SCIBERMENTOR EMAIL MENTORING PROGRAM FOR GIRLS

SCIberMENTOR

Quantitative and Qualitative Mentee Research Results

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March 2004

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ACKNOWLEDGMENTS

This research would not have been possible without the cooperation and support of a number of organizations and individuals. Funding for this research was provided by Alberta Innovation and Science, through their Science Awareness and Promotion Grant Program, with matching funds from EnCana Corporation. This support is gratefully acknowledged. Ms. Tamara McCarron is also thanked for her assistance in the research program.

EXECUTIVE SUMMARY

SCIberMENTOR is a unique program that matches girls aged 11 to 18 with women studying or practicing science or engineering in a one-on-one email mentoring relationship. The program matches mentees with mentors based on career interests and hobbies. In order to evaluate the impact of the program, a research program was undertaken of which the first phase consisted of administering a questionnaire to over 125 mentees who lived in both rural and urban centres, and who were spread across the program target age range. The second phase of the project consisted of in-depth telephone interviews with over 100 of these mentees.

The results indicate that the mentees have a very positive attitude towards school. In addition, over 87% agreed or strongly agreed that they liked themselves, whereas they strongly disagreed or disagreed that they would alter their behaviours or school achievement to be popular. They have generally positive affinity and interest for math and science. In particular, the mentees have just as much, if not more, confidence in their ability and interest in science as their typical male counterparts as determined from a previous study.

The mentees most often describe science as being 'interesting', 'fun', 'challenging' and 'exciting'. The parts of science class they like best were overwhelmingly the labs, experiments and hands-on experience. They were in agreement about science or math related professions as their first career choice which is significantly higher than in a previous study with a broader sample in which the girls tended to favour gender stereotypical careers. Students had generally positive attitudes about science careers with the top benefit being identified as *having a job that increased learning, understanding and knowing*. The most commonly cited disadvantage to a science career was that it is perceived to be time consuming and a lot of work.

The participants indicated strong perceptions about gender equality in contributing to family income, and sharing housework and childcare. They perceive themselves as being equally able to handle pressure on the job as males, and that working and non-working mothers are no different in their ability to establish a warm and secure relationship with their children. However, questions that more specifically examined the interrelationships between career and child rearing resulted in mixed emotions and greater ambiguity in response patterns.

The mentees were asked to name important male and female scientists. Both junior and senior students mentioned Einstein more often than any other male scientist. Both groups of students, however, had significant difficulty naming an important female scientist, where 82% of the junior students and 60% of the senior students could not answer this question. This shows a lack of communication of female science mentors to young women.

In terms of the SCIberMENTOR program, students were asked what they hoped to gain from participating in the program, with the most common answers for junior students being: *To know what is out there* and *Learning about a specific career. To know what is out there* was also the most popular response from senior students followed by *Learn about university or classes to take*. These responses directly match some of the objectives of the SCIberMENTOR program.

Overall, the research results show that the SCIberMENTOR mentees have a strong interest in science and many see themselves pursuing a career in science in their future. This suggests that the program attracts those that have already developed a keen interest in science and the program must continue to strive to nurture and further develop this interest. Indeed, results from a previous indicated a significant drop in interest in science from grade 7 to grade 10, and SCIberMENTOR involvement could forestall such an effect. Further research on educational choices of the mentees is being conducted and will be reported in the future.

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CHAPTER 1 INTRODUCTION AND SCIBERMENTOR OVERVIEW

SCIberMENTOR is a unique program that matches Alberta girls aged 11 to 18 with women studying or practicing science or engineering in a one-on-one email mentoring relationship. The need for this program stems from the fact that only about 22% of engineering students and 38% of science students in the province of Alberta are women. In some key areas, particularly in the Information Computer and Technology-based programs, there are significantly lower representations of women (e.g. typically 15% in Electrical Engineering and Computer Science). Therefore, in order to meet the demand for Highly Qualified Personnel (HQP) in Alberta's areas of focus, it is important to provide support and mentorship to young women during important stages of their development. Based on previous research, email has been shown to be an effective tool to reach out to young women and to have an impact in rural areas, which traditionally lack role models for science and engineering careers (Lupart, Cannon, & Telfer, 2002). SCIberMENTOR matches mentees with mentors based on career interests and hobbies for a nine-month period (October-June) during which they communicate using email at least ten minutes per week. Mentees and mentors are re-matched from year to year so there is exposure to a cross section of careers.

In order to evaluate the impact of the SCIberMENTOR program on the participant mentees and mentors, a research program was undertaken. The specific objectives of the research study were to:

1. Investigate the key personal and educational factors that contribute to the subjects' school participation and high achievement in the sciences.

2. Identify the factors that most directly contribute to decisions on the part of females to pursue programs and careers in science and related disciplines.

3. Determine the impact of an email mentoring program on the mentee participants in terms of increased career knowledge, further interest in math and sciences, and encouragement to pursue science and engineering-based careers.

4. Investigate the relative impact of an email mentoring program on various subsets of the mentee participants including high achieving versus lower achieving students, and rural versus urban participants.

5. Investigate the background and career development of the mentors and their preceived impact on the mentees.

Participation in the research program was voluntary and was conducted independent of the actual mentoring program, i.e. SCIberMENTOR participants could fully benefit from the email-mentoring program without being part of the research program. The first phase of the research program consisted of administering a questionnaire to over 125 mentees who lived in both rural and urban centres, and who were spread across the program target age range. Data from the questionnaire was collected during the period of February to June 2002. This questionnaire was a modified version of an instrument developed by Eccles and colleagues over a twenty-year period, and is based on the Eccles Achievement-Choice Model concerning education and career decision making. The second phase of the project consisted of an in-depth telephone interview with a sub-sample of about 100 of the mentees. Telephone interviews were also conducted with a sample of mentors, however these results are not reported here.

The intent of this report is to present an overview of some of the findings concerning mentees for the first and second phases of the study. It should be recognized that research is ongoing and that additional results will be presented in the future.

1.1 SCIberMENTOR Overview

SCIberMENTOR is a collaborative effort between the University of Calgary, the University of Alberta and the Alberta Women's Science Network (AWSN) and is funded by Alberta Innovation and Science and EnCana Corporation. Started in 2001, the program is currently in its third year of operation and there are over 900 people in the program. This makes SCIberMENTOR one of the largest youth email mentoring programs in North America in terms of size and scope.

The main objectives of the program are to expose young women to science and engineering career paths, to increase the retention rate of young women in high school math and science courses, to increase the representation of women in science and engineering programs at post-secondary institutions and to acquire data that will build on knowledge of the perceptions of maths and science, career interests and future plans of girls throughout Alberta that will add to our understanding of our current and future science culture.

The retention rate from year to year is about 90%, which shows a high level of satisfaction with the program. A critical component of SCIberMENTOR is to ensure a rural impact and about 58% of the participants are from outside of Calgary and Edmonton. Specific communities that have SCIberMENTOR involvement besides Calgary and Edmonton include Cochrane, Cold Lake, Drumheller, Grand Prairie, Red Deer, Lacombe, Morrin, Eagle Butte and Medicine Hat.

The program crosses all science and technology sectors in terms of mentor backgrounds. The representation of mentors includes engineering (49%), health sciences (28%), earth sciences (8%), physical sciences (6%), biological sciences (5%), computer sciences (3%) and mathematics and statistics (1%). The distribution of the mentors according to their type of work indicates that the 'Teaching and Research' category has the greatest number of mentors (53%), which is due to the fact that there are many strong links to the academic institutions. This is followed by corporate mentors (43%). The age distribution of mentees shows that there are at least 25 mentees in each of age categories (11 to 18).

The program has as a Project Director and two part-time Program Administrators, one at the U of C and a second at the U of A, who run the program on a day to day basis. To support the program, communications materials, such as brochures, have been developed and targeted recruitment strategies have been implemented. Over the first two years, more than 60 presentations and media interviews have been given across the province. Significant effort has been put into the mentee/mentor matching protocol as well as data security issues. Support structures and training programs have also been developed including a website (www.scibermentor.ca), mentor and mentee program booklets that provide strategies for successful mentoring, mentor training workshops (attended by 165 mentors), a brochure, a regular e-newsletter as well as discussion topics that are sent out on a monthly basis. 'SCIberMINGLEs' are held to allow mentors and mentees to get together for a face-to-face meeting to celebrate the completion of the program at the end of the year (currently held in Calgary, Edmonton and Red Deer).

1.2 Eccles' Model of Achievement-related Choices in Education and Career Decision Making

The past fifteen years have seen the rapid growth of a lively new field of gender-roles and achievement studies that attempt to address the unique personal values of females, their sense of connection and the interrelatedness and interdependence of multiple life-role development and choices (Belenky et al., 1986; Eccles, 1994; Gilligan, 1982). The extensive work of Eccles and her colleagues has particular relevance for the study of educational and vocational choices in the mathematics/science domains. The Achievement-Choice Model (Eccles, 1985, 1986a, 1986b, 1987, 1994; Eccles & Jacobs, 1986) features the interrelationship of psychological factors and social factors and their impact on student enrolment in programs and courses, and achievement-related decisions. The model is shown in Figure 1.1.

Expectations for success and subjective task value within a particular field of study or work are the central constructs of this model. Accordingly, these constructs are hypothesized to most directly influence achievement behaviours and to mediate the influence of all related constructs. The model proposes that expectancy for success is affected by the individual's specific beliefs and interpretations of ability, aptitude, the tasks and past events. Everyday choices, such as what courses to pursue, and how much effort to allocate to a specific task, may be consciously or unconsciously determined. In turn, these choices are directly or indirectly influenced by attitudes, interests, sex-role stereotyping, and self-concept. Values are mediated by the person's goals, self-schemata, perceptions of needs, role identity, and input of significant others. This interactive framework emphasizes that each of the psychological variables and their determining factors, is shaped by social forces and cultural conditioning.

The Eccles Model is unique in comparison to previous models for understanding gender differences in educational and vocational decision-making. Based on studies spanning more than twenty years, Eccles and her colleagues have attempted to synthesize what is known about decision-making, achievement theory and attribution theory to bring to the literature, a gender-neutral, integrative framework to guide research in the area of achievement-related choices.

Importantly, Eccles (1994) points out that definitions of achievement have characteristically been based upon male standards, while neglecting or devaluing the achievements more typical of females. Consequently, information on female issues, values, perceptions of achievement and life-role choices is extremely limited. Developed as an alternative approach to help bridge this information gap, instead of posing the traditional research question "How are females different from males?", Eccles model rises to a new level of inquiry by posing the question "What influences male and female achievement decisions and career choices?" Using this framework, some initial work has been carried out by Eccles and her colleagues at the junior high and high school level, however, there has been minimal replication of this work in Canadian research literature.

Thus the primary objective of the current research project is to apply the Eccles framework to determine whether it is the case that the roots of the well-documented educational and vocational differences of men and women and the sciences can be linked to the institutional, and differing psychological and sociological influences in the choices of young girls in Canadian schools. Given the complexity of the model, five specific areas have been targeted and are highlighted in Figure 1. These areas were selected because of the interest in determining how the more immediate factors contribute to adult life role and career choices. In addition, previous work has indicated the strong links between student achievement in the sciences and personal

support networks (Blair & Lupart, 1996). Consequently we have included data collection procedures for both mentees and mentors in the overall research design. The present report however, focuses on the data collection and results for mentees only.

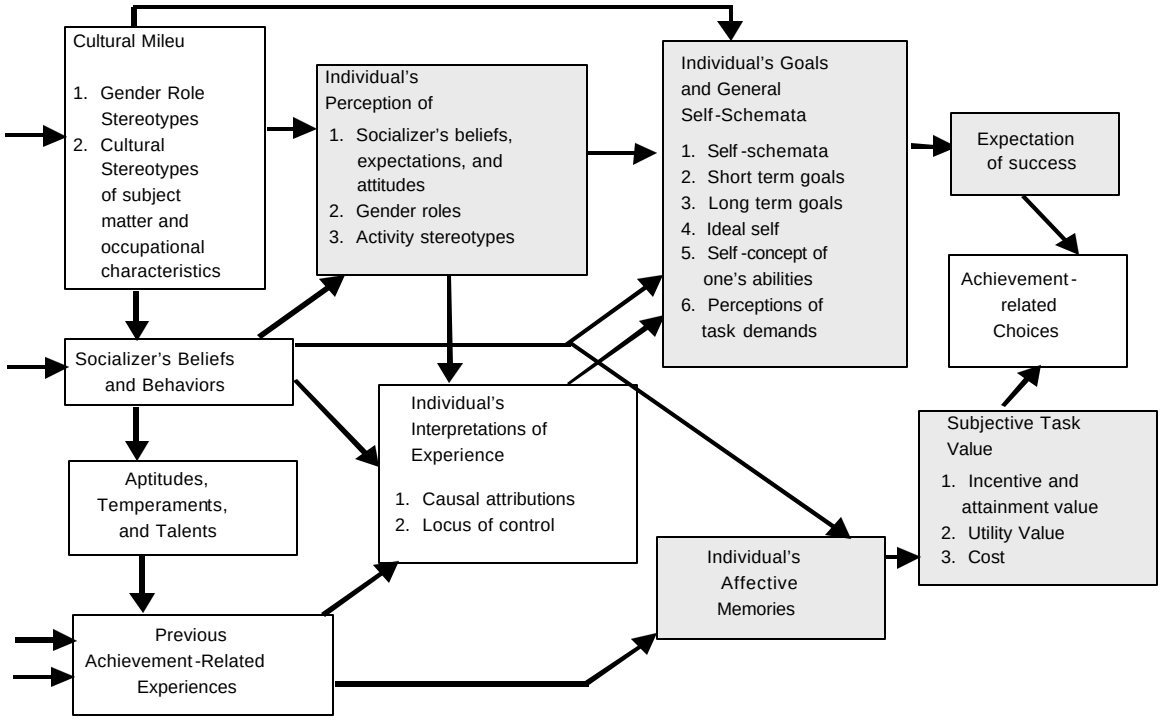

Figure 1.1 Eccles' Model of Achievement-related Choices in Education and Career Decision Making (Eccles, 1985)

CHAPTER 2 QUANTITATIVE DATA COLLECTION

2.1 Questionnaire

The questionnaire (see Appendix A) developed for this study was adapted and based upon the Eccles Michigan Study of Life Transitions Questionnaire (MSALTQ) and which was used in large part by the authors in a previous research study (Lupart, Cannon, & Telfer, 2002). The Michigan Study (MSALTQ) is the result of a 20-year longitudinal study of approximately 3,000 sixth graders in 12 different school districts from southeast Michigan (Eccles, Barber, & Jozefowicz, 1999). The SCIberMENTOR survey consists of 178 questions and contains the following sections: (i) background information (e.g. family status, parental education, language spoken at home), (ii) general (e.g. about schoolwork, leadership interests, self-esteem), (iii) beliefs and expectations for the SCIberMENTOR program, (iv) interest and value of math, science and English/Language Arts, (v) computer usage and interest, (vi) future plans and career choices, (v) adult roles in society, and (vi) friends.

2.2 Sample

The sample consisted of 127 female students between the ages 11 and 18 who were participating in the SCIberMENTOR program. One half of the sample (63) came from urban communities (Calgary and Edmonton) and one half came from rural communities (Red Deer, Grande Prairie and other small Alberta towns). The sample was also divided into two age/grade groups. Just over one half (65) of the sample was in grade 5, 6, 7, or 8, and just under one half (62) was in grade 9, 10, 11, or 12. Comparisons were made between grade groupings and communities yielding four comparative groups with distributions as shown in Figure 2.1.

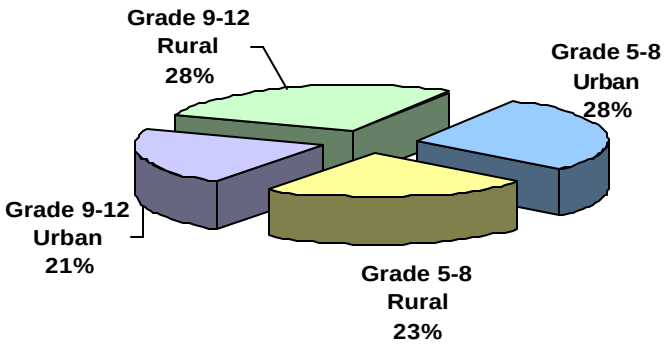

Figure 2.1 Distribution of Student Sample across Age and Community

2.3 Analysis Methodology

For this report, the findings are presented in the form of frequency distributions and mean scores. Frequency distributions represent the proportion of the sample group who selected a particular response. The mean scores are, for the most part, based on a five-point scale and represent the average scores computed by summing total number of responses and dividing by the number of participants who answered the particular question. A 5-point Likert scale was

used for the majority of questions where 1=strongly disagree, 2=disagree, 3=neither agree or disagree, 4= agree, and 5=strongly agree.

In each table or figure, age and/or community comparisons of the mean scores for younger or older students, and/or rural or urban community students, are made. In the case of grade or community comparisons, either a chi-test of independence or a t-test of significance is used for frequency distributions. If the results for a chi-square test are statistically significant (indicated by an asterisk) it means that the students differ in their representation across at least one of the categories in the table or figure. If the results for the chi-square test are not statistically significant, it means that students do not differ significantly in their representation across any of the categories contained in the figure or table.

Whereas chi-square tests are conducted for an entire table of results, t-tests are conducted for a single variable, which may be presented in either percentages or mean scores in this report. Gender and grade comparisons were carried out for the variables of interest using Analysis of Variance (ANOVA) t-tests of significance or Multivariate Analysis of Variance (MANOVA). Due to the limited size of the sample group a level of significance of $p < 0.05$ was chosen.

Two important caveats must be noted when interpreting the statistical significance of age or community differences. First, it must be recognized that a statistically significant difference does not necessarily mean that the difference between age and/or community is substantively meaningful. For example Table 3.3 in Section 3.1.2 shows that junior girls and senior girls differ significantly in the degree they like themselves. The results show that, on average, junior students obtained a mean score of 4.24 and senior students obtained a mean score of 4.48. . Despite the statistical significance of the difference in the mean scores, it is clear that on a scale from 1 (strongly disagree) to 5 (strongly agree), both junior and senior students show a high degree of confidence in liking themselves.

In some instances there will be a notation for reverse scoring. The ® symbol means that the values are reversed to 1 (strongly agree) to 5 (strongly disagree). This reversal was carried out for all questions with a negative connotation, for example in Table 3.4 the question “To be popular with my friends I sometimes don’t try as hard as I could”

The reversal was necessary to make the data analysis consistent.

CHAPTER 3 QUANTITATIVE RESULTS AND ANALYSIS

3.1 Profile of Student Participants

3.1.1 Family Background

Table 3.1 summarizes who the students live with. Results indicate that the majority (72%) of students live with both parents, followed by an average of 9% who live with their mother only.

Table 3.1 Who the Students Live With

Who do you live with?	Total sample (%)	Age Group		Community Group	
		Junior (%)	Senior (%)	Urban (%)	Rural (%)
Both parents	71.7	78.5	64.5	71.4	71.9
Mother only	9.4	10.8	8.1	9.5	9.4
Father only	2.4	1.5	3.2	3.2	1.6
Mother and other adult	7.1	1.5	12.9	4.8	9.4
Part time with each parent	6.3	7.7	4.8	7.9	4.7
Other	3.1	0.0	6.5	3.2	3.1

Chi-square results for comparisons by community and grade are not statistically significant ($p<0.05$)

Parents in this sample are well educated as shown in Figure 3.1. Over 75% of the sample had mothers who had received at least university, technical school or college level education and another 16% had graduated from high school. Less than 10% of the mothers had not completed a high school education. There were no statistical differences between junior and senior or urban and rural groups.

Over 80% of the fathers and 75% of the mothers in the sample had university, technical school or college level education. Further, almost 10% of the fathers had graduated from high school, whereas for mothers it was 16%. Similar to mothers, approximately 10% of the fathers had less than high school education. There were no statistical differences between age and community groups.

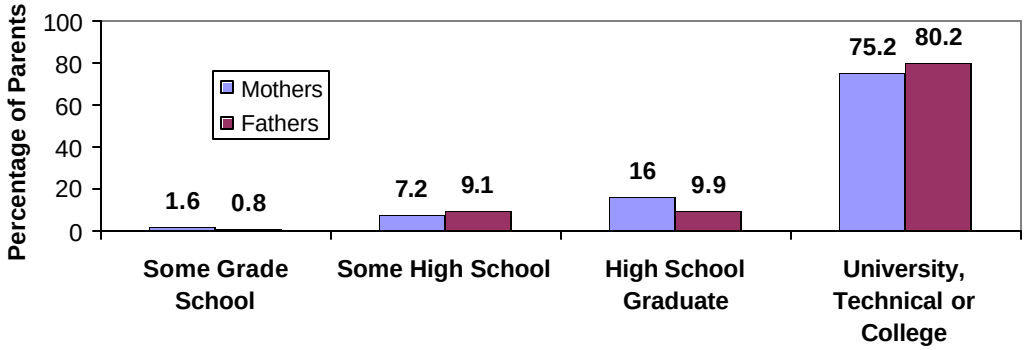

Figure 3.1 Parent Level of Education

The pie graph (Figure 3.2) indicates that English is the language most often spoken at home (91% of the sample). The questionnaire did not ask what other languages were spoken at home.

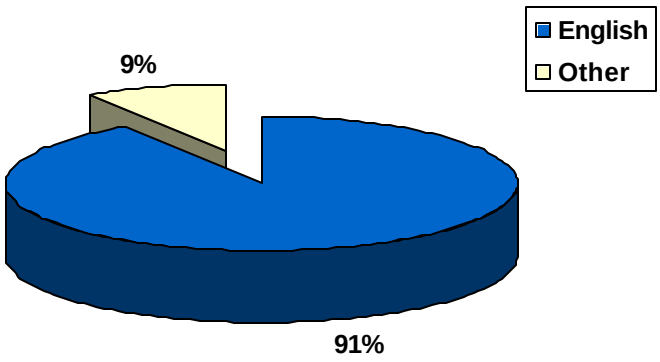

Figure 3.2 Language Spoken at Home

3.1.2 General Attitudes towards School

In a previous study Eccles and Roeser (1999) concluded that student's perceptions of the school environment are very important predictors of student's adjustment and adaptation to their school experiences. Since it is widely accepted that positive attitudes are associated with overall student success at school, this was the first area addressed in the present research. The first five questions in this section assessed the student's motivation for doing schoolwork. Students were not specifically asked to rank order their reasons for doing schoolwork, but an examination of the means indicates that all students rated the five statements in the same order. Over 82% of the total sample agreed or strongly agreed that they do their schoolwork because they want to learn new things, 65% agreed or strongly agreed that they do their schoolwork because they feel bad if it's not done and 58% agreed or strongly agreed that they do their school work because it's fun or interesting. Consistent high mean scores for the first three questions across all student subgroups indicates that these girls hold very positive attitudes toward school and learning. Further the girls show strong internal motivation for doing their schoolwork. It is of interest to note that the mean score for question one (I do my schoolwork because I want to learn new things) for a general sample of grade 7 and 10 students was 3.78 whereas the present sample mean was at 4.12.

Significant age and community differences were found for the two lowest ranked reasons for doing schoolwork. While 51% of the junior students agreed or strongly agreed that they do their schoolwork because it makes their parents happy, only 44% of the senior students agreed or strongly agreed with this statement. Only 38% of the urban students agreed or strongly agreed with doing their schoolwork to make their parents happy, but over 58% of the rural students agreed or strongly agreed with this statement. This suggests that the younger girls and girls living in rural communities are more influenced by the significant adults in their lives than are older girls and girls living in urban areas.

Table 3.2 Motivation for Doing Schoolwork

Motivation (rank order)	Junior (n=65)	Senior (n=62)	Urban (n=63)	Rural (n=64)
1. I do my school work because I want to learn new things	4.14	4.10	4.21	4.03
2. I do my school work because I feel bad if it's not done	3.88	3.53	3.78	3.63
3. I do my school work because it's fun or interesting	3.60	3.52	3.56	3.59
4. I do my school work because it makes my parent(s) happy	**3.52*** >	3.08	3.02 <	**3.58***
5. I do my school work because the teacher says I have to	**3.31*** >	2.97	2.90 <	**3.38***

* Values are significantly different (p<.05)
Values range from 1 (strongly disagree) to 5 (strongly agree)

Four general questions about the students were asked. The majority of the students (52%) agreed or strongly agreed that they try to work on problems themselves. The most common response for the question about organizing activities was neither agree or disagree, perhaps suggesting an ability to plan and to follow. Senior students agreed that winning is important at a significantly higher rate than junior students, but there was no difference between urban and rural students. The overall sample's most common response was neither agree or disagree that winning is important. Over 87% of the entire sample agreed or strongly agreed that they liked themselves. No student disagreed or strongly disagreed with this statement. While overall agreement about liking themselves was high, rural girls agreed at a significantly higher rate than did urban girls. Over 92% of the rural girls compared to 83% of the urban girls agreed or strongly agreed with this statement.

Table 3.3 Personal Characteristics Questions

Motivation (rank order)	Junior (n=65)	Senior (n=62)	Urban (n=63)	Rural (n=64)
If I get stuck on a problem or make a mistake, I try and figure it out by myself, rather than asking the teacher for help	3.46	3.53	3.59	3.30
When a group I belong to plans an activity, I would rather organize it myself than have someone else organize it	3.26	3.52	3.25	3.44
I feel winning is important	3.00 <	**3.47***	3.21	3.25
I like myself	4.43	4.29	4.24 <	**4.48***

* Values are significantly different (p<.05)
Values range from 1 (strongly disagree) to 5 (strongly agree)

3.2 Students' Interactions and Relationships to Friends

Questions concerning the influence of friends yielded significant age differences, but no significant community level differences. While agreement that friends influence course and career plans was low across all subgroups, junior students indicated more influence from friends than did senior students. Junior students also agreed more than did senior students that being

popular with girls and being concerned with social status was important, and that they sometime don't try as hard as they could at school just to be popular. However, overall agreement with these statements was low. Agreement was also low for questions about being popular with boys being important, being concerned about being popular, acting dumb to be popular, and letting grades slip to be popular.

The overall sample reported agreement with preferring to do things with one or two friends, being popular with girls, being good at making new friends, and telling people about SCIberMENTOR. Significantly more junior girls than senior girls reported that more of their friends would like to be in the SCIberMENTOR program and that their friends try hard at their studies. Senior girls reported being significantly more popular with boys.

Age differences follow developmental trends where younger girls were more influenced by friends and less independent in thought and attitudes. Importantly, the girls in this SCIberMENTOR program sample strongly disagreed or disagreed that they would act dumb, let schoolwork slip, or not try hard at school in order to be popular. Senior girls were particularly adamant (significantly lower score on reverse scored question) in their disagreement with the statement about not trying as hard as they could. Over 60% of the girls in SCIberMENTOR agreed or strongly agreed that their friends try hard at their studies. In general, it is apparent that friends are a positive factor in the lives of these girls who have opted to participate in the SCIberMENTOR program.

Table 3.4 Age Level Differences in Attitudes towards Friends

Attitude	**Junior Girls** (n=60)	**Senior Girls** (n=58)
My friends influence the courses I will take at school.	**2.92*** >	2.05
My friends influence my future job plans.	**2.42*** >	1.77
In general, I prefer to do things with one or two friends, rather than with a large group.	3.82	3.68
For me, being popular with girls is important.	**2.90*** >	2.42
I am popular with girls.	3.29	3.35
For me, being popular with boys is important.	2.42	2.56
I am popular with boys.	2.77 <	**3.26***
I am good at making new friends.	3.94	3.76
All of my friends are concerned about being popular.	2.37	2.05
My friends are very concerned with status in social situations.	**2.66*** >	2.11
My friends would like to be involved in this mentorship program.	**3.45*** >	3.11
I have told other students in my class about this program.	3.45	3.48
All of my friends try hard at their studies	**3.76*** >	3.29
® I would act dumber than I really am to be popular with my friends.	1.56	1.39
® It is okay to let your schoolwork slip or get a lower grade in order to be popular with your friends.	1.21	1.19
® To be popular with my friends I sometimes don't try as hard as I could in school.	1.74 >	**1.35***

* Values are significantly different ($p<.05$)
Values range from 1 (strongly disagree) to 5 (strongly agree)
® indicates reverse scoring

3.3 Interest and Affinity for Math, Science and English/Language Arts

Three sections of the questionnire asked identical questions for three subject areas: math, science and English/language arts (LA). Overall results were positively skewed meaning that the girls participating in the SCIberMENTOR program had generally positive affinity and interest for science, math and English/LA. In the next section of the report are a series tables and figures showing the response patterns to selected survey items in science, with science being the targeted subject area in the SCIberMENTOR program. A comparison across the three subject areas age and community differences follows.

3.3.1 Interest and Affinity for Science

Out of a total of 31 questions concerning science affinity and interest, 16 questions showed no age level differences (see Table 3.5). As indicated by the consistent high mean scores in Tables 3.5 and 3.6, it would appear that as a group all SCIberMENTOR program research participants showed a very strong affinity, confidence and interest in science. Not only do these girls try to do the best they can in science, 96% reported strongly agree or agree to this question), and know that it is important for them to do well in the subject (95% chose agree or strongly agree for this question), they also know that how they are doing now matters for their future career aspirations (86% reported agree or strongly agree to this question). While results for questions about nervousness were mixed, senior girls agreed more than junior girls that science classes and teachers were positive and reports of teacher favouritism were low in both groups. Consistent with the pattern of responses in the previous section on attitudes toward school, younger girls were more concerned about doing well in science for their teachers or parents, (see Table 3.6).

Table 3.5 Non-Significant Age Level Differences in Interest and Affinity for Science

Science Statement	**Junior** (n=60)	**Senior** (n=58)
I try to do the best I can in science.	4.50	4.69
I find working on science assignments interesting.	4.25	4.36
®I have to work hard to get good grades in science.	3.28	2.98
I am good at science.	3.97	4.22
I am good at learning something new in science.	4.00	4.07
®No matter how hard I try, I feel I just cannot understand science.	1.88	1.76
Students seem to like science class.	3.25	3.45
When taking a test in science I get nervous.	2.85	2.86
My heart bests faster when I take a science test.	2.48	2.66
I get nervous if I have to answer in front of the science class.	2.57	2.31
The science teacher is friendly to us.	4.08	4.12
The science teacher makes science interesting in this class.	3.90	4.07
I feel comfortable or okay asking a science teacher for help.	4.13	4.38
My science teacher shows more interest in the progress of boys than of girls.	1.82	1.81
It is important to my parent(s) that I do well in science.	4.37	4.17

Values did not reach significant difference
Values range from 1 (strongly disagree) to 5 (strongly agree)
® indicate reverse scoring

These results contrast markedly with the results from a general sample of grade 7 and grade 10 students (Lupart, Cannon, & Telfer, 2002). Females in this previous study showed limited interest and affinity toward science, and the boys' responses were significantly more positive for the majority of questions about science. Thus SCIberMENTOR girls in the present study show a pattern of responses more like the males in the previous sample. Moreover, the SCIberMENTOR girls with mean average scores over 4 for most questions showed even greater affinity and interest in science than the males in the previous study who had mean average scores for most questions in the 3.75 range.

Quantitative comparisons were made to determine age and community level differences. While there were no significant differences between the responses of urban and rural students on their interest and affinity for science, there were differences between the responses of junior and senior students. Senior students indicated stronger agreement with most statements about science than did junior students. Responses on fourteen of the science questions were statistically significant and are presented in Table 3.6. These results suggest that senior girls like science, see it as useful, would take more science courses, and see themselves as successful in science more so than do junior girls. A reverse trend of agreement is found in questions regarding achieving well for parents and teachers, where senior girls reported less agreement than junior girls. This latter result is consistent with responses in previous sections indicating that younger girls are more influenced by significant adults or socializers in their lives.

Table 3.6 Significant Age Level Differences in Interest and Affinity for Science

Science Statement	**Junior** (n=60)	**Senior** (n=58)
I think the science I am learning now will be useful for my future	4.20 <	**4.55***
It is important for me to do well in science	4.50 <	**4.72***
Compared to other subjects, science is useful	4.03 <	**4.53***
I like science	4.12 <	**4.53***
I like science compared to other subjects	3.72 <	**4.33***
I feel excited and challenged while doing science	3.82 <	**4.22***
I would take more science courses even if I didn't have to	3.48 <	**4.26***
®I feel that a more advanced science course would be too difficult for me	2.70 >	**2.09***
I am going to do well in science this year	4.12 <	**4.45***
If I were to rank all the students in science class from the lowest to the highest, I would put myself in the highest group	3.58 <	**4.09***
I would be successful in a career that required scientific ability	3.78 <	**4.21***
My science teacher is more interested in the smart kids than other kids	2.18 <	**2.55***
I am going to do as well in science this year as my parent(s) want me to	**4.05*** >	3.71
I am going to do as well in science this year as my teacher wants me to	**4.07*** >	3.66

* Values are significantly different (p<.05)
Values range from 1 (strongly disagree) to 5 (strongly agree)
® indicates reverse scoring

Senior girls also reported spending significantly more time on science homework than did junior girls. This time difference most likely reflects the more complex nature of senior science curriculum or perhaps a greater interest and affinity for science expressed by the senior girls (see above). Results are depicted in Figure 3.3.

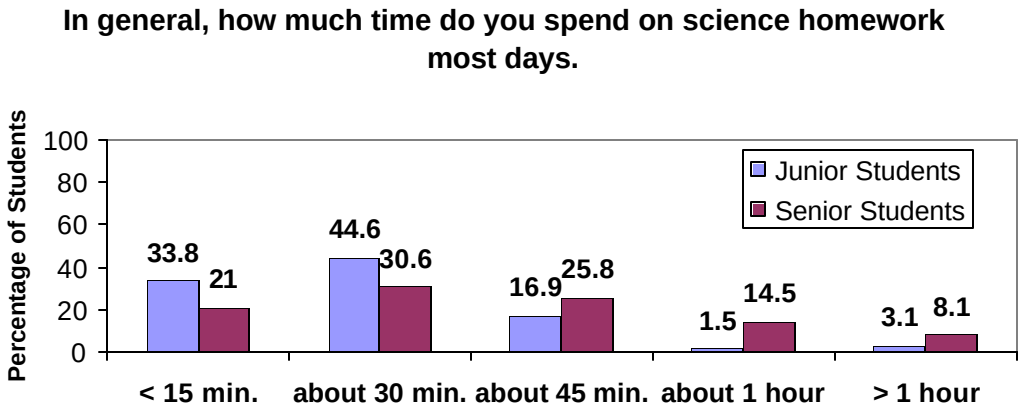

Figure 3.3 Science Homework

Overall, these significant and non-significant trend results indicate an age or developmental differences for responses to questions regarding science. Reasons for this difference may be that older girls have more experience with science and such experience has led to more positive feelings about the subject. Also, senior girls who are participating in the SCIberMENTOR program may already have a stronger interest and affinity for science than younger girls who may still be exploring their interest in science and have not made the same commitment as the senior girls.

Community differences were found on only five questions, two related to nervousness and three related to teachers. While the results do not indicate strong agreement, urban students report significantly more nervousness about science than do rural students. Rural students report significantly more support from teachers. Results are reported in Table 3.7.

Table 3.7 Significant Community Level Differences in Nervousness and Teacher Support in Science

Science Statement	Urban (n=57)	Rural (n=61)
When taking a test in science I get nervous	**3.18*** >	2.56
My heart bests faster when I take a science test	**2.84*** >	2.31
The science teacher is friendly to us	3.89 <	**4.30***
The science teacher makes science interesting in this class	3.70 <	**4.25***
I feel comfortable or okay asking a science teacher for help	4.00 <	**4.49***

* Values are significantly different (p<.05)
Values range from 1 (strongly disagree) to 5 (strongly agree)

3.3.2 Comparisons between Science, Math and English/Language Arts

There has been considerable interest throughout the world concerning gender differences in core academic subjects. Comparative international analyses in reading, science, and mathematics aim to extend and enrich national educational systems, using relative strengths and weaknesses to provide directions for policy, curriculum and instruction efforts and for student's learning. Recent studies have shown that with respect to specific course achievement, females are more likely to excel over male peers in English/LA, and males are more likely to excel in math and science (Lupart, Cannon & Telfer, 2002; OECD, 1998, 2000). These findings are particularly robust. For example, results from the comprehensive OECD Programme for International Student Assessment (OECD, 2000) comparing the reading, mathematics, and science performance of 15 year olds in thirty-one countries (including Canada) confirm these achievement trends.

To test for subject level differences in interest and affinity by the girls participating in the SCIberMENTOR program, a series of analyses were run on comparable questions in science, math and English/LA. Out of 24 matching questions in the three subject areas, eight questions yielded significant results where there was higher agreement with the science question than both the math and English/LA question. These results are reported in Table 3.8. It should be noted that these findings are in sharp contrast to those typically found for gender comparisons across subjects. These SCIberMENTOR program research participants demonstrate patterns of subject affinity and interest that looks much more like that typically found for males.

Table 3.8 Comparisons between Subject Areas – I

Statement	Science	Math	L.A./English
I think the ____ that I learn this year will be useful for my future	**4.32*** >	4.13	3.87
I find working on ____assignments interesting	**4.28*** >	3.74	3.59
Compared to other subjects, ____ is useful	**4.26*** >	3.73	3.61
I like ___	**4.29*** >	3.96	3.67
I like ____ compared to other subjects	**4.02*** >	3.61	3.29
I feel excited and challenged while doing ____	**4.00*** >	3.60	3.30
I would be successful in a career that required ____ ability	**3.98*** >	3.73	3.71
I would take more ____courses even if I didn't have to	**3.87*** >	3.47	3.01

* Values are significantly different (p<.05)
Values range from 1 (strongly agree) to 5 (strongly disagree)

Three further questions yielded significant results for science compared to English/LA, but not for science compared to math.

Table 3.9 Comparisons between Subject Areas – II

Statement	Science	L.A./English
It is important to me to do well in _____	**4.60*** >	4.31
I try to do the best I can in ____	**4.60*** >	4.46
I have to work hard to get good grades in _____	**3.15*** >	2.90

* Values are significantly different (p<.05)
Values range from 1 (strongly agree) to 5 (strongly disagree)

Overall the results reported in this section indicate that SCIberMENTOR girls have just as much, if not more, confidence in their ability and interest in science as their typical male counterparts. It is very likely that this strong affinity to science was the central factor leading them to participate in the SCIberMENTOR program. Our previous study of grade 7 and 10 students (Lupart, Cannon, & Telfer, 2002) indicated a significant decrease of interest in science over the three-year grade span, whereas as noted in the previous section the trend is opposite for girls in this research program. It will be interesting to see if these younger females show any changes in this area at the program completion.

3.4 Computer Usage and Affinity

Out of 127 girls in this sample, only one senior girl living in a rural area indicated she did not have a computer in her home. This translates into 99.2% of the sample owning a computer.

Figure 3.4 gives a breakdown of the age at which the students started using computers. Students are beginning to use the computer at a very young age as there is a computer available in almost all the homes in this sample.

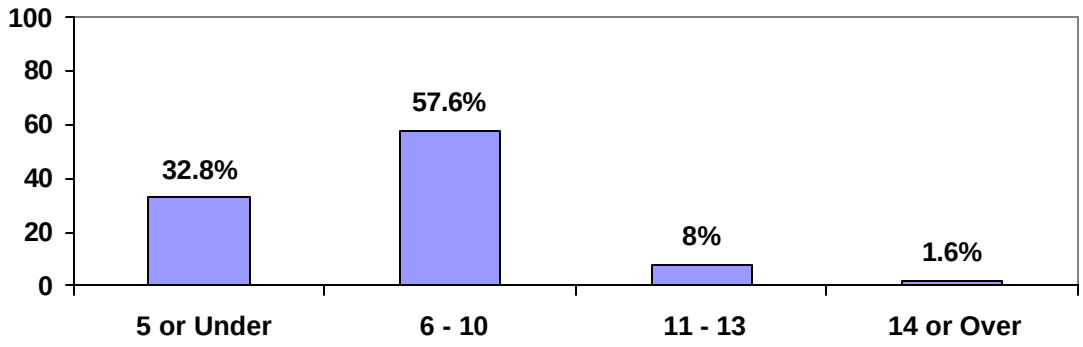

Figure 3.4 Age When Started to Use a Computer

Figure 3.5 gives the results on where students started to use the computer. Over 53% of the students started to use the computer in their homes followed by almost 40% who first used a computer at school. There were no significant differences between the two age groups or the two community groups.

Students were asked a series of questions regarding their affinity for computers, their perceived ability with computers and how useful they think computers are. Overall results suggest that the girls involved in the SCIberMENTOR program are very positive about computers. Table 3.10 indicates that out of a possible total of nineteen questions on computers, there were no age or community differences found for fourteen questions. This suggests that as a group these young girls enjoy working on computers and feel confident using them. Moreover, they reported minimal anxiety about using computers and they believe that there are no differences regarding male and female knowledge about computers.

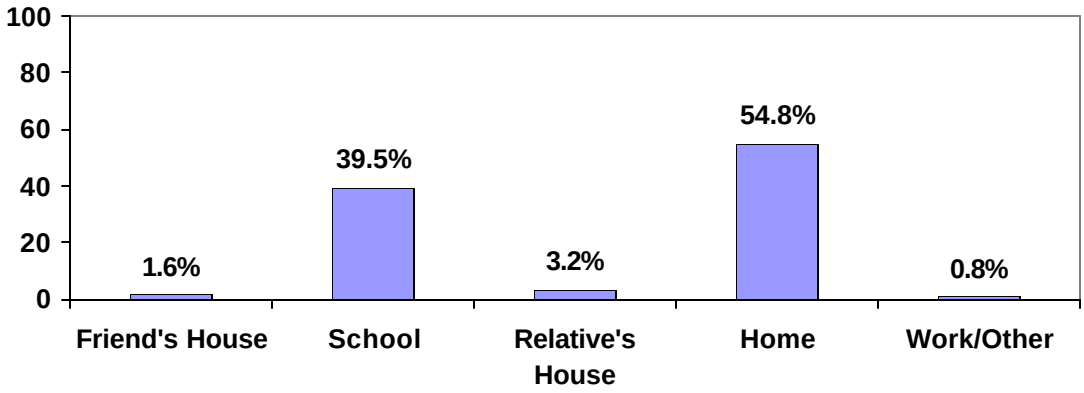

Figure 3.5 Where Started to Use a Computer

Table 3.10 Non-Significant Reponses for Questions Regarding Computers

Statement	Sample (n=127)
I like computers	4.34
I am good at doing things on the computer	4.13
I use the computer to help me with my homework	4.25
I use the computer (internet) to find information for projects, homework assignments, and papers	4.51
Good computer skills will help me in my future education	4.48
Good computer skills will help me in my future career	4.34
Having vast computer knowledge helps advance people in their careers	4.14
I feel nervous when I use a computer	1.57
I am afraid to try new things on the computer because I fear I will break it	1.78
Boys know more about computers than girls do	1.83
When I encounter a problem with the computer I attempt to figure it out myself before asking someone for help	3.63
Computers are used in most of my classes	2.81

* Values range from 1 (strongly disagree) to 5 (strongly agree)

Analysis of the data revealed four statements with significant age level differences (see Table 3.11) and one statement indicating a community level difference (see Table 3.12). Junior girls indicated more agreement that they would participate in computer camps and that they play with their friends on the computer. While agreement about attending computer camps was low, 36.9% of the junior girls indicated they agreed or strongly agreed with the statement and only 25.5% of the senior girls did the same. Over 78% of the junior girls agreed or strongly agreed that they play games on the computer with their friends while only 59.7% of the senior girls did the same. This finding is consistent with the Lupart, Cannon, & Telfer (2002) study suggesting that previous gender differences in certain computer activity areas may be diminishing for younger students. Over 69% of senior students indicated that they know more about computers than their parents compared to 33.7% of junior students. Over 52% of senior students indicated that the majority of their computer teachers have been male compared to 31% of the junior

students. These latter findings are quite positive as they indicate that the gender gap for teachers in the area of computer instruction may be decreasing.

Table 3.11 Age Level Differences in Computer Usage

Statement	Junior (n=60)	Senior (n=58)
I would participate in a computer club or camp	**3.16*** >	2.64
My friends and I play on the computer together	**3.90*** >	3.34
I know more about computers than my parents do	2.91 <	**3.93***
The majority of my computer teachers have been male	2.86 <	**3.29***

* Values are significantly different (p<.05)
Values range from 1 (strongly disagree) to 5 (strongly agree)

The one community difference was where rural students felt more comfortable asking teachers for help than urban students. Almost 86% of the rural girls agreed or strongly agreed with the statement, while only 68% of the urban girls reported agreement or strong agreement. This finding about comfort level with teachers is similar to responses from rural students regarding math, science and English/LA.

Table 3.12 Community Level Differences in Computer Usage

Statement	Urban (n=56)	Rural (n=60)
I feel comfortable asking my teachers for help with the computer	3.79 <	**4.20***

* Values are significantly different (p<.05)
Values range from 1 (strongly disagree) to 5 (strongly agree)

Students were asked to rate the amount of time they spend on various computer activities. Girls in this sample reported most of their computer time spent on homework assignments followed by email. These results are consistent with an earlier study (Lupart, Cannon, & Telfer, 2002). in that girls were significantly higher than males for using computers for assignments and email. The email usage suggests that girls tend to use computers more than boys as a means of communication. Over 64% of the girls reported never spending time in chat rooms and 69% of the girls reported never spending time programming. In the previous study (Lupart, Cannon, & Telfer, 2002), boys scored the computer activities, surfing the 'net, programming and playing games, significantly higher than the girls. Only one age difference was found in the SCIberMENTOR girls sample where junior students reported using the computer for more games (x = 2.92) compared to senior students (x = 2.29). This result was also noted in the previous study, and may be explained by the proliferation of computer games targeting young adolescents, and more importantly females. Results are reported in Figure 3.6 and Table 3.13.

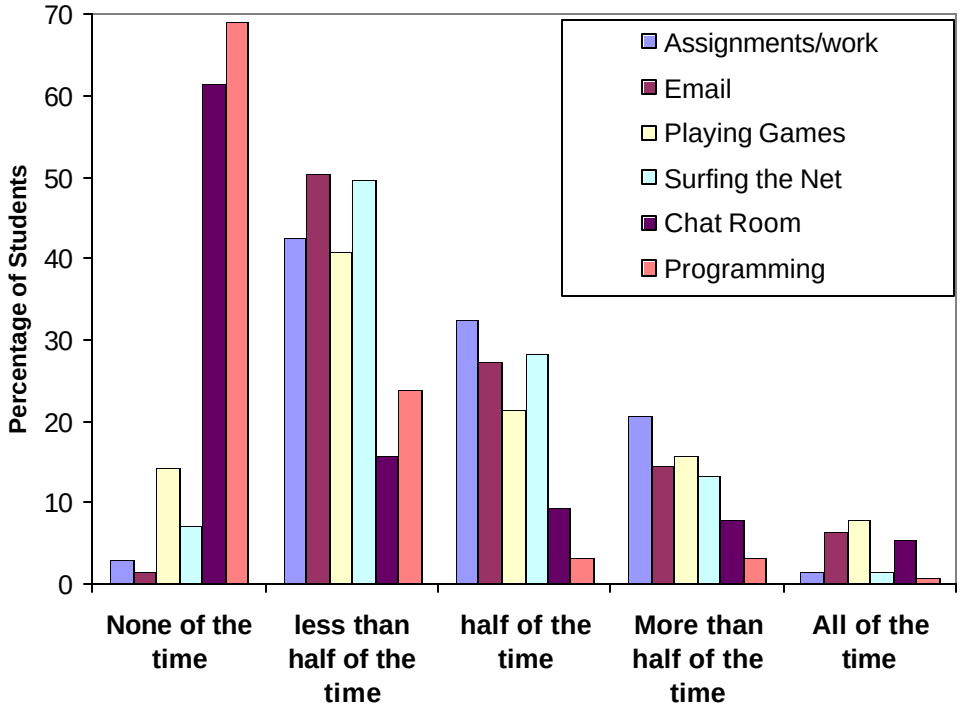

Figure 3.6 Time Spent per Day on Computer Activities

Table 3.13 Time Spent on Computer Activities

Computer Activities (in rank order) *When you are on the computer, how much time do you spend on…*	**Sample** (n=127)
Assignments/Work	2.75
Email	2.74
Playing Games	2.62
Surfing the Net	2.53
Chat Rooms	1.80
Programming	1.43

1=none of the time 2 less than half the time 3=half of the time 4=more an half of the time 5=all of the time

In summary, the findings indicate that these girls are quite comfortable using computers and that they began to use computers at home at an early age, Not only do these girls indicate a strong confidence in their computer ability, they also recognize the importance of this kind of expertise for future career choices. The results of the present study reveal similarities to findings from our previous study of grade 7 and 10 students (Lupart & Teasdale, Lupart, Cannon, & Telfer, 2002). SCIberMENTOR girls have a high degree of access to computers at home, and the top two activities when working on the computer are assignments and email.

3.5 Future Career Choices and Plans

3.5.1 Characteristics of Future Career Choices and Plans

Previous research conducted on engineering students (Wallace, Haines & Cannon, 1999), showed that female engineering students had some different perceptions in comparison to males about important characteristics of a future job. Specifically, the female engineering students rated the ability to contribute to society significantly higher than their male counterparts, while the male engineering students rated 'to be paid well' significantly higher than the females. Similar results have been reported for adolescent students (Eccles, 1994; Lupart, Cannon, & Telfer, 2002).

Accordingly, these questions were posed to age and community subgroups in this study. There were no significant age or community level differences on a series of questions that asked about characteristics of a future job. Over 98% of the sample agreed or strongly agreed that in the future they would like a job that provided enough money to support themselves and a family. A job that has high status in society was agreed to by 60% of the sample. Table 3.14 reports the mean scores of the SCIberMENTOR sample. While the students were not asked to rank order the characteristics, they are presented in the order of most agreement to least agreement. When these results are compared with the findings from a previous study of grade 7s and 10s (Lupart, Cannon, & Telfer, 2002), the SCIberMENTOR girls reveal a unique pattern of responses, not typical of males or females in the general student population. For example the item 'provides enough money to support me and my family' was significantly higher for males in the previous study. In contrast the SCIberMENTOR girls' high ranking on the item 'gives me the opportunity to try to make the world a better place' was significantly more positive for females in comparison with males in the previous study. SCIberMENTOR girls however gave lowest ratings to the items 'allows me to earn a great deal of money' and 'has high status in society'.

Table 3.14 Importance of Characteristics for Future Career Choice

Characteristic *In the future I would like a job that…*	**Sample** (n=127)
…provides enough money to support me and my family	4.69
…gives me a chance to learn new skills and new things	4.47
…gives me the opportunity to try to make the world a better place	4.41
…gives me a chance to work on challenging projects	4.33
…gives me the ability to combine career and family	4.10
…allows me to earn a great deal of money	4.10
…allows me to be my own boss most of the time	3.88
…has high status in society	3.74

* Values range from 1 (strongly disagree) to 5 (strongly agree)

Figure 3.7 reports the percentage of agreement with each statement. Two responses that are relatively higher ranked are 'gives me a chance to learn new skills' and 'gives me a chance to work on challenging projects'. This preference for intellectual challenge and seeking out opportunities for learning is consistent with contemporary research about learning competence and 'theories of mind' (Bereiter & Scardamalia, 1989). Bransford, Brown, and Cocking (2000) note that 'as they mature, children develop theories of what it means to learn and understand that profoundly influence how they situate themselves in settings that demand effortful and intentional learning' (p. 82).

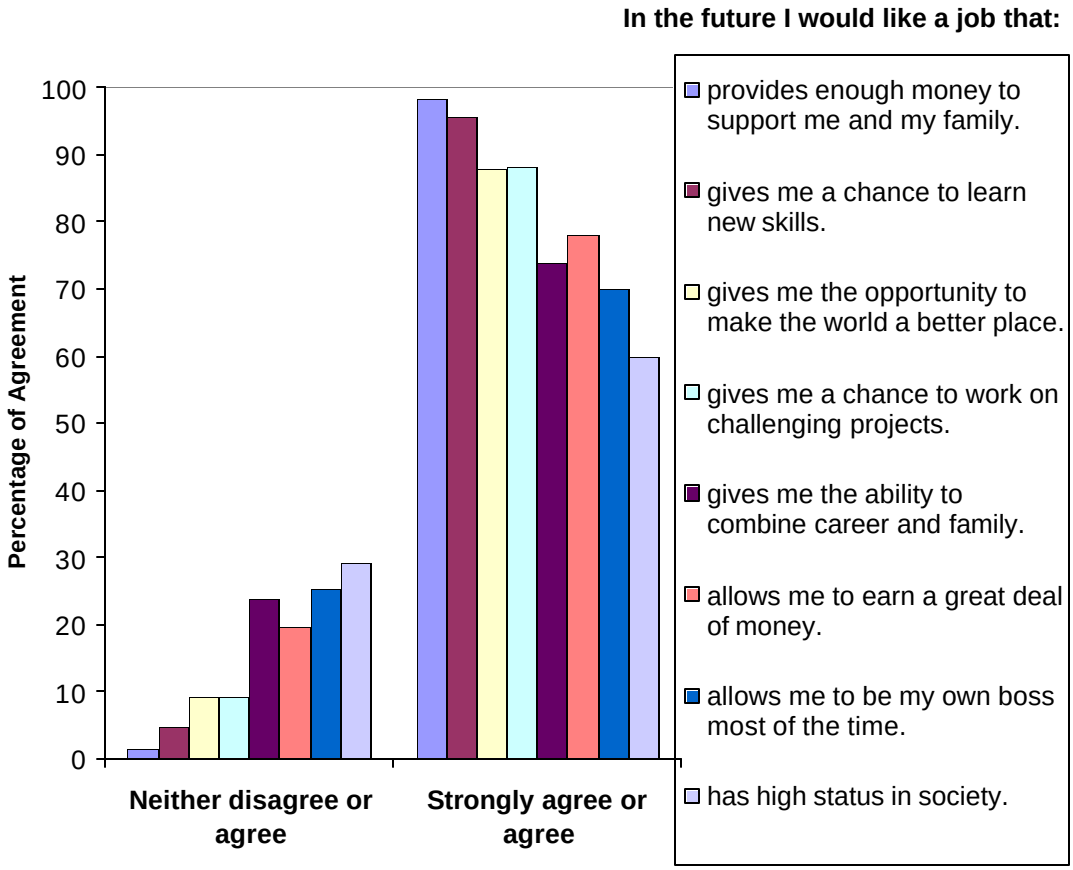

Figure 3.7 Job Characteristics

Several statements were posed about students' future educational and family plans and the mean scores are reported in Table 3.15. Almost 97% of the sample agreed that they were going to university and over 72% agreed or strongly agreed that they would get more than one university degree. Regarding family plans, 68% of the girls agreed or strongly agreed that they would likely get married while only 58% agreed or strongly agreed that they would have children. There were no age or community level differences.

Table 3.15 Future Plans

Characteristic *As things stand now, it is likely that I will…*	**Sample** (n=127)
…finish high school, then go on to University or College	4.80
…do more than one degree (e.g. Master's, PhD, become a medical doctor, lawyer)	4.06
…it is likely that I will get married	3.89
…it is likely that I will have children	3.68

* Values range from 1 (strongly disagree) to 5 (strongly agree)

It is of interest to note that this pattern of responses was very similar in our previous study (Lupart, Cannon, & Telfer, 2002). In fact, girls were significantly higher than boys on the question about finishing high school, then going to college and on the question about doing more than one University degree. Moreover, no gender differences were found on items concerning plans of getting married and having children. Taking the results of both studies together, girls, it appears have great confidence in thinking they 'can do it all'.

3.5.2 Career Choices

Students were asked how likely it is that they would choose 13 given career options. There were no significant differences in the choices of junior and senior or urban and rural girls. Although they were not specifically asked to rank the career choices, the following tables list the top six career choice for both age and community levels. The same six careers were listed as the top six for each comparison group, but in slightly different order. The first choice of careers for the entire sample was the same. All girls in the SCIberMENTOR program agreed that the career they would most likely pursue was a science or math related profession. Results are reported in Tables 3.16 and 3.17.

It is very significant that these sample groups were consistently in agreement about science or math related professions as their first career choice. In our previous study (Lupart, Cannon & Telfer, 2002), grade 10 boys similarly chose this as the top ranking career choice; for grade 10 girls however, this option didn't make it to the top six high rankings. For the younger students (grade 7), the science or math related career choice was ranked third highest and for the girls it was ranked as sixth. Remaining career choices for females in both studies were markedly similar, with artist, health professional, human services and other professions being ranked in the top six choices for all female samples. Girls, in general tend to favour gender stereotypical careers, although SCIberMENTOR girls stand out for their high-ranking preference for science and math related careers.

Table 3.16 Top Six Career Choices for Junior and Senior Students

Rank	Junior Career (identifier) (mean score)	Senior Career (identifier) (mean score)
1	Science or math related professional (like engineer, architect, geologist) (3.47)	Science or math related professional (like engineer, architect, geologist) (3.80)
2	Artist (like designer,, interior decorator, musician, actor) (3.13)	Health Professional (like doctor, dentist, veterinarian) (3.30)
3	Health Professional (like doctor, dentist, veterinarian) (3.05)	Environment Related (like forestry, marine biologist, environmental engineer) (3.15)
4	Environment Related (like forestry, marine biologist, environmental engineer) (2.98)	Other Professional (like lawyer, accountant, architect, stock broker) (3.03)
5	Other Professional (like lawyer, accountant, architect, stock broker) (2.98)	Human Services (like teacher, Social worker, counsellor) (2.75)
6	Human Services (like teacher, Social worker, counsellor) (2.71)	Artist (like designer,, interior decorator, musician, actor) (2.72)

* Values range from 1 (strongly disagree) to 5 (strongly agree)

It is of further interest to note that boys in our previous study (Lupart, Cannon, & Telfer, 2002) put information technology as first and third highest ranking respectively for grade 7 and 10, whereas this choice was not even in the top rankings for girls in the present study nor our previous study. Lupart and Teasdale (2003) note that the percentage of female undergraduate majors in computer science at Canadian Universities has declined from 30-40% in the 1980s to 15-20% in 2001. This trend is of critical concern since information technology accounts for well over 7.6% of Canada' Gross Domestic Product, and by all indications, females are not likely to be participants in this growing field any time soon.

Table 3.17 Top Six Career Choices for Urban and Rural Students

Rank	Urban Career (identifier) (mean score)	Rural Career (identifier) (mean score)
1	Science or math related professional (like engineer, architect, geologist) (3.70)	Science or math related professional (like engineer, architect, geologist) (3.56)
2	Environment Related (like forestry, marine biologist, environmental engineer) (3.08)	Health Professional (like doctor, dentist, veterinarian) (3.27)
3	Health Professional (like doctor, dentist, veterinarian) (3.07)	Other Professional (like lawyer, accountant, architect, stock broker) (3.10)
4	Other Professional (like lawyer, accountant, architect, stock broker) (2.92)	Environment Related (like forestry, marine biologist, environmental engineer) (3.05)
5	Artist (like designer,, interior decorator, musician, actor) (2.90)	Artist (like designer,, interior decorator, musician, actor) (2.95)
6	Human Services (like teacher, social worker, counsellor) (2.69)	Human Services (like teacher, social worker, counsellor) 2.77)

* Values range from 1 (strongly disagree) to 5 (strongly agree)

3.6 Students' Perceptions of Adult Roles in Society

In order to assess the SCIberMENTOR research participants perceptions of adult roles in society, several questions were asked regarding work/family balance, roles of mothers and fathers in child rearing, and perceptions of men and women in math and science. There were no age or community level differences, therefore mean results of the entire sample are presented in Table 3.18.

Students appeared to have mixed emotions on whether or not it is difficult for both men and women to have successful careers and raise a family. The distribution of agreement, however, suggests that students in this sample may be experiencing their own families work and home life in a variety of different ways. To better represent some of the key ambiguities perceived by these young adolescents, various results are presented in Figures 3.8, 3.9 and 3.10.

Table 3.18 Adult Roles in Society

Statement	Sample (n=127)
Men and women should contribute equally to the family income	4.21
If a husband and a wife both work full-time, the husband and wife should share the housework and childcare equally	4.36
All in all, it is better for the family if the husband provides most of the family's income and the wife takes care of the home and family	2.25
It is difficult for women to have successful careers and raise a family	2.62
It is difficult for men to have successful careers and raise a family	2.48
In general, men are better than women in science and engineering	1.72
In general, women are better than men in math	2.28
Women have better social skills than men do	3.00
Women can handle the pressure just as well as men when making important decisions on the job	4.43
Babies and young children need to have their mothers around most of the time	3.44
It is okay for mothers of babies and young children to have full-time jobs	3.20
A working mother can establish just as warm and secure relationship with her children as a mother who does not work	4.43
Women are better wives and mothers if they also have paid jobs outside the home	3.02
Having a job gives a wife a better chance to develop herself as a person than staying at home	3.77

* Values range from 1 (strongly disagree) to 5 (strongly agree)

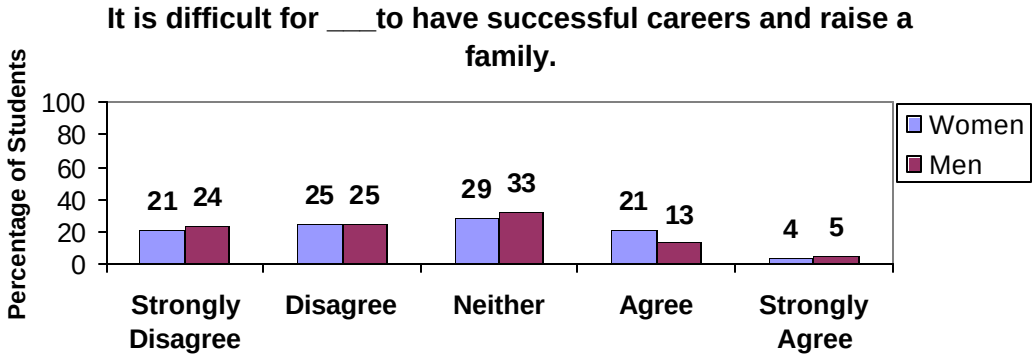

Figure 3.8 Perceptions of Raising a Family and Having a Successful Career

Students also appeared to have mixed emotions regarding working and child rearing. While the majority (59%) agreed or strongly agreed that mothers should be around for their young children, the responses concerning mothers working full time were more evenly distributed.

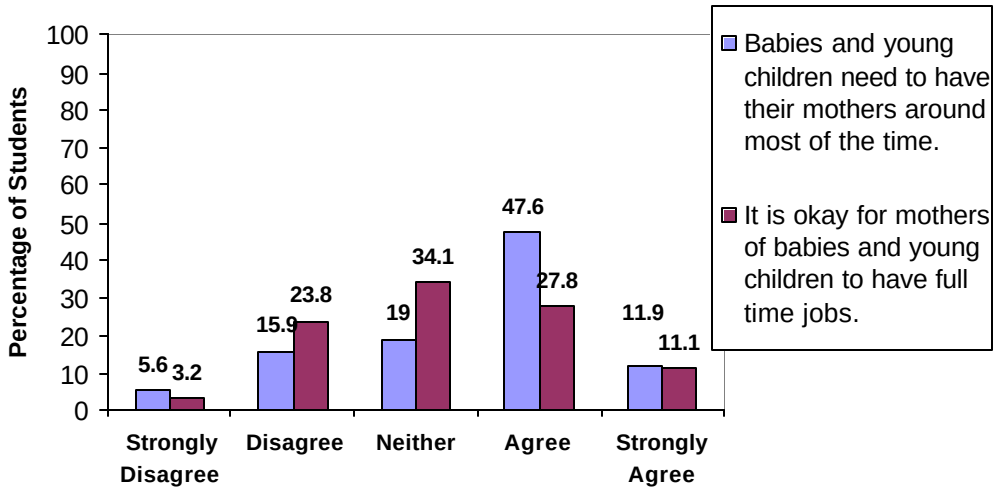

Figure 3.9 Perceptions of Child Rearing and Working

Students in this SCIberMENTOR sample also displayed mixed responses on the question concerning women being better wives and mothers if they work. Almost half of the girls chose the response neither agree nor disagree, suggesting an obvious lack of experience in adult roles and most likely ambiguity about this future role.

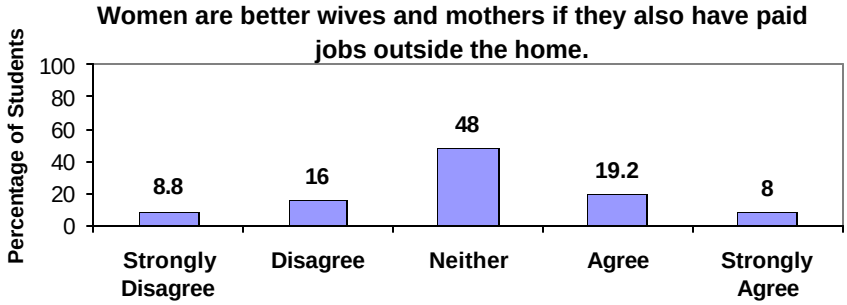

Figure 3.10 Perception of Women Having Paid Work

In summary, the research participants indicate strong perceptions about gender equality in contributing to family income, and sharing housework and childcare. They perceive themselves as being equally able to handle pressure on the job as well as males, and that working and non-working mothers are no different in their ability to establish a warm and secure relationship with their children. However, questions that more specifically examined the interrelationships between career and child rearing resulted in mixed emotions and greater ambiguity in response patterns. It will be interesting to see if this latter effect is diminished with their participation in the SCIberMENTOR program where they have ample opportunity to explore the realities of striking a balance in their career and family roles.

CHAPTER 4 QUALITATIVE DATA COLLECTION

4.1 Interview Questions

The telephone interview questions (see Appendix B) developed specifically for this study gathered further information about girls' interest and affinity for science. The interview protocol consists of 27 questions developed by the authors and contains the following sections: (i) science class and interest, (ii) science careers and adult life, (iii) perceptions of the SCIberMENTOR program. The majority of questions were open-ended format.

4.2 Sample

The sample consisted of 109 of the 127 female students who participated in the SCIberMENTOR research study described previously. Over 85% of the female students who participated in the first round of quantitative data collection continued to participate in this second round of qualitative data collection. The 18 students who did not participate in the interviews could not be contacted or had dropped out of the program. Rural and urban communities were equally represented in this second sample, however, comparisons were made between age (junior and senior) groups only. Just under one half (51) of the sample was in grade 5, 6, 7, or 8, (junior) and just over one half (58) was in grade 9, 10, 11, or 12 (senior). The distribution of the two comparative groups is shown in Figure 4.1.

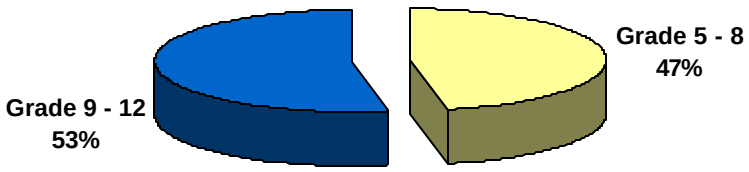

Figure 4.1 Distribution of Student Sample across Grade

4.3 Analysis Methodology

Written transcripts of the telephone interviews were analyzed for this segment of the report. Results are presented in the form of frequency distributions. Data gathered for most questions allowed for direct frequency counts. Selected data were placed together based on synonymous answers or thematic groupings before frequency counts were tabulated.

CHAPTER 5 QUALITATIVE RESULTS AND ANALYSIS

5.1 Science Class and Interest

Students were asked: *Identify two words to describe how you feel about science* (Question 11). Some students offered two separate words *(fun, hard)* while other students offered a two word descriptor (*always learning*). The top four words generated by both junior and senior students were *interesting*, *fun*, *challenging* and *exciting*. The word *interesting* was used by 53% of the junior students and 57% of the senior students and the word *fun* was used by 41% of the junior students and 24% of the senior students. Results of words used more than once to describe science are presented in Table 5.1. While some words suggested that science may be *difficult* or *hard work*, the overall nature of the words was positive, reflecting the students' interest and strong affinity for science.

Table 5.1 Top Science Words

Junior (n = 51)		**Senior** (n = 58)	
Word	Frequency	Word	Frequency
Interesting	27	Interesting	33
Fun	21	Fun	14
Exciting	9	Challenging	8
Challenging	3	Exciting	5
Curious	2	Fascinating	3
Useful	2	Enjoyable	3
Educational	2	Hard work	2
Difficult	2	Intriguing	2
		Like it	2

To determine which parts of science classes were most interesting to female students they were asked two questions: *Can you mention something you did in science class that was really interesting?* (Question 1) and *What part of your science class do you like best?* (Question 3).

Results were overwhelmingly in favour of labs, experiments and hands on experience. Over 58% of the junior students stated that making things (bridges, paper airplanes, simple machines), experiments (dry ice, baking soda and vinegar, food colouring and celery), and labs (dissecting worms, creating a biodome) were the most interesting things they had done in science class. The majority of junior girls (53%) expressed that labs and experiments were the part of science class they liked best followed by research and class or group projects (29%). Over 75% of the senior students stated that chemistry labs (chemical reactions, igniting chemicals), dissection labs (sheep hearts, pig brains), experiments (electricity, stroop effect) and making things (soap, batteries, pop bottle rockets) were the most interesting things they had done in science class. Similar to the junior students the majority of senior girls (63%) also expressed that labs and experiments were the part of science class they liked best followed by research and class or group projects (21%). Overall results suggest that female students enjoy a hands-on approach to studying science.

Three interview questions were devoted to experiences with science teachers: *What characteristics do you look for in a good science teacher.* (Question 4), *Does your science teacher talk about careers that need science?* (Question 5), and *Think of all the science*

teachers you have had. Have they been mostly male or female? Did this make any difference to you? (Question 6).

Most students indicated more than one desirable characteristic for a science teacher (see Table 5.2). The largest group of characteristics had to do with general teaching characteristics. Junior students listed 40 traits and senior students listed 58 traits that described good teaching practice in general such as *makes classes interesting* and *explains things*. The second largest group of characteristics had to do with the personality of the individual teacher. Junior students listed 25 personal characteristics and senior students listed 37 personal characteristics such as *funny*, *kind,* and *enthusiastic*. The third group of characteristics was more specific to science teaching. Junior students listed 12 words and senior student listed 20 words that indicated a good science teacher should *like science* and *have experience in science*. Students in this sample indicated that characteristics of good science teachers are more specific to overall teaching ability and personal suitability to teaching, more than specific science related characteristics.

Table 5.2 Characteristics of a Good Science Teacher

Characteristic	**Junior** (n = 51)	**Senior** (n = 58)
General Teaching Characteristics		
Explains things	14	9
Uses a hands on approach	7	1
Wants students to learn	5	5
Teaches well, teaches clearly	4	9
Answers questions	4	7
Makes it interesting, not boring	4	12
Controls the class	1	3
Relates to students	1	2
Updated, modern examples	0	2
Uses personal stories	0	3
Involved, supportive	0	5
Personality Characteristics		
Funny, humorous	11	16
Kind, nice, friendly	8	4
Exciting, enthusiastic, vibrant	3	8
Patient, understanding, tolerant	2	7
Likes kids, accepts students	1	2
Science Teacher Characteristics		
Knows what they are doing, experience	9	8
Likes science, knows science	3	12

The second question regarding teachers concerned the frequency with which they talked about science careers. Almost 10% of the junior students reported their teachers definitely talked about science careers and another 22% reported they sometimes talked about science careers. Just over one half (52%) of the senior students reported that their teachers definitely talked about science careers and another 17% said they talked about science careers sometimes or a little. This age level difference can most likely be attributed to the increased concentration on careers and career choices in the senior grades.

Concerning gender of science teachers, 66% of the junior students reported that most of their science teachers had been female, and 28% reported that most of their science teachers had been male. The reverse was true for senior students where 55% reported that most of their science teachers had been male, and 28% reported that most of their science teachers had been female. These results reflect common gender differences in junior and senior high school staffing practices in Alberta. When asked if the teacher's gender made any difference to them, 94% of the juniors and 91% of the seniors replied *No.* The three junior students who said *Yes* suggested the following reasons: *I can communicate better with females, Boys are better, I like male science teachers better.* The five senior students who said *Yes* suggested the following reasons: *Males are easier to talk to, I only had one female and she wasn't good, Males are more specific and less temperamental, Males because they explain better, Females know more.* Interestingly, students for whom gender did make a difference chose both females and males as preferred teachers.

A series of questions were asked to determine the students' interest in science. The first set of questions was: *Do you have a strong interest in science? How long have you had this interest? What helped develop this interest?* (Question 8). Students were also asked*: Are your friends interested in science?* (Question 10).

Despite the fact that the SCIberMENTOR program is designed to encourage girls' interest in science and science careers, 22% of the junior girls and 9% of the senior girls said they did not have a strong interest in science (see Table 5.3). However the anticipated high level of interest for these girls was confirmed with 73% of the junior girls and 88% of the senior girls responding positively to this question. Of the large majority that did have a strong interest in science, length of this interest ranged from as recent as *2 months* to answers such *as long as I can remember* (see Table 5.4). The top four answers indicating what helped the girls to develop this interest are presented in Table 5.5. The most frequent answer for both junior and senior girls was that *Science Fairs and Contests* or *Nothing* helped to develop their strong interest in science. The majority of junior students (69%) and the majority of senior students (74%) indicated that their friends are interested in science.

Table 5.3 Interest in Science

Do You Have a Strong Interest in Science?	**Junior** (n = 51)	**Senior** (n = 58)
Yes	37	51
No	11	5
No response	3	2

Table 5.4 Length of Interest in Science

How Long Have You Had This Interest? *Since…*	**Junior** (n = 51)	**Senior** (n = 58)
2 months	2	0
Year or so	6	8
2 - 3 years	11	9
4 - 5+ years	2	7
Since a kid	8	17
Forever, As long as I can remember	5	13
No response	17	2

Table 5.5 Top Four Activities that Helped Develop this Interest

Junior (n = 51)		Senior (n = 58)	
Activity	Frequency	Activity	Frequency
Science Contests / Fairs	13	Nothing	17
Nothing	11	Science Contests / Fairs	14
University Science Camp	5	Teacher	6
Field Trips (e.g. science centre)	5	Science Class	3

Students were then asked*: What area within the sciences interests you the most? Why?* (Question 9). Responses from junior students covered a wide range of science careers. Careers mentioned more than once include: biology (8), forensics (7), computers (7), chemistry (4), space (4) engineering (3), medicine (3), and astronomy (3). Careers mentioned once were: weather, sky science, geography, cells, body systems, plants, teaching geology, ecology. Reasons for their expressed interest would be categorized as *fun* or of *special interest* to the student. Responses from senior students also covered a wide range of science careers. Careers mentioned more than once include: biology (22), chemistry (12), biology and chemistry (5), computers (3), space (3) engineering (5), physics (2) and all areas (2). Careers mentioned once were: astronomy, archaeology, psychology, genetics, and forensics. While reasons for their expressed interest were again *fun* or of *special interest* to the student, senior students added liking the specific science career subject, being good at it, and wanting to use a specific science in their career.

Another question was posed to determine students' interest in science by determining their familiarity with important scientists. Students were asked: *Can you name two important male scientists?* and *Can you name two important female scientists?* (Question 12). Both junior and senior students mentioned *Einstein* more often than any other scientist. More than one junior student also named *Galileo, Newton, Edison, Neil Armstrong, Archimedes,* and *Alexander Graham Bell.* Senior students also named *Newton, Galileo, Darwin, Benjamin Franklin, Rutherford, Dalton Edison* and *David Suzuki*. Over 39% of the junior students and 21% of the senior students could not name an important male scientist. Both groups of students had even more difficulty naming an important female scientist where 82% of the junior students and 60% of the senior students could not answer this question. A total of seven junior students named *Roberta Bondar, Jane Goodall, Katherine Sullivan* or *Diane Fossey*. Seventeen senior students named six female scientists: *Marie Curie, Roberta Bondar, Florence Nightingale, Wendy Hutchins, Elizabeth Kemp* and *Julie Payette* (for selected results see Table 5.6).

Finally students were asked to: Describe a person you know that likes science (Question 13). Answers from both junior and senior students typically included: friend, classmate, sibling, parent, teacher, or relative. Only two students named themselves as a person that likes science. Most answers used to describe the person who liked science fell into two categories: Smart or a Good Thinker, and Interested or Excited by Science (see Table 5.7). Junior answers that were not categorized ranged from: *Has glasses and is nerdy* to *Is funny and has a good personality*. Senior answers that were not categorized included: *I don't think you have to have certain characteristics to like science* and *They are going to be doctors and go for the money*.

Table 5.6 Number of Important Scientists Known (only male scientists named more than once indicated)

Junior (n = 51)				Senior (n = 58)			
Male Scientist	#	Female Scientist	#	Male Scientist	#	Female Scientist	#
Einstein	21	Don't know	42	Einstein	27	Don't know	35
Don't know	20	Roberta Bondar	2	Don't know	12	Marie Curie	10
Galileo	4	Jane Goodall	2	Newton	11	Roberta Bondar	3
Newton	3	Katherine Sullivan	2	Galileo	4	Florence Nightingale	1
Edison	2	Diane Fossey	1	Darwin	2	Wendy Hutchins	1
Neil Armstrong	2			Ben Franklin	2	Elizabeth Kemp	1
Archimedes	2			Rutherford	2	Julie Payette	1
Alexander G. Bell	2			Dalton	2		
				David Suzuki	2		
				Edison	2		

Table 5.7 Main Descriptors of People Who Like Science

Describe a person you know that likes science.	Junior (n = 51)	Senior (n = 58)
Smart, skilled or good thinker	10	17
Interested, enthusiastic or excited by science	32	30
Other	9	11

5.2 Science Careers and Adult Life

A series of questions were posed to the students regarding science careers and adult life. The first question was: *Please list up to five careers that involve science* (Question 14). Only 27% of junior students could list five science careers, but the majority of senior students (62%) could do so. (See Table 5.8) Of the science careers that the girls were able to identify, the top three for both junior and senior girls was engineering, medicine and biology. Selected results are reported in Table 5.9. For a total list of careers generated by both junior and senior students see Appendix C.

Table 5.8 Number of Science Careers Student Could Name

Number of Science Careers	Junior (n = 51)	Senior (n = 58)
5 careers	14	36
4 careers	20	9
3 careers	14	9
2 careers	2	3
1 careers	1	1

Table 5.9 Top Thirteen Science Careers Named

Junior (n = 51) Science Career	Frequency	**Senior** (n = 58) Science Career	Frequency
Engineering	25	Engineering	39
Biologist / Microbiologist	18	Medicine/Doctor	31
Medicine/Doctor	18	Biologist / Microbiologist	19
Scientist	12	Chemist	15
Chemist	10	Marine biologist	12
Science teacher	10	Science teacher	10
Forensics / Police lab / CSI	9	Forensics / Police lab / CSI	7
Marine biologist	8	Astronaut	7
Vet	7	Pharmacist	7
Astronaut	6	Vet	6
Geologist	6	Zoologist	6
Zoologist	5	Computer science/technology	6
Computer science/technology	5	Physicist / Nuclear physicist	6

Students were then asked: *Would any of these careers interest you? Which ones? Why or why not?* (Question 15). The majority of both junior (94%) and senior (91%) students said that one of the 5 science careers they listed would be of interest to them. Junior and senior students both indicated their specific career choice was because they had an interest and affinity for that area of science. Only one senior and one junior student indicated that money was a factor, two senior students said their chosen career would help them contribute to the world, and three junior students indicated that a relative in that particular science career influenced their career interest choice.

The influence of relatives on science career choice has been previously documented (Wallace, Haines & Cannon, 1999). To further understand relatives' influence on career choice in this sample of female students, they were asked: *Do your parents or any other close relative have careers in science? Who? Does that person encourage you in science? How?* (Question 16). Just over half of the junior (59%) and senior (55%) students reported they had a relative in a science career. For both groups of students the most frequently named person was father, followed by mother, uncle and then aunt. Most of these adults encouraged the students by being involved and expressed this by: *helping them with science homework, encouraging them, telling them about their jobs, buying science books, answering questions, taking them to work, explaining science concepts, finding a science school*, or *teaching them about computers*.

To further determine the student's attitudes towards science careers they were asked: *What would be the benefits of a career involving science? What would be some disadvantages?* (Question 17). Students were generally positive about science careers having more benefits than disadvantages. Of the top five benefits listed by junior and senior students, the response *having a job that increased learning, understanding and knowing* was most often given. The most commonly cited disadvantage to a science career was the response that it was *time consuming* and *a lot of work* (see Tables 5.10 and 5.11).

Table 5.10 Top Five Benefits of a Science Career

Benefits	Junior (n = 51)	Senior (n = 58)
Learning, understanding and knowing	28	26
Fun and interesting	6	9
Money	6	5
Discovering new things	5	5
Helping people and animals	5	4
Other	1	9

Table 5.11 Top Four Disadvantages of a Science Career

Disadvantages	Junior (n = 51)	Senior (n = 58)
A lot of work, time consuming	12	15
None	8	14
Boring	6	2
Risk (physical and failure)	4	7
Other	21	20

To further determine attitudes towards scientist and science careers students were asked: *What words would you use to describe a scientist or engineer?* (Question 18). The three most commonly used words by both junior and senior students are listed in Table 5.12. The descriptive words were positive and indicate a perceived high standard of functioning for people in science. Over 60% of the junior students and 36% of the senior students used the word *smart*, *intelligent* or a synonym to describe a scientist.

Table 5.12 Top Words used to describe a Scientist or Engineer

Words	Junior (n = 51)	Senior (n = 58)
Smart / intelligent	31	21
Hard working	6	4
Interesting	6	4
Other	8	30

A more specific question regarding future career goals was: *What specific career goals do you have?* (Question 19). Some student specified one goal while others listed multiple goals. *Science careers* were mentioned 22 times (out of 64 responses) by junior students and of these, five were physical science related careers such as *chemistry, geologist and engineer*. Most science careers mentioned were biology related such as *doctor, vet and biologist*. Other careers listed included *teaching, law, professional athlete,* and *arts related careers*. Some responses (16) were goals rather than careers such as: *something I enjoy, a job, not sure, be my own boss* or *get to a good university*. Senior students mentioned science-related careers 35 times (out of 105 responses) and of these 8 were *engineering*. Medical related careers were the most frequently mentioned science careers. Other choices included *psychology, teacher, architect,* and *writer.* Almost half (50) of the senior responses were not careers, but goals such as: *finish*

university, get a degree, a job that peaks my interest, make a lot of money, something I'd be happy at, not fall in a rut, be known for something and *live life to the fullest.*

Three questions were asked about the student's perception of women in careers. The first was, *In your opinion, what are some of the most popular careers for women today?* (Question 22). Both junior and senior students listed *teacher* as the most popular career for women. The top ten careers for junior and senior students are listed in Table 5.13.

Table 5.13 Top Ten Most Popular Careers for Women Today

Junior (n = 51)		**Senior** (n = 58)	
Career	Frequency	Career	Frequency
Teacher	15	Teacher	21
Doctor	10	Nurse	21
Nurse	8	Secretary	10
Lawyer	8	Engineer	7
Secretary	7	Doctor	5
Homemaker/mom	5	Social Work / Counsellor	5
Designer	4	Business women	4
Engineer	4	Hairdresser	4
Acting	3	Law	4
Waitress	3	Science	4

A second question asked: *In the media what careers do you see women involved in?* (Question 23). The top ten careers are presented in table 5.14. Both junior and senior girls saw *homemaker, nurse, media, teacher* and *doctor* as common careers portrayed in the media.

Table 5.14 Top Ten Careers Portrayed in the Media

Junior (n = 51)		**Senior** (n = 58)	
Career	Frequency	Career	Frequency
Media	10	Homemaker	13
Homemaker	8	Nurse	10
Nurse	8	Fashion / Makeup / Hair	10
Doctor	7	Media	9
Acting	7	Teacher	8
Housemaids	5	Lawyer	7
Design	4	Doctor	7
Science	4	Secretary	7
Teacher	4	Waitress	5
Secretary / Office Work	4	No job	3

Further regarding women in careers, the students were asked: *There are not so many women in science, engineering and technical careers. Why do you think this is so?* (Question 24). Overall the answers reflect typical gender stereotypes but responses have been further broken down into four categories for both junior and senior students (see Table 5.15). *Traditional Roles* was the most commonly cited reason for the scarcity of women in science careers. Sample answers

in this category by junior students were: *They think its mostly what men do, not what women do; They have kids and don't think they can work and have kids at the same time; Their mothers growing up didn't know of women in these careers; They think that men are better for the job; Cause men take control and won't let women do anything a long time ago and its just turning around now.* Sample answers in this category by senior students were: *It's stereotypically a field dominated by males; Our society is still sexist, they don't tend to encourage women to do the things men do; Typical stereotypes that women stay a home and look after the kids; You need a lot of information to get there and women usually have families and don't have time.* Sample responses for *No Interest* were: *Men are more interested in that kind of stuff; Women don't like the subject as much; Women don't want to go into those jobs.* Common responses in the *Discouraged/Not Encouraged* category were: *Because they didn't get encouraged to like it, and they may have if they had a program like this (SCIberMENTOR); Women used to be discouraged from getting a job in these careers; Maybe they were discouraged.* Responses from the *Scared* group included: *It's really competitive; Women didn't think they could do that job; It's hard.*

Table 5.15 Reasons for so Few Women in Science

Reason	**Junior** (n = 51)	**Senior** (n = 58)
Traditional Roles	26	37
No Interest	9	7
Scared	7	3
Discouraged / Not Encouraged	4	10
Don't know	2	1
Other	2	0

The last series of questions in this section concerned adult roles. Students were asked: *As an adult, do you see yourself as: married, with children, working outside the home, working outside the home with children?* (Question 20). Results are presented in Figures 5.1 and 5.2. The majority of both junior and senior students see themselves as married, having children, working and also working when they have children.

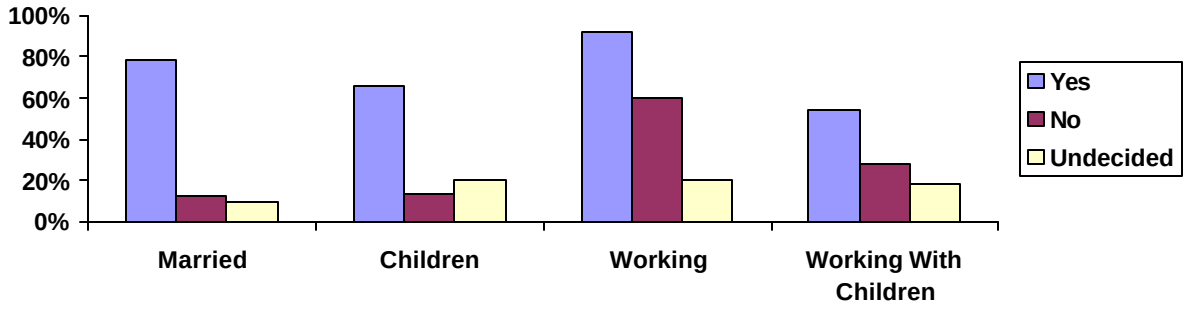

Figure 5.1 Junior Student Responses Regarding Adult Roles

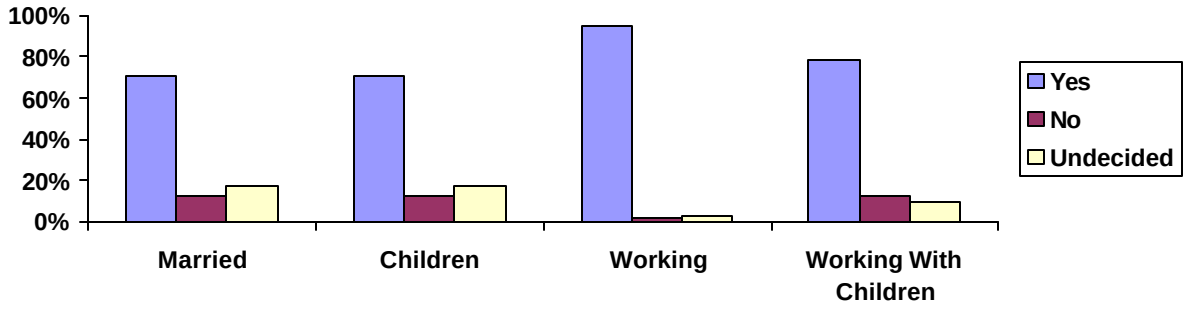

Figure 5.2 Senior Student Responses Regarding Adult Roles

Students were further asked: *Do you see potential conflict between career and family goals?* (Question 21). Answers by junior students were even for both *yes* and *no* regarding potential conflict and answers from seniors reflected that over half of the students said there would be no conflict between career and family goals (see Figure 5.3).

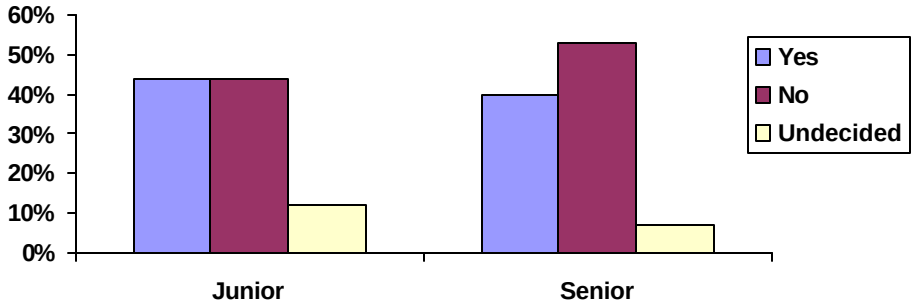

Figure 5.3 Student Responses Regarding Conflict between Career and Family Goals

Students who foresaw potential conflict cited reasons such as: *But I might have to work on Saturdays so no babysitter, Long hours and time with family lost, Daycare issues like cost and who do you trust,* and *For kids it would be harsh not growing up and knowing their mother.* Students who did not perceive a potential conflict cited reasons such as: *There's help out there like daycare, I'll work around it and deal with it then, A career would make money to make your family better,* and *My family hasn't had problems and both my parents work outside the home.*

5.3 Perceptions of SCIberMENTOR Program

Students were asked three questions regarding mentorship. The first question was: *Have you ever been involved in a mentorship program before SCIberMENTOR where you have been the mentee?* (Question 25). One junior student and two senior students replied *yes*. The junior student had a female mentor in a music program she participated in. The mentorship was face to face and the student reported that it had made a difference to her music studies and the gender of the mentor was not important. One senior student had worked with a veterinarian when in grade six. She reported that the face-to-face interaction with the male mentor had made a difference in confirming that she did want to be a veterinarian and the gender of the mentor was not important. The second senior student worked with a male mentor from a home construction company. This student also reported that the gender of the mentor did not matter

and that the experience had confirmed her interest in architecture. For the remaining 106 research participants, the SCIberMENTOR program was their first experience with mentorship.

Students were asked: *Please describe what you think your SCIberMENTOR does at her job* (Question 26). Senior student were more capable of clearly describing their SCIberMENTORS' job than junior students (See Table 5.16).

Table 5.16 Mentees' Descriptions of Mentors' Jobs

Statement	Junior (n =46)	Senior (n = 57)
Can describe the SCIberMENTORS' job	18	32
Cannot describe the SCIberMENTORS' job	6	10
Has a vague idea of the SCIberMENTORS' job	22	15

Students were finally asked*: What do you hope to gain from participating in the program?* (Question 27). The most common answers for junior students was: *To know what is out there* and *Learning about a specific career. To know what is out there* was also the most popular response from senior students followed *by Learn about university or classes to take*. Responses are shown in Table 5.17.

Table 5.17 What Student Hopes to Gain from the SCIberMENTOR Program

Statement	Junior (n =49)	Senior (n = 58)
To know what is out there, what is available	9	16
Learn about a specific career	9	8
Learn about science	8	2
Learn about science careers	6	7
Learn about careers	5	9
Learn about university or classes to take	5	11
Someone to listen to me, encourage me	2	5
Other	5	0

SUMMARY

SCIberMENTOR is a unique program that matches girls aged 11 to 18 with women studying or practicing science or engineering in a one-on-one email mentoring relationship. The program matches mentees with mentors based on career interests and hobbies during which they communicate using email. In order to evaluate the impact of the program on the mentees and mentors, a research program was undertaken of which the first phase consisted of administering a questionnaire to over 125 mentees who lived in both rural and urban centres, and who were spread across the program target age range. The second phase of the project consisted of in-depth telephone interviews with over 100 of these mentees. This report documented some of the results from both the questionnaire and telephone interviews.

The questionnaire indicated that the mentees had a very positive attitude towards school. In addition, over 87% agreed or strongly agreed that they liked themselves, whereas they strongly disagreed or disagreed that they would act dumb, let schoolwork slip, or not try hard at school in order to be popular. They have generally positive affinity and interest for math, science and English/language arts. In particular, the results indicate that the mentees have just as much, if not more, confidence in their ability and interest in science as their typical male counterparts determined from a previous study. It is likely that this strong affinity to science was the central factor leading them to participate in SCIberMENTOR.

Almost all (97%) agreed that they were going to university, and they had strong responses to a future career that 'gives me a chance to learn new skills', 'gives me a chance to work on challenging projects', and 'gives me the opportunity to try to make the world a better place'. They were consistently in agreement about science or math related professions as their first career choice which is significantly higher than in a previous research study in which the girls from a broader population sample tended to favour gender stereotypical careers. Interestingly, although they were interested in computers and felt that they were good with computers, Information Technology careers did not rate as one of the top six career choices.

The research participants indicated strong perceptions about gender equality in contributing to family income, and sharing housework and childcare. They perceive themselves as being equally able to handle pressure on the job as males, and that working and non-working mothers are no different in their ability to establish a warm and secure relationship with their children. However, questions that more specifically examined the interrelationships between career and child rearing resulted in mixed emotions and greater ambiguity in response patterns.

Data collected from telephone interviews indicate that mentees most often describe science as being 'interesting', 'fun', 'challenging' and 'exciting'. The parts of science class they like best were overwhelmingly the labs, experiments and hands on experience. Overall results suggest that female students enjoy a hands-on approach to studying science. In addition, they indicated that they like a science teacher who *makes classes interesting* and *explains things*, while having personal characteristics such as being *funny*, *kind,* and *enthusiastic.* They also think a good science teacher should *like science* and *have experience in science*.

The research participants were asked to name important male and female scientists. Both junior and senior students mentioned *Einstein* more often than any other scientist, however, over 39% of the junior students and 21% of the senior students could not name an important male scientist. Both groups of students had even more difficulty naming an important female scientist where 82% of the junior students and 60% of the senior students could not answer this question which shows a lack of communication of female science mentors to young women.

Students were generally positive about science careers having more benefits than disadvantages, with the top benefit being identified as *having a job that increased learning, understanding and knowing*. In contrast, the most commonly cited disadvantage to a science career was the response that it was *time consuming* and *a lot of work*. The top two words to describe a scientist or engineer were 'smart' and 'intelligent'. When asked to name the most popular career for women, both junior and senior students listed *teacher*.

In terms of the SCIberMENTOR program, students were asked what they hoped to gain from participating in the program, with the most common answers for junior students was: *To know what is out there* and *Learning about a specific career. To know what is out there* was also the most popular response from senior students followed *by Learn about university or classes to take*. These responses directly match some of the objectives of the SCIberMENTOR program.

Overall, the research results show that the SCIberMENTOR mentees have a strong interest in science and many see themselves pursuing a career in science in their future. This suggests that the program attracts those that have already developed a keen interest in science and the program must continue to strive to nurture and further develop this interest. Further research on future choices of the mentees is being conducted and will be reported in the future.

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APPENDIX A: MENTEE QUESTIONNAIRE

SCIberMENTOR Mentee Questionnaire

Phase I

Name:_____

Grade:_____

School:_____

Home Telephone #:_____

We appreciate you participating in this study with us, and hope you will find this questionnaire both interesting and fun! The following pages contain a variety of questions about your activities, interests, likes, abilities, future plans, etc. We are interested in your opinion about these matters. Please read and answer each item carefully, and remember, there are no right or wrong answers. If you don't understand a question, don't spend a lot of time on it. Just go on to the next question.

All your answers will be kept confidential. Only those working on this research project will see your answers.

Part 1 Background Information

1. What is your date of birth? Month_____ Day_____ Year_____

2. Who do you live with?
   _____Mother and father together
   _____Mother only
   _____Father only
   _____Mother + other adult
   _____Father + other adult
   _____Part of the time with each parent
   _____Other (specify) _____

	None	One	Two	Three	Four or more
3. How many brothers do you have?	?	?	?	?	?
4. How many sisters do you have?	?	?	?	?	?

5. What is the highest level of education your parent(s) received?

a) **Mother**

some grade school	some high school	high school graduate	university, technical school or college
?	?	?	?

b) **Father**

Some grade school	some high school	high school graduate	university, technical school or college
?	?	?	?

		English	Other
6.	What language is most often spoken at home?	?	?

Part 2 General Questions About Yourself

		Less than 60%	60-69%	70-79%	80-89%	90-100%
7.	In the year just completed, what were your final grades in the following courses?					
	a) Math (if you are in high school, state the Math course you took _____) (e.g. Math 10, 20, 30)	?	?	?	?	?
	b) English / Language Arts (if you are in high school, state the English/Language Arts course you took _____ (e.g. English 10, 20, 30)	?	?	?	?	?
	c) Science (if you are in high school, state the Science course you took_____) (e.g. Science 10,20,30) **OR** Give the final grades in the following courses:	?	?	?	?	?
	d) **Biology** _____ (e.g. 20 or 30)	?	?	?	?	?
	e) **Physics** _____ (e.g. 20 or 30)	?	?	?	?	?
	f) **Chemistry** _____ (e.g. 20 or 30)	?	?	?	?	?

		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
8.	I do my schoolwork because I want to learn new things.	?	?	?	?	?
9.	I do my schoolwork because it's fun or interesting.	?	?	?	?	?
10.	I do my schoolwork because I feel bad if it's not done.	?	?	?	?	?

		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
11.	I do my schoolwork because the teacher says I have to.	?	?	?	?	?
12.	I do my schoolwork because it makes my parent(s) happy.	?	?	?	?	?
13.	If I get stuck on a problem or make a mistake, I try and figure it out by myself, rather than asking the teacher for help.	?	?	?	?	?
14.	When a group I belong to plans an activity, I would rather organize it myself than have someone else organize it.	?	?	?	?	?
15.	I feel that winning is important.	?	?	?	?	?
16.	I like myself.	?	?	?	?	?

Part 3 Beliefs and Expectations for SCIberMENTOR Program

		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
17.	I think I will benefit from this mentorship program.	?	?	?	?	?
18.	I expect to become more aware of the different careers that are related science as a result of this program.	?	?	?	?	?
19.	I think that job-shadowing is a good way to learn about new areas of employment.	?	?	?	?	?

Part 4 - Questions About Math

		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
20.	I think the math that I will learn this year will be useful for my future.	?	?	?	?	?
21.	It is important to me to do well in math.	?	?	?	?	?
22.	I try to do the best I can in math.	?	?	?	?	?
23.	I find working on math assignments interesting.	?	?	?	?	?
24.	Compared to other subjects, math is useful.	?	?	?	?	?
25.	I like math.	?	?	?	?	?
26.	I like math compared to other subjects.	?	?	?	?	?
27.	I feel excited and challenged while doing math.	?	?	?	?	?
28.	I would take more math courses even if I didn't have to.	?	?	?	?	?
29.	I feel that a more advanced math course would be too difficult for me.	?	?	?	?	?
30.	I have to work hard to get good grades in math.	?	?	?	?	?
31.	I am going to do well in math this year.	?	?	?	?	?
32.	I am going to do as well in math this year as my teacher wants me to.	?	?	?	?	?

		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
34.	If I were to rank all the students in a math class, from the lowest to the highest, I would put myself in the highest group.	?	?	?	?	?
35.	I am good at math.	?	?	?	?	?
36.	I am good at learning something new in math.	?	?	?	?	?
37.	I would be successful in a career that required mathematical ability.	?	?	?	?	?
38.	I get nervous when taking a test in math.	?	?	?	?	?
39.	My heart beats faster when I take a math test.	?	?	?	?	?
40.	No matter how hard I try, I feel I just cannot understand math.	?	?	?	?	?
41.	I get nervous if I have to explain my answer in front of a math class.	?	?	?	?	?
42.	In general, I feel comfortable or okay asking a math teacher for help.	?	?	?	?	?
43.	It is important to my parent(s) that I do well in math.	?	?	?	?	?
44.	In general, how much time do you spend on math homework most days?	?	?	?	?	?

Part 5 Questions About Language Arts/English

		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
45.	I think the Language Arts/English that I will learn this year will be useful for my future.	?	?	?	?	?

		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
46.	It is important to me to do well in Language Arts/English.	?	?	?	?	?
47.	I try to do the best I can in Language Arts/English.	?	?	?	?	?
48.	Compared to other subjects, Language Arts/English is useful.	?	?	?	?	?
49.	I find working on Language Arts/English assignments interesting.	?	?	?	?	?
50.	I like Language Arts/English.	?	?	?	?	?
51.	I like Language Arts/English compared to other subjects.	?	?	?	?	?
52.	I feel excited and challenged while doing Language Arts/English.	?	?	?	?	?
53.	I would take more Language Arts/English courses even if I didn't have to.	?	?	?	?	?
54.	I feel that a more advanced Language Arts/English course would be too difficult for me.	?	?	?	?	?
55.	I have to work hard to get good grades in Language Arts/English.	?	?	?	?	?
56.	I am going to do well in Language Arts/English this year.	?	?	?	?	?
57.	I am going to do as well in Language Arts/English this year as my parent(s) want me to do.	?	?	?	?	?

		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
58.	I am going to do as well in Language Arts/English this year as my teacher wants me to.	?	?	?	?	?
59.	If I were to rank all the students in a Language Arts/English class, from the lowest to the highest, I would put myself in the highest group.	?	?	?	?	?
60.	I am good at Language Arts/English.	?	?	?	?	?
61.	I am good at learning something new in Language Arts/English.	?	?	?	?	?
62.	I would be successful in a career that required writing and speaking ability.	?	?	?	?	?
63.	While I am taking a test in Language Arts/English I get nervous.	?	?	?	?	?
64.	My heart beats faster when I take a Language Arts/English test.	?	?	?	?	?
65.	No matter how hard I try, I feel I just cannot understand Language Arts/English.	?	?	?	?	?
66.	I get nervous if I have to explain my answer in front of a Language Arts/English class.	?	?	?	?	?
67.	I feel comfortable or okay asking a Language Arts/English teacher for help.	?	?	?	?	?
68.	It is very important to my parent(s) that I do well in Language Arts/English.	?	?	?	?	?

		Less than 15 min.	About 30 min.	About 45 Min.	About an Hour	More Than an hour
69.	In general, how much spare time do you spend reading books, comic books, or magazines?	?	?	?	?	?

		Less than 15 min.	About 30 min.	About 45 min.	About an hour	More than an hour
70.	In general, how much time do you spend on Language Arts/English homework most days?	?	?	?	?	?

Part 6 Questions About Science

		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
71.	I think the science I am learning now will be useful for my future.	?	?	?	?	?
72.	It is important to me to do well in science.	?	?	?	?	?
73.	I try to do the best I can in science.	?	?	?	?	?
74.	Compared to other subjects science is useful.	?	?	?	?	?
75.	I find working on science assignments interesting.	?	?	?	?	?
76.	I like science.	?	?	?	?	?
77.	I like science compared to other subjects.	?	?	?	?	?
78.	I feel excited and challenged while doing science.	?	?	?	?	?

		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
79.	I would take more science courses even if I didn't have to.	?	?	?	?	?
80.	I feel that a more advanced science course would be too difficult for me.	?	?	?	?	?
81.	I have to work hard to get good grades in science.	?	?	?	?	?
82.	I am good at science.	?	?	?	?	?
83.	I am going to do well in science this year.	?	?	?	?	?
84.	I am going to do as well in science this year as my parent(s) want me to do.	?	?	?	?	?
85.	I am going to do as well in science this year as my teacher wants me to do.	?	?	?	?	?
86.	If I were to rank all the students in science class from the lowest to the highest, I would put myself in the highest group.	?	?	?	?	?
87.	I am good at learning something new in science.	?	?	?	?	?
88.	I would be successful in a career that required scientific ability.	?	?	?	?	?
89.	When taking a test in science, I get nervous.	?	?	?	?	?
90.	My heart beats faster when I take a science test.	?	?	?	?	?

91.	No matter how hard I try, I feel I just cannot understand science.	?	?	?	?	?
		Strongly Disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly Agree**
92.	I get nervous if I have to explain my answer in front of the science class.	?	?	?	?	?
93.	Students seem to like the science class.	?	?	?	?	?
94.	The science teacher is friendly to us.	?	?	?	?	?
95.	The teacher makes science interesting in this class.	?	?	?	?	?
96.	I feel comfortable or okay asking a science teacher for help.	?	?	?	?	?
97.	My science teacher is more interested in smart kids than other kids.	?	?	?	?	?
98.	My science teacher shows more interest in the progress of boys than of girls.	?	?	?	?	?
99.	It is important to my parent(s) that I do well in science.	?	?	?	?	?
		Less than 15 min.	**About 30 min.**	**About 45 min.**	**About an hour**	**More than an hour**
100.	In a typical day, how much spare time do you spend doing science activities like collecting rocks, collecting insects, or doing experiments?	?	?	?	?	?
		Less than 15 min.	**About 30 min.**	**About 45 min.**	**About an hour**	**More than an hour**
101.	In general, how much time do you spend on science homework most days?	?	?	?	?	?

Part 7 Questions About Computers

		Yes	No
102.	Do you (or your family) own a computer?	?	?

		5 or under	6-10	11-13	14 or over
103.	At what age did you first use a computer?	?	?	?	?

		At a friend's house	At school	At a relative's house	At home	At work/ other
104.	Where did you first use a computer?	?	?	?	?	?

		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
105.	I like computers.	?	?	?	?	?
106.	I am good at doing things on the computer.	?	?	?	?	?
107.	I use the computer to help me with my homework.	?	?	?	?	?
108.	I use the computer (Internet) to find information for projects, homework assignments, and papers.	?	?	?	?	?
109.	Good computer skills will help me in my future education.	?	?	?	?	?
110.	Good computer skills will help me in my future career.	?	?	?	?	?
111.	Having vast computer knowledge helps advance people in their careers.	?	?	?	?	?
112.	I feel nervous when I use the computer.	?	?	?	?	?
113.	I am afraid to try new things on the computer because I fear I will break it.	?	?	?	?	?

114.	I feel comfortable asking my teachers for help with the computer.	?	?	?	?	?
115.	Boys know more about computers than girls do.	?	?	?	?	?
116.	When I encounter a problem with the computer I attempt to figure it out myself before asking someone for help.	?	?	?	?	?
		Strongly Disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly Agree**
117.	I would participate in a computer club or camp.	?	?	?	?	?
118.	My friends and I play on the computer together.	?	?	?	?	?
119.	I know more about computers than my parents.	?	?	?	?	?
120.	Computers are used in most of my classes.	?	?	?	?	?
121.	The majority of my computer teachers have been male.	?	?	?	?	?
		Less than 15 min.	**About 30 min.**	**About 45 min.**	**About an hour**	**More than an hour**
122.	In a typical day, how much time do you spend on the computer?	?	?	?	?	?

123. **When you are on a computer, how much of the time do you spend doing each of the following activities?**

	None of the time	**Less than half the time**	**Half of the time**	**More than half of the time**	**All of the time**
Email	?	?	?	?	?
Surfing the 'net	?	?	?	?	?
Assignments/work on the computer.	?	?	?	?	?

Programming	?	?	?	?	?
Playing Games	?	?	?	?	?
Chat Rooms	?	?	?	?	?

Part 8- Questions About Your Future and Career Choices

In the future, I would like a job that . . .

		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
124.	Allows me to earn a great deal of money.	?	?	?	?	?
125.	Has high status in society.	?	?	?	?	?
126.	Provides enough money to support me and my family.	?	?	?	?	?
127.	Gives me a chance to work on challenging projects.	?	?	?	?	?
128.	Allows me to be my own boss most of the time.	?	?	?	?	?
129.	Gives me a chance to learn new skills and new things.	?	?	?	?	?
130.	Gives me an opportunity to make the world a better place.	?	?	?	?	?
131.	Gives me the ability to combine career and family.	?	?	?	?	?

As things stand now, it is likely that I will:

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

132.	Finish high school, then go on to University or College.	?	?	?	?	?
133.	Do more than one University degree (e.g. Master's, PhD, become a medical doctor, lawyer).	?	?	?	?	?
134.	Get married.	?	?	?	?	?
135.	Have children.	?	?	?	?	?

It is likely that I will choose the following as a career option:

		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
136.	Service/clerical (like childcare worker, beautician, secretary).	?	?	?	?	?
137.	Trade (like welder, carpenter, plumber).	?	?	?	?	?
138.	Protective or military service (like police, officer, firefighter, military).	?	?	?	?	?
139.	Full-time homemaker.	?	?	?	?	?
140.	Farmer	?	?	?	?	?
141.	Artist (like designer, interior decorator musician, actor).	?	?	?	?	?
142.	Healthcare worker (like registered nurse physical therapist, pharmacist).	?	?	?	?	?
143.	Health professional (like doctor, dentist, veterinarian).	?	?	?	?	?
144.	Science or math-related professional (like engineer, architect, geologist).	?	?	?	?	?

145.	Human services (like teacher, social worker, counsellor).	?	?	?	?	?
146.	Environment-related (like forestry, marine biologist, environmental engineer).	?	?	?	?	?
147.	Information Technology (like computer scientist, computer engineer, Web-Page designer, Systems Analyst, Computer Animated Graphics Designer).	?	?	?	?	?
148.	Other professions (like lawyer, accountant, architect, stock broker).	?	?	?	?	?

Part -9- Questions About Adult Roles in Society

		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
149.	Men and women should contribute equally to the family income.	?	?	?	?	?
150.	It is difficult for women to have successful careers and raise a family.	?	?	?	?	?
151.	It is difficult for men to have successful careers and raise a family.	?	?	?	?	?
152.	In general, men are better than women in science and engineering.	?	?	?	?	?
153.	In general, women are better than men in math.	?	?	?	?	?
154.	Women have better social skills than men do.	?	?	?	?	?
155.	All in all, it is better for the family if the husband provides most of the family's income and the wife takes care of the home and family.	?	?	?	?	?

156.	Babies and young children need to have their mothers around most of the time.	?	?	?	?	?
157.	It is okay for mothers of babies and young children to have a full-time job.	?	?	?	?	?
158.	Women are better wives and mothers if they also have a paid job outside the home.	?	?	?	?	?
159.	If a husband and a wife both work full-time, the husband and wife should share the housework and childcare equally.	?	?	?	?	?
160.	A working mother can establish just as warm and secure a relationship with her children as a mother who does not work.	?	?	?	?	?

		Strongly disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**
161.	Women can handle the pressure just as well as men when making an important decision on the job.	?	?	?	?	?
162.	Having a job gives a wife a better chance to develop herself as a person than staying at home.	?	?	?	?	?

Part -10- Questions About Your Friends

		Strongly disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**
163.	My friends influence the courses I will take in school.	?	?	?	?	?
164.	My friends influence my future job plans.	?	?	?	?	?
165.	In general, I prefer to do things with one or two friends, rather than with a large group.	?	?	?	?	?

166.	For me, being popular with girls is important.	?	?	?	?	?
167.	I am popular with girls.	?	?	?	?	?
168.	For me, being popular with boys is important.	?	?	?	?	?
169.	I am popular with boys.	?	?	?	?	?
170.	I am good at making new friends.	?	?	?	?	?
171.	All of my friends are concerned about being popular.	?	?	?	?	?
		Strongly disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**
172.	My friends are very concerned with status in social situations.	?	?	?	?	?
173.	My friends would like to be involved in this mentorship program.	?	?	?	?	?
174.	I have told other students in my class about this program.	?	?	?	?	?
175.	All of my friends try hard at their studies.	?	?	?	?	?
176.	I would act dumber than I really am to be popular with my friends.	?	?	?	?	?
177.	It's ok to let your schoolwork slip or get a lower grade in order to be popular with your friends.	?	?	?	?	?
178.	To be popular with my friends I sometimes don't try as hard as I could in school.	?	?	?	?	?

Thank you for completing this questionnaire, we truly appreciate your participation in this project. Please place this completed questionnaire in the stamped addressed envelope that has been provided. Thank you once again and good luck with your mentoring experience.

APPENDIX B: MENTEE TELEPHONE INTERVIEW QUESTIONS

SCIberMENTOR Mentee Interview Questions

Name:_____ Telephone:_____ Date:_____

In this interview, I will use the word science to mean all the sciences such as biology, chemistry and physics as well as engineering and the information technology areas such as computer science. Are you okay with that?

	Section 1: Demographics	**Counter #**	**Notes**
	School:		
	Grade:		
	Section 2: Science Class		
1.	Can you mention something you did in a science class that was really interesting?		
2.	On a scale of 1 to 10, 1 meaning the least and 10 meaning the most, how much effort does doing science take for you?		
3.	What parts of your science class do you like best – class projects, labs, field trips, etc.)?		
4.	What characteristics do you look for in a good science teacher?		
5.	Does your science teacher talk about careers that need science?		
6.	Think of all the science teachers you have had. Have they been mostly male or female? Did this make any difference to you?		
7.	What was your favorite subject last year? What was your least favorite subject last year? What was your most difficult subject last year? What was your least difficult subject last year?		
	Section 3: Science Interest		
8.	Do you have a strong interest in science? If so, how long have you had this strong interest? Are there any activities that you participated in that helped develop this interest (e.g. science fair)?		
9.	What area within the sciences interests you the most? (i.e. engineering, space, biology, computers) Why?		
10.	Are any of your friends interested in science?		
11.	Identify two words to describe how you feel about science?		
12.	Can you name two important male scientists? Can you name two important female scientists?		
13.	Describe a person you know that likes science?		
	Section 4: Science Careers		
14.	Please list up to five careers that involve science.		
15.	Would any of the careers you listed be of interest to you? Which ones? Why? Why not?		
16.	Do your parents or any other close relatives have careers in science? Who specifically?		

	What work do they do? Does that person encourage you to pursue science? How?		
17.	What would be the benefits of a career involving science? What would be some disadvantages?		
18.	What words would you use to describe a scientist or engineer?		
Section 5: Adult Life			
19.	What specific career goals do you have (if any)?		
20.	As an adult, do you see yourself as married? -with children? -working outside of the home? -working outside of the home and with children?		
21.	Do you see potential conflict between career and family goals? What? Why?		
22.	In your opinion, what are some of the most popular careers for women today?		
23.	In the media, what careers do you see women involved in?		
24.	There are not so many women who are in science, engineering and technical careers. Why do you think this is so?		
Section 6: SCIberMENTOR Program			
25.	Have you ever been involved in a mentorship program before SCIberMENTOR where you have been the mentee? ✍ Where did this program take place? ✍ When did this mentorship occur? ✍ What was your relationship with your mentor like? ✍ How were you matched with your mentor? ✍ What was the gender of this person? ✍ Did gender matter? ✍ What form did this take (face to face, email)? ✍ Did this mentoring program make a difference? (please explain)		
26.	Please describe what you think your SCIberMENTOR does at her job? (give a description of her duties, responsibilities)		
27.	What do you hope to gain from participating in the program?		

This completes the telephone interview portion. Thank you for your cooperation with the research aspect of the SCIberMENTOR program. We appreciate your support.

Do you have any questions?

Thanks again, and good luck with your mentoring experience.

APPENDIX C: CAREER CHOICES THAT INVOLVE SCIENCE

Question 14 – List up to 5 careers that involve science

Senior (n = 58)	engineering	39	cellular biologist	1
	medicine / doctor	31	pathologist	1
	biology/biologist/microbiologist	19	astronomer	1
	chemist	15	work in morgue	1
	marine biologist	12	nutrition	1
	science teacher/teacher	10	astrologist	1
	astronaut	7	respiratory therapist	1
	pharmacists	7	physiotherapist	1
	forensics/police labs/CSI	7	genetic engineer	1
	zoology	6	NASA	1
	vet	6	technician	1
	computer sciences/technology	6	inventor	1
	physicists/nuclear physicist	6	medical detective	1
	scientist	4	forestry	1
	geologist	4	neuroscience	1
	dentist	4	web page design	1
	environmental/	4	lab science	1
	research	3	archaeologists	1
	psychiatrist	3	molecular pathologists	1
	electrician	3	space	1
	nursing	2	paper industry	1
	psychology	2	information technology	1
	geophysicist	2	artist	1
	mathematician	2	environmental engineer	1
	architect	2	someone that looks at organisms, cells	1
	mechanic	2	optometrist	1
	lab scientist	1	aerospace engineer	1
	agriculture/forestry	1	genetic researcher	1
	weather person	1	geophysicist	1

Junior (n = 50)	engineering	25	weather person/meteorologist	2
	biology/biologist/microbiologist	18	science professor	2
	medicine / doctor	18	mechanic	1
	scientist	12	psychology	1
	chemist	10	research	1
	science teacher/teacher	10	nursing	1
	forensics/police labs/CSI	9	oceanologist	1
	marine biologist	8	archaeologist	1
	vet	7	NASA	1
	astronaut	6	inventor	1
	geologist	6	mathematician	1
	zoology	5	electrician	1
	computer sciences/technology	5	making spaceships	1
	astronomer	4	rocket scientist	1
	space	3	web page design	1
	botanist/someone who takes care of plants	3	gardener	1
	palaeontologist	3	writer	1
	pharmacists	3	paramedic	1
	architect	3	cook	1
	flying planes	2	wildlife person	1
	physicists/nuclear physicist	2	ecologist	1
	lab scientist	2	house building	1
	environmental	2	primatologist	1