to provide a healthy learning environment for all students. Parents have to support and encourage their daughters to pursue the learning of science since childhood through providing them with scientific toys that prepare them for science learning.

Conclusions, limitations and suggestions for further research are presented in the next and last chapter in this project.
CHAPTER SIX

Conclusion

Summary

The aim of this research was to explore the factors that discouraged females from choosing the scientific academic track at the secondary level. The results were significant for teachers’ professional development and parents’ gender awareness for the purpose of increasing social justice and gender equity in education.

In conclusion, this study showed that the gender of the teacher was not an influencing factor in females’ choices of academic tracks and that teachers’ approaches to the subject played a more crucial role. Female students received the message that physics was a male domain because of the sole presence of male teachers for this subject. Differences in treatment of male and female students in science classes were obvious in the observation sessions. Moreover, parents interfered in their daughters’ choices of academic tracks. In addition, Lebanese science and mathematics books reflected gender bias in language and pictures and the problem was that teachers were not aware of this fact. Furthermore, in spite of the fact that the data showed diminishing influence of social stereotypes on females’ choices yet parents’ socialization showed different expectations for their daughters, for most bought them dolls as a first choice followed by educational toys as a second choice. Very few parents chose scientific or physical toys for their daughters, or were aware that such toys might match future schools’ curricula. In addition, females’ abilities were promising but female students lacked confidence in their abilities. More role models in the field should be present as well as more job opportunities in society for females with careers of scientific background.
Limitations of the study

The study was conducted in one school only with its two branches and with the participation of a small sample of female students due to the small number of students in the chosen class. Moreover, two females were absent on the day the questionnaires were distributed. The study would have led to better explanations of the findings if the sample consisted of participants from more than one school and with a larger number of female students.

Suggestions for further study

The study discussed a neglected aspect which is gender equity in Lebanese schools. The findings will set the stage for more studies in the field. As a suggestion for further research, it will be interesting to conduct the same study on elementary classes because of the importance of some factors that originate at such early ages as parents' socialization and teachers' attitudes and behaviors. It is hopeful that this study will help teachers think of their experiences, practices and behaviors in science classes. Also, this study might give teachers the motivation to work collaboratively to develop fruitful intervention strategies that could improve their interactions with their students in science and mathematics classrooms.
References


Haynie, W. J. (2005). Where the women are: research findings on gender issues in technology education; once investigations discover issues to address, the profession can make the changes needed to attract and retain more female students and teachers. *The Technology Teacher, 64* (7), 12-19. Retrieved March 7, 2006, from www.galenet.galegroup.com


Appendix A

Females’ Questionnaire

This study is conducted by a graduate student at the Education Department of the Lebanese American University. The purpose of the study is to explore factors that discourage females from choosing the scientific academic track. Your participation will increase knowledge in the field. Your responses will remain confidential.

Instructions:
1. No need to write down your names.
2. Please place a checkmark within the box of your answer.
3. Only one checkmark in a box for each question, some questions are exceptions and this is mentioned as 'check as many as to apply'.
4. Please answer the following questions honestly.

1. How can you describe your achievement in scientific subjects until last year?
   - Excellent
   - Very good
   - Good
   - Average
   - Poor

2. Which subject do you like most?
   - Languages (Arabic or English or French)
   - Mathematics
   - Biology
   - Social studies
   - Chemistry
   - Physics
   - Economy/sociology

3. Based on your grades up till now, which section do you think you will follow next year?
   - Scientific
   - Literary

4. Do you frankly think you can continue in the scientific track?
   - Yes
   - No

5. What is the educational level of your mother?
   - Elementary school
   - Middle school
   - Secondary school
   - A university degree (BS, BA, or BE)
   - Higher (MA, MS, ME or Ph.D)
6. What is the educational level of your father?
   - Elementary school
   - Middle school
   - Secondary school
   - A University degree
   - Higher

7. How can you describe the financial situation of your family?
   - High
   - Middle
   - Average
   - Low

8. What kind of toys did your parents buy you at younger ages? (Check as many as to apply).
   - Entertaining toys as dolls
   - Educational toys
   - Mechanical toys (related to angles, velocity and 3 dimensions)
   - Craft toys
   - Toys related to life science and chemistry, as chemicals in laboratories, doctors’ instruments

9. Your parents encourage you to choose:
   - The scientific track
   - The literary track

10. Please state your parents’ occupation:
    - Father
    - Mother

11. The majority of your science subject teachers are:
    - Males
    - Females
    - Equal in number

12. Whose approach in teaching scientific subjects do you prefer?
    - Male teachers
    - Female teachers
    - No difference

13. In general, do you think boys are given more opportunities to answer questions than girls in your science classes?
    - Yes
    - No
14. Who receive more encouragement in your science classes?
   □ Males
   □ Females
   □ No difference in treatment

15. How can you compare females’ achievement to that of males?
   □ Males are better in science and mathematics
   □ Females are better in science and mathematics
   □ They are the same

16. Do you prefer individual or group work in science classes?
   □ Individual work
   □ Group work
   □ Both

17. Do you think studying science is important in your daily practical lives and future?
   □ Yes
   □ No

18. Do you think studying science for a female is ‘unfeminine’ and that science and mathematics are ‘masculine’?
   □ Yes
   □ No

19. Do you believe scientists are ‘nerdy’, that is, they only concentrate on work in life?
   □ Yes
   □ No

20. Who is presented more in the content of your science and mathematics textbooks (language and pictures)?
   □ Males
   □ Females
   □ Equal presentations

21. Do you know the name of an important female scientist?
   □ Yes, please mention it: ________________________
   □ No

22. What is your future plan as a profession and why?
   ________________________
   ________________________

Please write down your home’s phone number: ________________________

Thank you for your time and participation
Appendix B

The prepared questions addressed to the secondary science teachers:

1. We realize that females choosing the scientific academic track at the secondary level are much less in number than males. As a science or math teacher at this level, do you agree or not and why?

2. Do you think that the teacher’s gender and teaching approach affect female student’s choice? For example, male science teachers are more subject-oriented whereas female science teachers are more student-centered.

3. Do teachers treat male and female students differently in science and mathematics classes? Give examples.

4. Do girls have specific learning styles related to their gender that affect their choices? For example, girls prefer group work and constructivist approach whereas boys prefer individual activity and learn through arguments.

5. Do you think parents play a role in a female student’s choice?

6. What is the effect of the educational and financial level of the females’ parents on their choices?

7. Do males and females have the same ability at the scientific subjects? For example, boys understand new ideas more quickly, answer more questions and are more competitive.

8. Do you think that girls lack self-confidence in their abilities? Give examples.

9. It is believed that the cause of females’ failure in math is due to the fact that they are not risk takers. Can you comment?
10. Bacon rooted the idea that 'science is masculine'. Does this metaphor or belief still work nowadays?

11. Do girls and boys have equivalent or different levels of achievement in science and mathematics?

12. Do you have females teaching mathematics and sciences at secondary 2 and secondary 3 classes in your school? How many females and males are there?

13. Do the books you use reflect this issue? Is there any gender bias in these books concerning language, content and pictures?
Appendix C

The prepared questions addressed to parents of female students:

1. What is the educational level of the mother?
   What is the educational level of the father?
   How can you describe the financial situation of your family?
   What kind of toys did you buy to your daughter at younger ages? Are they entertaining, educative, mechanical or craft toys?
   Which track do you prefer for your daughter and why?
   Who encourages or supports your daughter to choose the scientific or literary track?
Appendix D

Classroom Observation Checklist:

**Teacher:**

**Subject:**

<table>
<thead>
<tr>
<th>Frequency of calling a male by name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of calling a female by name</td>
<td></td>
</tr>
<tr>
<td>Frequency of a male asking a question</td>
<td></td>
</tr>
<tr>
<td>Frequency of a female asking a question</td>
<td></td>
</tr>
<tr>
<td>Wait time given to a male to answer</td>
<td></td>
</tr>
<tr>
<td>Wait time given to a female to answer</td>
<td></td>
</tr>
<tr>
<td>Frequency of a male answering a question</td>
<td></td>
</tr>
<tr>
<td>Frequency of a female answering a question</td>
<td></td>
</tr>
<tr>
<td>Frequency and kind of praise a male receives ability/neatness</td>
<td></td>
</tr>
<tr>
<td>Frequency and kind of praise a female receives ability/neatness</td>
<td></td>
</tr>
<tr>
<td>Reaction to a wrong answer by a male</td>
<td></td>
</tr>
<tr>
<td>Reaction to a wrong answer by a female</td>
<td></td>
</tr>
<tr>
<td>Frequency of mentioning a male scientist</td>
<td></td>
</tr>
<tr>
<td>Frequency of mentioning a female scientist</td>
<td></td>
</tr>
<tr>
<td>Frequency of a male solving a problem on board</td>
<td></td>
</tr>
<tr>
<td>Frequency of a female solving a problem on board</td>
<td></td>
</tr>
<tr>
<td>Difficulty of a question addressed to a male</td>
<td></td>
</tr>
<tr>
<td>Difficulty of a question addressed to a female</td>
<td></td>
</tr>
<tr>
<td>Frequency of a male conducting an experiment</td>
<td></td>
</tr>
<tr>
<td>Frequency of a female conducting an experiment</td>
<td></td>
</tr>
<tr>
<td>Frequency of teacher asking a question to a male</td>
<td></td>
</tr>
<tr>
<td>Frequency of teacher asking a question to a female</td>
<td></td>
</tr>
</tbody>
</table>
Appendix E

1) Role of school in females gender inequity → R.S.F.G.I
   Teachers’ gender and approaches → R.S.F.G.I 1
   Teachers’ attitudes and behaviors → R.S.F.G.I 2
   Gender bias in textbooks → R.S.F.G.I 3

2) Role of parents and society in females’ gender inequity → R.P.S.F.G.I
   Family socializations and expectation → R.P.S.F.G.I 1
   Parents’ socio-economic status and education → R.P.S.F.G.I 2
   Social stereotypes and image of science in society → R.P.S.F.G.I 3

3) Other factors in females’ gender inequity → O.F.F.G.I
   Females’ interests → O.F.F.G.I 1
   Females’ abilities → O.F.F.G.I 2
   Females’ learning styles → O.F.F.G.I 3
   Females’ confidence level → O.F.F.G.I 4
   Females’ attitudes towards science → O.F.F.G.I 5
   Lack of role models in the field → O.F.F.G.I 6
   Lack of opportunities → O.F.F.G.I 7
Appendix F

Transcribed teachers’ Interviews

Informants:1 group interview of science teachers for grade 10 in school X1 (Lebanese and American sections). Mr. Hagop, biology, Miss Maha, coordinator and teacher of mathematics, Mrs. Ghada, biology, and Miss Rita, mathematics. All of them teach both sections. The physics and chemistry teachers could not attend the meeting.

Interviewer: Rula Hallab

Date: Wednesday, April, 26, 2006.

Subject: Factors that discourage females from choosing the scientific track at the secondary level.

Place: School X1

Time: 10:50-11:20
R. H.: We realize that females choosing the scientific academic track at the secondary level are much less in number than males. As a science or math teacher at this level, do you agree or not and why?

Mr. Hagop (biology): In Eastwood, the Lebanese program, usually we do not have this problem because the trend in Lebanon is that students prefer, I don’t know why, what’s the reason, may be the fashion stuff of their females but they want to go into the scientific track and this is unfortunately like that as if it’s because the best students should go into the scientific track and they respond to their families and parents and peer pressure.

Rula: So you don’t agree that this is the case?

Mrs. Maha (math): later they can choose and join their majors; this is mainly from their families’ points of view.

Rula: so you don’t feel that this problem exists?

Maha: No.

Rula: What about the number of females in the Lebanese and American sections?

Maha: the number of female and male students is the same in both sections.

Hagop: In the American program, they have to take some electives regarding sciences, but we have required courses which are math and biology and elective courses are either chemistry or physics at higher levels and we have males and females choosing their electives.

Maha: In the Lebanese system, usually in grade 10 they don’t have a choice, yaani, either they leave the school to go for instant to do something else and don’t stay at school but go to institutions and if they have to continue at school then this is what they have. The tracking really starts in grade 11; there you have to choose sections as literary or scientific and even in the American system, the track concerning math starts at grade 11.
Rula: But it's their results at the end of grade 10 that determines their track, isn't it?

Maha: yeah and many of them insist on staying in the scientific section and as Hagop mentions we don't have distinctions, girls nowadays are highly motivated to continue in the scientific track and they are even more clever than boys.

Mrs. Rita (math): In the American section that I teach, I have the girls more motivated than boys.

Rula: Do you think that the teacher's gender and teaching approach affect a female student's choice?

Rita: I think to an extent the teacher will play a role. I mean if the student likes the teacher more she will make him or her love the subject more.

Rula: so you think the gender of the teacher plays a role?

Rita: it's not that, it's like if the teacher makes them like the subject or not, but not if the teacher is a male or a female.

Hagop: I think it makes a difference, if for example; it's always that the physics teacher is a male, and then probably psychologically it will make a difference for a female student that physics is for males and not for females. I believe the gender affects.

Rula: Even if the female teacher may be qualified to do that?

Hagop: yes; it could be; that's why I believe that there should be a balance of female and male teachers teaching scientific subjects at school.

Rula: so you believe there's a lack?

Hagop: in terms of what, where?

Rula: in that there are more male teachers than female teachers for scientific subjects.

Hagop: I don't have numbers, well what I can say at Eastwood is that we have a balance, but in general male physics teachers are more than female physics teachers.
Maha: so far at Eastwood, we have only male physics teachers, but in other sciences as biology and chemistry there’s a balance.

Rita: In general, in the Lebanese curriculum, for grade 10 and above I think most for physics are male teachers.

Rula: Do teachers treat male and female students differently in science and math classes? Give examples.

Hagop: personally, I don’t.

Rita: this may happen but not as males or females, may be a favorite student but not necessarily a male or a female.

Rula: But what I know is that males are treated differently, they may be given more chances to solve problems on the board…

Rita: Actually in grade 6 because I teach also grade 6, students, specifically male students, have the idea in mind that most teachers at this level are females and so they believe that teachers prefer girls and not boys so whenever I ask a girl to go to the board they complain, oh you always take girls. This is not true; I try to have balance but may be they have it in their mind. So I always try to make this balance. But I don’t notice this in other classes.

Rula: may be the teacher does that unconsciously.

Rita: this is what I told you. In grade 6 I realized this problem and always try to make balance between boys and girls.

Rula: do you think girls have specific learning styles related to their gender that affect their choices? For example, girls prefer group work while boys prefer individual work?

Maha: no, but I want to comment. At Eastwood here you have something may be that doesn’t exist at other schools. Most of our staff is females and we had never really had this distinction
between girls and boys at all. I realize that boys like group work and enjoy it as much as girls. This is related to the school culture, if you encourage group work since they are young then it’s based in regardless of their gender. We don’t really have this. For example, my students, the boys form groups to challenge and compete girls.

Rula: other than group work do you think females have special learning styles?

Maha: no, but why should they have specific learning styles? Just because they are females. No, they’re receiving the same education and the problems we face with boys are the same problems we face with girls.

Rula: Do you think parents play a role in a female student’s choice?

Rita: They do for both sexes, they interfere.

Rula: so you believe it’s the same effect.

Hagop: Every year we have cases where we could have students either males or females who do much better in humanities but their parents insist that their children go to scientific sections.

Rula: ok, but can they manage concerning grades?

Hagop: well they face difficulties a lot.

Maha: but regardless of being a girl or a boy. Last year we had a class most of it girls and just with 2 boys and all the parents insist that they should join the scientific section regardless cost what it made.

Rula: even if they can’t?

Maha: this is the situation, they were not really qualified to join the scientific section and parents were persistent that all our kids must join the scientific section and tried to support them and we as a school had a difficult time but finally we had good results at the end.
Hagop: unfortunately in Lebanon University needs either studying to be medical doctors or engineers and both should follow the scientific track. This is the aim of the majority of parents and the top students.

Maha: but here many are realizing their parents’ dreams. Many students start the university with a major their parents prefer, then after one or two years many changes their majors for it didn’t work with them and parents start pressurizing sometimes even from grade 9 on students.

Rula: what is the effect of the educational and financial level of the females’ parents on their daughters’ choices?

Rita: the financial situation of the parents don’t affect the choice of track, it affects the way they approach their study. Students with families of very good financial situation as having their own companies or business, it develops in them an attitude of being lazy or careless and takes it for granted that their work is waiting for them to graduate. So most will seek a business degree to run their families’ business.

Hagop: she reminded me of my students in grade 12, actually the American program, where many were taking a biology course and many of them were not motivated, males and females. What happened is once we get to the question why they don’t like, I discover that it’s because they were saying that we do study biology and then what? What is genetic engineering going to give us later on, in terms of financial benefit, you know instead if we go and teach or if we go and do research how much are we going to earn and this is the belief of students coming from rich families or those of high socio economic background and their parents usually have private business and such students were not motivated to go to science and what happen is they do freshman and went to business.
Maha: as Mr. Hagop has mentioned, the financial state of parents especially regarding females, I have encountered many parents who tell me just let the girls pass the class and all what I’m expecting from my daughter at the end of school is to get married, even though their financial state is very good. They enjoy a good financial state and they really didn’t care about their daughters’ performance, all that mattered for them is let her have a degree, let her graduate. Issue for them is let her have a degree, let graduate from school, no matter what this is what they want.

Rula: do males and females have the same ability at the scientific subjects?

Maha: It depends, yaani sometimes there is a boy who is really very hard worker, but he’s not smart, he has good grade because he’s a hard worker and sometimes you find a girl who is a hard worker, she gets good grades but she is not smart.

Rula: so the gender doesn’t affect the ability? That boys understand scientific subjects more.

Hagop: this is a very good question because personally I have never differentiated between a male and a female in these issues. So it’s very difficult to give an answer.

Maha: from our experience we can’t tell that males have more abilities than females.

Rita: even in performance, achievement and in process of analytical thinking, kids in class when they get to understand a concept, no, I can’t say there is difference.

Maha: again this is related to the school culture because they are brought up equally, there is no distinction yaani from the beginning we don’t distinguish...this is a boy and this is a girl. This is how we are at this school.

Rula: do you think that girls lack self confidence in their abilities?

Maha: they know their abilities very well and those who are weak they tell you we are weak.
Rula: It's believed that scientific subjects require students to be risk takers. For example, scientific problems have many and not only one single solution, males are are more risk takers while females lack the confidence even if they had right solutions?

Hagop: you know there are males and females thinking like this sometimes and not only females.

Rula: Bacon rooted the idea that 'science is masculine' does this metaphor still work nowadays?

Maha: not at all. I want to tell most of our staff here are females.

Hagop: especially in the American program because here well we choose our teachers, resources and are careful to these issues.

Rula: do you think that the books reflect this issue in the language, in the pictures as more males than females.

Hagop: in the American program, no.

Maha: in the Lebanese, yes. For example, in the math problems, more names of males than females. But we rarely have pictures in the math books.

Hagop: more male than female pictures in the Lebanese science books.

Rula: do you have female teachers teaching math and sciences at secondary 2 and 3?

Maha: you know I taught math for 3 years for boys only in another school. I think whenever they find a qualified person it doesn't matter, the gender is not an issue.

Rula: do girls and boys have equivalent or different levels of achievement in science and mathematics?

Maha: this depends on their qualifications for we are a school that has no distinction, even in the Lebanese program because we never thought of such issues. We go to class and we think of students as students, we don't think of gender.
Informant 2: Mr. Bassem, biology (American section)

Interviewer: Rula Hallab

Date: Monday, May 6, 2006

Subject: factors that discourage females from choosing the scientific academic track at the secondary level

Place: School X2

Time: first break
R.H.: We realize that females choosing the scientific academic track at the secondary level are much less in number than males. As a science teacher at this level, do you agree or not and why?

Bassem: I agree with you know because most of the females you know find scientific topics they are hard to follow you know that's why they prefer to go to the economics or literal part.

Rula: do you think that the teacher’s gender and teaching approach affect a female student’s choice? For example, it’s believed that a male science teacher is more subjects oriented whereas a female science teacher is more student centered.

Bassem: in my opinion, I don’t believe with this you know. It’s not related whether the teacher is a male or a female. I don’t know if in the elementary classes it can affect you know whether it’s a male or a female teacher but in middle or senior it doesn’t affect this is what I believe.

Rula: do you think teachers treat male and female students differently in science and math classes? Can you give examples?

Bassem: no, I don’t think teachers differentiate between students whether they are girls or boys.

Rula: may be unconsciously they do that. For example, it’s believed that teachers treat males differently; they give them more time to answer questions, more opportunities...

Bassem: according to me, no, the most important if the student is clever and is not interested in the subject regardless whether he’s a girl or a boy. I have you know in my classes you know I have girls which are more smart and clever than what? Boys and they can answer and they put effort more than boys, that’s why I put more attention on girls than boys because it’s not related whether I’m teaching boys or girls.

Rula: so in general you put more attention on who’s more clever?

Bassem: yes, who’s no, it’s not like this. I have to work even with the weak ones you know but usually you can cooperate more with the clever students.
Rula: do girls have specific learning styles related to their gender that affect their choices? For example, girls prefer group work and like to build concepts over each other whereas boys prefer individual activities and learn through arguments? Do you think it’s true?

Bassem: no, the Lebanese system you don’t have this you know it’s most of the class work in group work you know because we have like experiments they have to analyze it and discuss it. In the American system because you know I have a limited number of students so I can’t build an idea whether it’s true or not and even in my previous experience you know I work in Dubai for several years you know where there are girls classes and boys classes.

Rula: do you think parents play a role in a female student’s choice and how?

Bassem: yes, I agree with this. Many parents you know they guide their children you know to what major they have to choose in the future and you know children are affected by their parents a lot and they have a big influence on them whether to go like medicine or engineering that is the scientific or literary

Rula: what is the effect of the educational and financial level of the females’ parents on their choices? If for example, the better is the financial situation the more encouragement for their daughters to choose the scientific track or is it the opposite?

Bassem: I think the educational level plays more role. It depends you know I think if let’s say for example you know if the family you know have the company like commercial they will guide their children to go for business for example to run the family work or if it’s a poor family for example, they want their children to go scientific because in the future perhaps they are going to get better jobs and better salaries. So the lower the financial situation the more encouragement to choose the scientific track like engineers or doctors.
Rula: do males and females have the same ability at the scientific subjects? For example, it’s believed that boys understand new ideas more quickly, answer more questions and are more competitive?

Bassem: I agree on this. In general, yes, boys have more abilities. Even if girls are better yet boys have more abilities. I think girls have like a character that they are shy, they have the information but they don’t like to share it with others unless you push them to what? Participate or to answer.

Rula: do you think that girls lack self confidence in their abilities? Give examples?

Bassem: yes, I think they lack self confidence. I agree on this. For example, they are afraid to have like comments from boys if their answer is wrong, o.k. or not ok, you don’t know how to answer this, and you don’t think like this, they are not sure ok, they want to be sure 100% in order to answer.

Rula: so you believe that boys are more risk takers?

Bassem: yes, I agree on this and sometimes they are typically like this even if it’s wrong, girls you know they need more time ok. to prepare the answer.

Rula: boys are more risk takers especially in scientific subjects and problems that have several solutions or many ways to answer them

Bassem: girls need to be 100% sure that their answer is right, they don’t try to guess o.k. or write anything which is not accurate like 100%, opposite to boys, boys can give answers quickly, no problem...

Rula: Bacon rooted the idea that ‘science is masculine’ does this belief still work nowadays?

Bassem: I think no, these days, no because if you go o.k. to the universities and you do statistics I think many girls are going to the scientific field right so you can’t agree with this anymore. I think that in the past yes. I agree with it 100% this is not working now.
Rula: do girls and boys have equivalent or different levels of achievement in science and mathematics?

Bassem: you mean in their assessment. I can’t compare it because you know the number of girls you know, if I want to compare it to the number of boys we have a less number for the boys are more but let me talk about my class which you visited we have 10 Americans we have 3 girls you know 2 girls they 1 girl she is the best student in the whole class you know

Rula: do you have females teaching math and physics at secondary 2 and 3 classes in your school?

Bassem: in grade 10 both are males. In grade 11 and 12 mixed we have males and females. In grade 11 chemistry and physics teachers are females but math a male. In grade 12 biology and math males whereas for physics and chemistry females so it’s a 50%.

Rula: do the books you use reflect this issue concerning who is mentioned more in the language, content or pictures?

Bassem: this is not direct in the American books, in the Lebanese books also don’t have this problem you know in the biology it’s all experimental, an experiment with procedures. Sometimes if there is a discovery you know of a male scientist, they mention it, no problem but I don’t think he or she is a problem for they mention a ‘research was done’ or ‘we did’, they don’t use he or she in the biology, we don’t have this, so no gender bias in the books.

Rula: so out of all the mentioned factors which do you think are the most leading factors that affect a female student’s choice?

Bassem: I think the first is related to their abilities the most important issue whether they are going to be scientific in the future or they are going to literary so abilities and achievement well in their assessments you know high grades, this is going to give whether they are going to be
scientific and I think it starts with the elementary classes, these are suffering from math like
grade 3 for girls more than boys you know and this problem you know is going to get bigger and
bigger until they reach what? Senior classes and then they find themselves we are going to
literature; it’s easier so most it’s their abilities.
Informant 3: Mr. Anis for mathematics (American section)

Interviewer: Rula Hallab

Date: Tuesday, May 9, 2006

Subject: factors that discourage females from choosing the scientific academic track at the secondary level.

Place: School X2

Time: second break
R.H.: We realize that females choosing the scientific academic track at the secondary level are much less in number than males. As a math teacher at this level, do you agree or not and why?

Anis: I think I want to disagree here. May be it’s right you say why lot of people wants to be engineers, not a lot of people wants to be engineers, we need math. teachers, I think just coincidence lot of ladies probably don’t have interest; you know it’s not of being a female or not a female. I think opportunities for both are not great for anybody. I think opportunities for both is a little bit not easy, so lot of people are planning to avoid being like engineers or mathematicians or something like this. That’s why the Lebanese are good in business. I believe once we introduce industries, you’re gonna see this changing. The same questions are asked all over the world, why not a lot of people studying mathematics. They don’t like it. They just don’t want it, you know, they don’t think logical, or something like this, I don’t know but they just don’t want it. I think it’s just coincidence being a female or a male you know I don’t want to be prejudice here but I really believe it’s a coincidence. I more think it’s like that males go for prestige, lady don’t go for prestige for example especially in Lebanon I want to be engineer but do you love engineering, I want to be an engineer because my dad told me so. You see what I mean o.k.

Rula: so it’s the effect of parents?

Anis: yeah, excellent for the lady; they don’t have this ok. I want to be like this for the guys to make more money to do this and that so lot of them are pushed to it. Ladies have more freedom.

Rula: You mean parents push males more than females? They give females the freedom of choice you mean?

Anis: they are trying in a negative way push the guys into things ok. you are smart go and study math or engineering may be they don’t like it while they give the girls the freedom to choose.

This could be positive, why not mathematics, because I don’t like it she tells I don’t like it. Go to
A.U.B. lot of ladies studying mathematics, they will become teachers although they do not want to become teachers.

Rula: do you think the financial situation of parents affect the female’s choice? or the educational level?

Anis: I don’t know miss, but why not lot of females want to be pilots go and ask American airlines, these are American careers, why? There’s freedom in U.S. right? If you are saying male and female ask them why? They don’t want although they give them freedom. Why not Lebanese ladies want to be engineers because go to the west if you are thinking about male and female, they don’t want to be engineers they don’t want to

Rula: so you don’t relate the educational or financial level of the parents to a female’s choice?

Anis: no, I don’t look at it this way because go to the other parts of the world where there’s money and everything believe me it’s the same story, if you look at it universally you won’t be prejudiced I really believe it’s the same, ladies more like soft they like careers as being a teacher, being a nurse because they are soft you know it’s their character, that’s how God put in their heart, instinct, you know they don’t wanna become football player or they don’t wanna become like pilots, I don’t like it, she wants to become what? You help me...

Rula: you mean she chooses careers where she can take care of others?

Anis: if you go on the plane you have pilots and who else in the plane serving the plane?

Rula: hostesses

Anis: thank you. They are all females, why not males because females all have this instinct. God has blessed them with this instinct. She wants to serve, so suddenly we get prejudiced, why not studying mathematics, I think because they don’t want to.
Rula: Do you think that the teacher’s gender and teaching approach affect a female student’s choice?

Anis: no, I will give you a quick answer. Go elementary they are all females, most are female teachers they don’t have male.

Rula: and the secondary level?

Anis: in the middle school the same story, most females, why in the secondary being affected although it’s a couple of years in Lebanon, why?

Rula: do teachers treat male and female students differently in science and mathematics classes?

Give examples?

Anis: I don’t know in my classroom, usually the males are more vocal, you have to be careful here, yeah sometimes it is, and sometimes it is not. In my classroom I don’t see it. I see guys are more vocal....the girls are more quiet. The guys are always vocal, it’s not the teacher and I don’t want to tell them oh be quiet and let the girls talk, I don’t wanna do that. If the girls are vocal, eh come in. may be it’s just their character you have to be careful, it’s their character so the teacher have the tendency of paying more attention to them and not because he’s a male.

Rula: so you believe that boys are more risk takers?

Anis: I believe they are more vocal. Actually the class you were in the best student she’s a girl, the one sitting aside, you see how she is quiet.

Rula: you mean the one who solved the problem on the board?

Anis: yeah, she is the brightest. I know she is the brightest see her papers but I don’t want to tell her you have to talk. You have to give them the freedom. Women want freedom, that’s how she is, then that’s how she is. Now I let her go to the board how many times?

Rula: one time
Anis: and how many times I let other guys?

Rula: six times for different guys and here we have to consider the ratio I guess.

Anis: excellent, yeah but it also depends on the teacher too

Rula: do males and females have the same ability at the scientific subjects? For example, boys understand new ideas more quickly, answer more questions and are more competitive?

Anis: I agree with it, I think it is part of the guys’ character you know

Rula: but does this mean that they have more abilities?

Anis: no, I believe from all my heart that this is not true. God has blessed both people, God the almighty, see if you don’t look at it from God, see all the questions, these are worthless because this is how God put things, he gave Adam and he gave eve, and what did he tell eve you’ll be a complement to Adam, he didn’t say you’re gonna be the same like him. It means where he’s weak she’s gonna be strong and where she’s weak he’ll be strong so that is why he put them together. So when a guy is vocal the lady is more quiet. At home the same, she is still feminine, you need that at home so you need both. So it’s hard to say I want the guys to be like the girls. When someone says like this miss, you see all the education you’re getting, throw it out the window. All this research you’re doing, male and female, don’t look at research. I know the world miss; I taught here, I taught there. There’s freedom in other countries where I lived, it’s the same story you’re telling me, why the girls? and they are trying so hard do something about it, I don’t know why at the end they are failing, family wise they are failing, they bring down families and at the end they force women to do things and tell her to be like the men but she’s different, she’s beautiful why you are messing her as if they are taking the flower out of the stem, what happens to the flower when you do this? It will die but the female has to be careful and not let someone strong, there are some areas that you are weak that’s how god put them together
Rula: Do you think that girls lack self confidence in their abilities? Give examples?

Anis: Sometimes, not always. This depends on the girl. Sometimes you're right sometimes it's true as you say, like the brightest girl I mentioned she's so confident that she keeps quiet. This girl is the best student in my class. She's a girl. She gets 100 in her tests but I don't think of them like this. No unless it's cultural. I taught before in other places, however, you have to be careful miss; girls are quiet because it's not their passion yet. Once you show someone his passion, you see him opening his mouth and talking. They lack interest because that's not what they want to do. Talk about clothes and design, the girls jump and tell you everything. Talk about interior design and homes, the boys are quiet and girls start, where you put furniture, this color or another, talk about something that arouses their interest.

Rula: do you believe that math is useless for their future and that's why they lack the interest?

Anis: they're not interested init. If you go to A.U.B. there are ladies studying math but they are not interested. Yeah being a lady sometimes plays a role, not because she's a lady but because the culture is telling her 'you're not good'. May be in some families, in some areas, in some religions, but even in other religions that don't do that they are still facing the same problem so how can you say that? Even in countries that give freedom go and tell me how many pilots are ladies? How many engineers, how many c o s are ladies? So before we say I think the human being is trying to disobey God in all aspects of life and this is one of them, trying to force women to do things they actually don’t like. You need to do that, even in areas of freedom, they call it freedom go and ask them why you’re not doing it? I taught overseas, still they need math teachers, secondary level and out of every 10 may be one is a woman so how can you look at me and tell me opportunities. Be careful not to take the flower out of the stem.

Rula: Bacon rooted the idea that ‘science is masculine’. Does this belief still work nowadays?
Anis: it might be but I think it was like this in the past but not nowadays
Rula: do girls and boys have equivalent or different levels of achievement in science and mathematics?
Anis: yes, the same achievement, I don’t see much difference. It’s not about being a male or a female; it’s about going back to God. God has given you certain things and human beings don’t like what God gave them. They are trying to force issues and mess up the whole thing, they end up messing their families and the whole world around them and they think oh they are improving the world, no miss
Rula: do the books you use reflect this issue? Is there any gender bias in these books concerning language, content and pictures?
Anis: it’s the opposite get the book and check
Rula: may be you mean the American but what about the Lebanese books?
Anis: I don’t know I don’t realize this. In the American books they show ladies driving planes. I will tell you something funny miss they give them scholarships, they pay for them I know I’m from there. They give everybody the same thing no prejudice, they give them money but why they don’t wanna become engineers?
Rula: out of all the mentioned factors, what are the leading ones that affect a female student’s choice?
Anis: I think o.k. I believe this; if there is opportunity parents will start encouraging everybody but those poor parents especially the father who wakes up early in the morning and go to work and work hard all the day and come back to bring only couple of 100 dollars and he has his kids and think that opportunities there are so rare, I can’t make them all engineers so whom do you think he will encourage, look at me and tell? If there is opportunity for everybody I think
everyone will be encouraged. If Lebanon is opening jobs to everybody like other countries, everyone will be encouraged unless it’s religion. I know some religions here in Lebanon they look at ladies down but the Bible said no. If you read from the Bible and see what God wants the ladies to be, he told the man, you see the lady, your wife, she’s your body and you both become one and God said you die for her and God dies for you on the cross so the man is supposed to die and he told them you treat her the way God has treated you. See how beautiful, other religions don’t. I just heard one lady who changed her religion because she said that she doesn’t believe that God doesn’t like women for in some religions they keep saying kill and are not treated nice. She looked there and read the Bible and God opened her heart, I’m created by God, I believe God loves everybody the same, he loves you, he loves me, and he loves all the same. But we have to be careful to say, oh God what you really want me to do in life, not what my parents or society. Now may be the opportunities in Lebanon are not enough so we have to be realistic. This poor guy who gets an engineering degree from A.U.B. is immigrating you know to Saudi Arabia, so how can you tell a lady go and get an engineering degree, can you find her a job to do that. She wants to get married too so she can’t jump all over the world. You see ladies think different so if you look from the social aspect, not to be prejudiced, it’s about opportunities. Did you get my point of what I’m saying? I really think you really don’t have to be prejudiced. You don’t have to think about it, we talk like this, I think people here, some people in Lebanon are affected by the old Lebanon long long long time ago, ah you stay at home but now they are not doing this no ok, why is this the case? some people are still prejudice. I think because in Lebanon it’s about opportunities. You get 20 people engineers, they have nothing to do. I know a person, an engineer, he opens a pharmacy, he find no job but do you think this guy is going to encourage his daughter to become an engineer?
Rula: No

Anis: Why? Nothing you know here you don't get in unless you have 'wasta' or something like this. You know so it's not only opportunities it's also like 'wasta' you know, not your qualifications. You can't ask a lady go to Saudi Arabia and work there, she wants a family, will I end up my life like this, think of this at the end the money what will we do with it so the instinct you see how God brought the instinct in a lady. I want to be a mom, I want a family. I notice something, they go to Saudi Arabia, and their families stay in Lebanon. You know what am I talking about? So how come this society and tell a lady go and do what a man do or don't do it. I think it's over related, I think because there's no opportunities and instinct. Almost instinct, both of them together are doing this however, I'm not saying we have the perfect society that's not discouraging women but even if they encourage her they won't find jobs. Look at them, men can't find jobs so how will we encourage people to do like this?
Appendix G

Transcribed Parents' Interviews

Family 1:

Rula: My name is Rula. I am a student at the Lebanese American University doing a study on females' science education in your daughter's school. Can I ask you some questions about your daughter?

Mother: Yes, of course.

Rula: What is your educational level?

Mother: I have a business degree.

Rula: What is the educational level of the father?

Mother: He has a PhD degree.

Rula: Sorry for the question but how can you describe the financial situation of your family?

Mother: I can consider it high.

Rula: What kind of toys did you buy to your daughter at younger ages?

Mother: Entertaining, educational and craft toys and also musical instruments for she play piano.

Rula: Which track do you prefer the scientific or the literary for your daughter and why?

Mother: I prefer the scientific track because she likes it.

Rula: Who encourages or supports your daughter to choose her track?

Mother: I do this.
Family 2:

Rula: My name is Rula. I am a student at the Lebanese American University doing a study on females’ science education in your daughter’s school. Can I ask you some questions about your daughter?

Mother: yes, ok.

Rula: What is your educational level?

Mother: I have a secondary degree.

Rula: What is the educational level of the father?

Mother: He is an engineer.

Rula: How can you describe the financial situation of your family?

Mother: I can consider it average.

Rula: What kind of toys did you buy to your daughter at younger ages?

Mother: Entertaining, educational and craft toys.

Rula: Which track do you prefer the scientific or the literary for your daughter and why?

Mother: I give her the freedom of choice.

Rula: Who encourages or supports your daughter to choose her track?

Mother: It is me who plays this role.
Family 3:

Rula: My name is Rula. I am a student at the Lebanese American University doing a study on females’ science education in your daughter’s school. Can I ask you some questions about your daughter?

Mother: Of course.

Rula: What is your educational level?

Mother: I have BA and MA degrees.

Rula: What is the educational level of the father?

Mother: He has BE for he is an engineer and MBA.

Rula: How can you describe your financial situation?

Mother: It is above average.

Rula: What kind of toys did you buy your daughter at younger ages?

Mother: Entertaining and educational as puzzles.

Rula: Which track do you prefer the scientific or the literary for your daughter and why?

Mother: I give her the freedom of choice.

Rula: Who encourages or supports your daughter to choose her track?

Mother: Both of us do this.
Family 4:

Rula: My name is Rula. I am a student at the Lebanese American University doing a study on females' science education in your daughter's school. Can I ask you some questions about your daughter?

Mother: ok.

Rula: What is your educational level?

Mother: I have a BA degree in psychology.

Rula: What is the educational level of the father?

Mother: He has a university degree also.

Rula: How can you describe your financial situation?

Mother: It ranges between average and high.

Rula: What kind of educational toys did you buy to your daughter at younger ages?

Mother: mostly educational toys.

Rula; which track do you prefer the scientific or the literary track to your daughter and why?

Mother: I give her the freedom of choice>

Rula: Who encourages her to choose her track?

Mother: both of us do.
Family 5:

Rula: My name is Rula. I am a student at the Lebanese American University doing a study on females’ science education in your daughter’s school. Can I ask you some questions about your daughter?

Mother: Yes, of course.

Rula: What is your educational level?

Mother: I have the intermediate degree then in USA I have a college degree.

Rula: What is the educational level of the father?

Mother: He has a PhD in chemistry.

Rula: How can you describe your financial situation?

Mother: It is average.

Rula: What kind of toys did you buy your daughter at younger ages?

Mother: Entertaining and educational toys

Rula: Which track do you prefer for your daughter the scientific or the literary track and why?

Mother: I give her the freedom of choice.

Rula: Who encourages her to choose her track?

Mother: Both of us do.
Family 6:

Rula: My name is Rula. I am a student at the Lebanese American University doing a study on females' science education in your daughter's school. Can I ask you some questions about your daughter?

Mother: ok.

Rula: What is your educational level?

Mother: I have the Lebanese Baccalaureate degree.

Rula: What is the educational level of the father?

Mother: He has a business degree.

Rula: How can you describe your financial situation?

Mother: It is average.

Rula: Which track do you prefer the scientific or the literary for your daughter and why?

Mother: I prefer the scientific section because it has wider specializations.

Rula: Who encourages or supports her to choose her track?

Mother: Both of us do.
Appendix H

Questionnaire

How can you describe your achievement in scientific subjects until last year?

- Excellent: 5
- Very Good: 3
- Good: 6
- Average: 2
- Poor: 1

Which subject do you like most?

- Languages: 4
- Mathematics: 5
- Biology: 9
- Social studies: 0
- Chemistry: 3
- Physics: 0
- Economy/sociology: 0

Based on your grades up till now, which section do you think you will follow next year?

- Scientific: 15
- Literary: 2
Do you frankly think you can continue in the scientific track?

- Yes: 15
- No: 2

What is the educational level of your mother?

- Elementary school: 0
- Middle school: 2
- Secondary school: 7
- University degree (BS, BA, or BE): 6
- Higher (MA, MS, ME or Ph.d): 2

What is the educational level of your father?

- Elementary school: 0
- Middle school: 1
- Secondary school: 3
- University degree (BS, BA, or BE): 7
- Higher (MA, MS, ME or Ph.d): 6

How can you describe the financial situation of your family?

- High: 2
- Middle: 10
- Average: 4
- Low: 0
1. What kind of toys did your parents buy you at younger ages? (Check as many as to apply)

- Entertaining toys as dolls: 17
- Educative toys: 12
- Mechanical toys: 4
- Craft toys: 10
- Toys related to life science: 7

2. Your parents encourage you to choose:

- The scientific track: 12
- The literary track: 3

3. Please state your father occupation

- Employee: 11
- Owner: 6

4. Please state your mother occupation

- Employee: 8
- Owner: 5
- Housekeeper: 4
2. The majority of your science teachers are:

- Males: 8
- Females: 7
- Equal in number: 2

3. Whose approach in teaching scientific subjects do you prefer?

- Male teachers: 0
- Female teachers: 0
- No difference: 17

4. In general, do you think boys are given more opportunities to answer questions than girls in your science classes?

- Yes: 0
- No: 17

5. Who receive more encouragement in your science classes?

- Males: 0
- Females: 0
- No difference in treatment: 17
5. How can you compare females’ achievement to that of males?

- Males are better in science: 0
- Females are better in science: 2
- They are the same: 15

6. Do you prefer individual or group work in science classes?

- Individual work: 0
- Group work: 5
- Both: 12

7. Do you think studying science is important in your daily practical lives and future?

- Yes: 17
- No: 0

8. Do you think studying science for a female is “unfeminine” and that science and mathematics are “masculine”?

- Yes: 0
- No: 17
1. Do you believe scientists are "nerdy", that is, they only concentrate on work in life?

- Yes: 3
- No: 14

2. Who is presented more in the content of your science and mathematics textbooks (language and pictures)?

- Males: 1
- Females: 0
- Equal presentations: 16

3. Do you know the name of an important female scientist?

- Yes: 5
- No: 11

4. What is your future plan as a profession and why?

- Scientific field: 10
- Literary field: 2
- Fashion and Sports: 2
- Not Decided: 3
Appendix I

Results of Classroom Observation Checklist:

Teacher:

Subject:

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<td>Frequency of calling a female by name</td>
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<tr>
<td>Frequency of a male asking a question</td>
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<td>Frequency of a female asking a question</td>
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<td>Wait time given to a male to answer</td>
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<td>Wait time given to a female to answer</td>
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<td>Frequency of a male answering a question</td>
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<td>Frequency of a female answering a question</td>
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<td>Frequency and kind of praise a male receives ability/neatness</td>
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<td>Frequency and kind of praise a female receives ability/neatness</td>
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<td>Reaction to a wrong answer by a male</td>
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<td>Frequency of a male conducting an experiment</td>
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<tr>
<td>Frequency of teacher asking a question to a female</td>
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# Classroom Observation Checklist:

**Teacher:** Mr. Inab  
**Subject:** Physics/La Boussa.

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<tr>
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<tr>
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</table>

Additional notes:
- All students are seated at the front of the class.
- Frequent display of chalkboard and handouts.
## Classroom Observation Checklist:

**Teacher:** Miss [last name]  
**Subject:** Chemistry

<table>
<thead>
<tr>
<th>Item</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>Frequency of calling a male by name</td>
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<tr>
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<tr>
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<td>[ ] [ ] [ ] [ ] [ ] [ ]</td>
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Additional Notes:

- Frequency of a male conducting a discussion: [ ] [ ] [ ] [ ] [ ] [ ]
- Frequency of calling a question to a male: [ ] [ ] [ ] [ ] [ ] [ ]
## Classroom Observation Checklist:

**Teacher:** Mrs. Hervat  
**Subject:** Mathematics / Lebanese

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<td>Difficulty of a question addressed to a female</td>
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</tr>
</tbody>
</table>

*Additional notes:
- Frequency of a male conducting exp.
- Frequency of a female conducting exp.
- How often teacher uses a timer? 
- Difficulty of a question addressed to a male

*Rating Example:* 5 asterisks for high frequency, 1 asterisk for low frequency.
# Classroom Observation Checklist:

**Teacher:** Mrs. Ghada  
**Subject:** Biology / Lebanon

| Frequency of calling a male by name | 11111 |
| Frequency of calling a female by name | 11 |
| Frequency of a male asking a question | [group process] |
| Frequency of a female asking a question | [op wave] |
| Wait time given to a male to answer | |
| Wait time given to a female to answer | |
| Frequency of a male answering a question | 11111 |
| Frequency of a female answering a question | 11111 |
| Frequency and kind of praise a male receives ability/heatness | |
| Frequency and kind of praise a female receives ability/heatness | |
| Reaction to a wrong answer by a male | |
| Reaction to a wrong answer by a female | |
| Frequency of mentioning a male scientist | |
| Frequency of mentioning a female scientist | |
| Frequency of a male solving a problem on board | |
| Frequency of a female solving a problem on board | |
| Difficulty of a question addressed to a male | 11 explain a process |
| Difficulty of a question addressed to a female | 11 |
### Classroom Observation Checklist:

**Teacher:** Hagop  
**Subject:** Biology

| Frequency of calling a male by name |  
| Frequency of calling a female by name |  
| Frequency of a male asking a question |  
| Frequency of a female asking a question |  
| Wait time given to a male to answer |  
| Wait time given to a female to answer |  
| Frequency of a male answering a question |  
| Frequency of a female answering a question |  
| Frequency and kind of praise a male receives ability/neatness |  
| Frequency and kind of praise a female receives ability/neatness |  
| Reaction to a wrong answer by a male |  
| Reaction to a wrong answer by a female |  
| Frequency of mentioning a male scientist |  
| Frequency of mentioning a female scientist |  
| Frequency of a male solving a problem on board |  
| Frequency of a female solving a problem on board |  
| Difficulty of a question addressed to a male |  
| Difficulty of a question addressed to a female |  

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*Sample Entries:*

- Frequency of calling a male by name: 
  - Male: 11111
  - Female: 1111
- Frequency of a male asking a question: 
  - Male: 11
  - Female: 11
- Wait time given to a male to answer: 
  - Male: 
  - Female: 
- Frequency of a male answering a question: 
  - Male: 
  - Female: 
- Frequency and kind of praise a male receives ability/neatness: 
  - Male: 
  - Female: 
- Reaction to a wrong answer by a male: 
  - Male: 
  - Female: 
- Frequency of a male solving a problem on board: 
  - Male: 
  - Female: 
- Difficulty of a question addressed to a male: 
  - Male: 
  - Female:
Classroom Observation Checklist:

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## Classroom Observation Checklist:

**Teacher:** Mr. Anis

**Subject:** Mathematics / American

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*Additional notes and comments:*
Classroom Observation Checklist:

Teacher: Mr. Bassem  
Subject: Biology  10/A.  (9/7/6M)

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## Classroom Observation Checklist:

**Teacher:**

**Subject:**

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*Note: The numbers indicate the frequency of occurrence.*